# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade | Accredited by NBA | Affiliated to JNTUH)

Dundigal, Hyderabad - 500 043, Telangana

# OUTCOME BASED EDUCATION
# WITH
# CHOICE BASED CREDIT SYSTEM

## BACHELOR OF TECHNOLOGY
## ELECTRONICS AND COMMUNICATION ENGINEERING

## ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI UNDER AUTONOMOUS STATUS

**B.Tech Regular Four Year Degree Programme**

**(for the batches admitted from the academic year 2016- 2017)**

**&**

**B.Tech (Lateral Entry Scheme)**

**(for the batches admitted from the academic year 2017 - 2018)**

## FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

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"Take up one idea.
Make that one idea your life-think of it, dream of it, live on that idea. Let the brain muscles, nerves, every part of your body be full of that idea and just leave every other idea alone.
**This is the way to success"**

**Swami Vivekananda**

# PRELIMINARY DEFINITIONS AND NOMENCLATURES

**Academic Council**: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

**Academic Autonomy:** Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

**Academic Year:** It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., (one odd + one even) and one supplementary semester.

**AICTE:** Means All India Council for Technical Education, New Delhi.

**Autonomous Institute:** Means an institute designated as autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University, Hyderabad) and State Government.

**Backlog Course:** A course is considered to be a backlog course if the student has obtained a failure grade (F) in that course.

**Basic Sciences:** The courses offered in the areas of Mathematics, Physics, Chemistry, Biology etc., are considered to be foundational in nature.

**Betterment:** Betterment is a way that contributes towards improvement of the students' grade in any course(s). It can be done by either (a) re-appearing or (b) re-registering for the course.

**Board of Studies (BOS):** BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

**Branch:** Means specialization in a program like B.Tech degree program in Civil Engineering, B.Tech degree program in Computer Science and Engineering etc.

**Certificate course:** It is a course that makes a student gain hands-on expertise and skills required for holistic development in a specific area/field.

**Choice Based Credit System:** The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

**Compulsory course:** Course required to be undertaken for the award of the degree as per the program.

**Commission:** Means University Grants Commission (UGC), New Delhi.

**Continuous Internal Examination:** It is an examination conducted towards sessional assessment.

**Course:** A course is a subject offered by a department for learning in a particular semester.

**Course Outcomes:** The essential skills that need to be acquired by every student through a course.

**Credit:** A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

**Credit point:** It is the product of grade point and number of credits for a course.

**Cumulative Grade Point Average (CGPA):** It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

**Curriculum:** Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

**Department:** An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff and other resources in the process of study for a degree.

**Detention in a course:** Student who does not obtain minimum prescribed attendance in a course shall be detained in that particular course.

**Dropping from the Semester:** A student who doesn't want to register for any semester can apply in writing in prescribed format before commencement of that semester.

**Elective Course:** A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.

**Evaluation:** Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

**Grade:** It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

**Grade Point:** It is a numerical weight allotted to each letter grade on a 10 - point scale.

**Institute:** Means Institute of Aeronautical Engineering, Hyderabad unless indicated otherwise by the context.

**Massive Open Online Course (MOOC):** MOOC courses inculcate the habit of self learning. MOOC courses would be additional choices in all the elective group courses.

**Pre-requisite:** A course, the knowledge of which is required for registration into higher level course.

**Core:** The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

**Professional Elective:** It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

**Program:** Means, Bachelor of Technology (B.Tech) degree program / PG degree program: M.Tech/ MBA.

**Program Educational Objectives:** The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

**Project work:** It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

**Re-Appearing:** A student can reappear only in the semester end examination for the theory component of a course, subject to the regulations contained herein.

**Registration:** Process of enrolling into a set of courses in a semester of a Program.

**Regulations:** The regulations, common to all B.Tech programs offered by Institute are designated as "IARE Regulations R-16" and are binding on all the stakeholders.

**Semester:** It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. The odd Semester starts usually in July and even semester in December.

**Semester End Examinations:** It is an examination conducted for all courses offered in a semester at the end of the semester.

**S/he:** Means "she" and "he" both.

**Student Outcomes:** The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

**University:** Means the Jawaharlal Nehru Technological University Hyderabad, Hyderabad.

**Withdraw from a Course:** Withdrawing from a course means that a student can drop from a course within the first two weeks of the odd or even semester (deadlines are different for summer sessions). However s/he can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

# FOREWORD

The autonomy is conferred to Institute of Aeronautical Engineering (IARE), Hyderabad by University Grants Commission (UGC), New Delhi based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like J N T University Hyderabad (JNTUH), Hyderabad and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system** and **monitoring mechanism**, independent of the affiliating University but under its observance.

IARE is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the institute and recommendations of the JNTUH to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the institute to order to produce a quality engineering graduate to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

**PRINCIPAL**

# ACADEMIC REGULATIONS

**B.Tech. Regular Four Year Degree Programme**
**(for the batches admitted from the academic year 2016 - 17)**
**&**
**B.Tech. (Lateral Entry Scheme)**
**(for the batches admitted from the academic year 2017 - 18)**

For pursuing four year undergraduate Bachelor Degree programme of study in Engineering (B.Tech) offered by Institute of Aeronautical Engineering under Autonomous status and herein after referred to as IARE.

## 1.0. CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions (HEI's) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester system at first year itself. The semester system helps in accelerating the teaching-learning process and enables vertical and horizontal mobility in learning.

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

Choice Based Credit System (CBCS) is a flexible system of learning and provides choice for students to select from the prescribed elective courses. A course defines learning objectives and learning outcomes and comprises of lectures / tutorials / laboratory work / field work / project work / comprehensive Examination / seminars / assignments / alternative assessment tools / presentations / self-study etc. or a combination of some of these.

Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

The CBCS permits students to:

1. Choose electives from a wide range of elective courses offered by the departments.
2. Undergo additional courses of interest.
3. Adopt an interdisciplinary approach in learning.
4. Make the best use of expertise of the available faculty.

## 2.0 MEDIUM OF INSTRUCTION

The medium of instruction shall be English for all courses, examinations, seminar presentations and project work. The curriculum will comprise courses of study as given in course structure, in accordance with the prescribed syllabi.

## 3.0 TYPES OF COURSES

Courses in a programme may be of three kinds: **Foundation / Skill, Core and Elective.**

### 3.1 Foundation / Skill Course:

Foundation courses are the courses based upon the content leads to enhancement of skill and knowledge as well as value based and are aimed at man making education. Skill subjects are those areas in which one needs to develop a set of skills to learn anything at all. They are fundamental to learning any subject.

### 3.2 Core Course:

There may be a core course in every semester. This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

### 3.3 Elective Course:

Electives provide breadth of experience in respective branch and applications areas. Elective course is a course which can be chosen from a pool of courses. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

An elective may be discipline centric (Professional Elective) focusing on those courses which add generic proficiency to the students or may be chosen from an unrelated discipline called as "Open Elective".

There are six professional elective groups; students can choose not more than two courses from each group. Overall, students can opt for four professional elective courses which suit their project work in consultation with the faculty advisor/mentor. Nevertheless, one course from each of the two open electives has to be selected. A student may also opt for more elective courses in his area of interest.

## 4.0 SEMESTER STRUCTURE

Each academic year is divided into three semesters, TWO being MAIN SEMESTERS (one odd + one even) and ONE being a SUPPLEMENTARY SEMESTER. Main Semesters are for regular class work. Supplementary Semester is primarily for failed students i.e. registration for a course for the first time is generally not permitted in the supplementary semester. However, the following cases are exempted:

4.1 Students admitted under Lateral Entry Scheme in the subjects 'Audit Course', 'Advanced Programming Lab' and 'Value Added Course'.

4.2 Students admitted under Lateral Entry Scheme shall register 'Environmental Studies' course in supplementary semester and pass the subject by the end of VI semester for the award of the degree. This is a non-credit and mandatory course for students admitted under Lateral Entry Scheme.

4.3 Students admitted on transfer from JNTU affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.

4.4 Each main semester shall be of 21 weeks (Table 1) duration and this period includes time for registration of courses, course work, examination preparation and conduct of examinations.

4.5 Each main semester shall have a minimum of 90 working days; out of which number of contact days for teaching / practical are 75 and 15 days for conduct of exams and preparation.

4.6 The supplementary semester shall be a fast track semester consisting of eight weeks and this period includes time for registration of courses, course work, examination preparation, conduct of examinations, assessment and declaration of final results.

4.7 All subjects may not be offered in the supplementary semester. The student has to pay a stipulated fee prescribed by the Institute to register for a course in the supplementary semester. The supplementary semester is provided to help the student in not losing an academic year. It is optional for a student to make use of supplementary semester. **Supplementary semester is a special semester and the student cannot demand it as a matter of right** and will be offered based on availability of faculty and other institute resources.

4.8 The institute may use **supplementary semester** to arrange add-on courses for regular students and / or for deputing them for practical training / FSI. A student can register for a maximum number of 15 credits during a supplementary semester.

4.0.1 The registration for the Summer Semester (May – July) provides an opportunity to students to clear their backlogs (‘F’ grade) or who are prevented from appearing for SEE examinations due to shortage of attendance less than 65% in each course (‘SA’ Grade) in the earlier semesters or the courses which he / she could not register (Drop/Withdraw) for some reason.

Students will not be permitted to register for more than 15 credits (both I and II Semester) in the Summer Semester. Students are required to register for Summer Semester courses are to pay a nominal fee in within the stipulated time.

It will be optional for a student to get registered in the course(s) of Summer Semester; otherwise, he / she can opt to appear directly in supplementary examination. However, if a student gets registered in a course of Summer Semester, then it will be compulsory for a student to fulfil attendance criteria (≥90%) of Summer Semester and he / she will lose option to appear in immediate supplementary examination.

The students who have earlier taken an SEE Examination and register afresh for the Summer Semester will revoke the CIA marks secured by them in their regular/earlier attempt in the same course. Once revoked, the students shall not seek restoration of the CIA marks.

Summer Semester will be at an accelerated pace and will be at double the rate of normal semester e.g. one credit of course shall require two hours/week so that the total contact hours are maintained same as in normal semester.

Instructions and guidelines for the summer semester course:

- A minimum of 36 to 40 hours will be taught by the faculty for every course.
- The students registered and having sufficient percentage of attendance for the course alone will be permitted to write the examination.
- The assessment procedure in a summer semester course will also be similar to the procedure for a regular semester course.
- Student shall register for the Summer Semester as per the schedule given in academic calendar.
- Once registered, students will not be allowed to withdraw from a summer semester.

4.0.2 The academic calendar shown in Table 1 is declared at the beginning of the academic year.

**Table 1: Academic Calendar**

<table>
<tr><td rowspan="6">FIRST SEMESTER (21 weeks)</td><td>I Spell Instruction Period</td><td>8 weeks</td><td rowspan="5">19 weeks</td></tr>
<tr><td>I Mid Examinations</td><td>1 week</td></tr>
<tr><td>II Spell Instruction Period</td><td>8 weeks</td></tr>
<tr><td>II Mid Examinations</td><td>1 week</td></tr>
<tr><td>Preparation and Practical Examinations</td><td>1 week</td></tr>
<tr><td colspan="2">Semester End Examinations</td><td>2 weeks</td></tr>
<tr><td colspan="3">Semester Break and Supplementary Exams</td><td>2 weeks</td></tr>
<tr><td rowspan="6">SECOND SEMESTER (21 weeks)</td><td>I Spell Instruction Period</td><td>8 weeks</td><td rowspan="5">19 weeks</td></tr>
<tr><td>I Mid Examinations</td><td>1 week</td></tr>
<tr><td>II Spell Instruction Period</td><td>8 weeks</td></tr>
<tr><td>II Mid Examinations</td><td>1 week</td></tr>
<tr><td>Preparation & Practical Examinations</td><td>1 week</td></tr>
<tr><td colspan="2">Semester End Examinations</td><td>2 weeks</td></tr>
<tr><td colspan="3">Summer Vacation, Supplementary Semester and Remedial Exams</td><td>8 weeks</td></tr>
</table>

## 5.0 REGISTRATION / DROPPING / WITHDRAWAL

5.1. Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses in time. The registration will be organized departmentally under the supervision of the Head of the Department.

5.2. IN ABSENTIA registration will not be permitted under any circumstance.

5.3. At the time of registration, students should have cleared all the dues of Institute and Hostel in the previous semesters, paid the prescribed fees for the current semester and not been debarred from institute for a specified period on disciplinary or any other ground.

5.4. The student has to normally register for a minimum of 20 credits and may register up to a maximum of 30 credits, in consultation with HOD/faculty mentor. On an average, a student is expected to register for 25 credits.

5.5. **Dropping of Courses:** Within one week after the last date of first internal assessment test or by the date notified in the academic calendar, the student may in consultation with his / her faculty mentor/adviser, drop one or more courses without prejudice to the minimum number of credits as specified in clause 5.4. The dropped courses are not recorded in the Grade Card. Student must complete the dropped subject by registering in the supplementary semester / forthcoming semester in order to earn the required credits. Student must complete the dropped subject by registering in the supplementary semester / forthcoming semester in order to earn the required credits.

5.6. **Withdrawal from Courses:** A student is permitted to withdraw from a course by the date notified in the academic calendar. Such withdrawals will be permitted without prejudice to the minimum number of credits as specified in clause 5.4. A student cannot withdraw a course more than once and withdrawal of reregistered subjects is not permitted.

**5.7.** After **Dropping and / or Withdrawal** of courses, minimum credits registered shall be 20.

## 6.0 UNIQUE COURSE IDENTIFICATION CODE

Every course of the B.Tech program will be placed in one of the nine groups of courses as listed in the Table 2. The various courses and their two-letter codes are given below;

**Table 2: Group of Courses**

| S. No | Branch | Code |
|---|---|---|
| 1 | Aeronautical Engineering | AE |
| 2 | Computer Science and Engineering | CS |
| 3 | Information Technology | IT |
| 4 | Electronics and Communication Engineering | EC |
| 5 | Electrical and Electronics Engineering | EE |
| 6 | Mechanical Engineering | ME |
| 7 | Civil Engineering | CE |
| 8 | Humanities and Basic Sciences | HS |
| 9 | Miscellaneous | MS |

## 7.0 CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Foundation / Skill Courses, Core Courses, Elective Courses, Laboratory Courses, Audit Courses, Mandatory Courses, Comprehensive Examination, Ideation and Product Development, Internship and Project work. The list of elective courses may include subjects from allied disciplines also.

**Contact Periods:** Depending on the complexity and volume of the course, the number of contact periods per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours/week as follows:

- **Contact classes (Theory):** 1 credit per lecture hour per week, 1 credit per tutorial hour per week.
- **Laboratory Hours (Practical):** 1 credit for 2 Practical hours, 2 credits for 3 or 4 practical hours per week.
- **Project Work:** 1 credit for 4 hours of project work per week.
- **Ideation and Product Development:** 1 credit for 2 hours per week

### 7.1 Credit distribution for courses offered is shown in Table 3.

**Table 3: Credit distribution**

| S. No | Course | Hours | Credits |
|---|---|---|---|
| 1 | Theory Course (Core and Foundation) | 3 / 4 | 3 / 4 |
| 2 | Elective Courses | 3 | 3 |
| 3 | MOOC Courses | - | 2 |
| 4 | Laboratory Courses | 2 / 3 | 1 / 2 |
| 5 | Audit Course / Mandatory Course | - | 0 |
| 6 | Comprehensive Examination | - | 1 |
| 7 | Ideation and Product Development | - | 1 |
| 8 | Summer Internship | - | 0 |
| 9 | Full Semester Internship (FSI) Project Work | - | 16 |
| 10 | Project Work | - | 10 |

### 7.2 Course Structure

Every program of study shall be designed to have 38 - 42 theory courses and 20 - 26 laboratory courses. Every course of the B.Tech program will be placed in one of the eight categories with minimum credits as listed in the Table 4. In addition, a student has to carry out a Ideation and Product Development, project work and comprehensive Examination.

**Table 4: Category Wise Distribution of Credits**

| S. No | Category | Subject Area and % of Credits | Average No. of Credits |
|---|---|---|---|
| 1 | Humanities and Social Sciences (HS), including Management. | HS (05% to 10%) | 10 |
| 2 | Basic Sciences (BS) including Mathematics, Physics and Chemistry. | BS (15% to 20%) | 28 |
| 3 | Engineering Sciences (ES), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering. | ES (15% to 20%) | 28 |
| 4 | Professional Subjects - Core (PC), relevant to the chosen specialization/branch. | PC (30% to 40%) | 96 |
| 5 | Professional Subjects - Electives (PE), relevant to the chosen specialization/branch. | PE (10% to 15%) | 12 |
| 6 | Open Subjects - Electives (OE), from other technical and/or emerging subject areas. | OE (05% to 10%) | 06 |
| 7 | Project Work or Full Semester Internship, Ideation and Product Development, Comprehensive Examination. | 10% to 15% | 12 - 18 |
| 8 | Mandatory Courses / Audit Courses. | MC / AC | Non-Credit |
| **TOTAL** | | | **192** |

### 7.3 Semester wise course break-up

Following are the **TWO** models of course structure out of which any student shall choose or will be allotted with one model based on their academic performance.

i. Full Semester Internship (FSI) Model and

ii. Non Full Semester Internship (NFSI) Model.

### 7.4 For Four year regular program (FSI Model):

In the FSI Model, out of the selected students - half of students shall undergo Full Semester Internship in VII semester and the remaining students in VIII semester. In the Non FSI Model, all the selected students shall carry out the course work and Project work as specified in the course structure. A student who secures a minimum CGPA of 7.5 up to IV semester with no current arrears and maintains the CGPA of 7.5 till VI Semester shall be eligible to opt for FSI.

| Semester | No. of Theory Courses | No. of Lab Courses | Total Credits |
|---|---|---|---|
| I Semester | 5 Foundation | 4 | 24 |
| II Semester | 5 Foundation | 4 | 24 |
| III Semester | 5 + Mandatory Course (2 Core + 3 Foundation) | 3 | 25 |
| IV Semester | 5 + Audit Course (3 Core + 2 Foundation) | 3 | 25 |
| V Semester | 6 (5 Core + 1 Professional Elective) | 3 | 29 |
| VI Semester | 6 (3 Core + 1 Professional Elective + 1 Open Elective + 1 Foundation) | 3 + Ideation and Product Development | 28 |
| VII Semester | **Full Semester Internship (FSI)** | | 16 |
| VIII Semester | 4 (3 Core + 1 Professional Elective) | 3 + Comprehensive Examination | 21 |
| **Total** | **36 (16 Foundation + 16 Core + 3 Professional Electives + 1 Open Electives) + Mandatory Course + Audit course** | **22 + Comprehensive Examination + Ideation and Product Development + FSI** | **192** |

## 7.5 For Four year regular program (Non FSI Model):

| Semester | No. of Theory Courses | No. of Lab Courses | Total Credits |
|---|---|---|---|
| I Semester | 5 Foundation | 4 | 24 |
| II Semester | 5 Foundation | 4 | 24 |
| III Semester | 5 + Mandatory Course (2 Core + 3 Foundation) | 3 | 25 |
| IV Semester | 5 + Audit Course (3 Core + 2 Foundation) | 3 | 25 |
| V Semester | 6 (4 Core + 1 Skill 1 Professional Elective) | 3 | 25 |
| VI Semester | 5 (3 Core + 1 Professional Elective + 1 Open Elective) | 3 + Ideation and Product Development | 25 |
| VII Semester | 5 (3 Core + 1 Professional Elective + 1 Open Elective) | 3 | 24 |
| VIII Semester | 3 (2 Core + 1 Professional Elective) | Project Work + Comprehensive Examination | 20 |
| **Total** | **39 (15 Foundation + 01 Skill + 17 Core + 4 Professional Electives + 2 Open Electives) + Mandatory Course + Audit Course** | **23 + Ideation and Product Development + Comprehensive Examination + Project work** | **192** |

### 7.6 For Three year lateral entry program (FSI Model):

| Semester | No. of Theory Courses | No. of Lab Courses | Total Credits |
|---|---|---|---|
| III Semester | 5 + Mandatory Course (2 Core + 3 Foundation) | 3 | 25 |
| IV Semester | 5 + Audit course (3 Core + 2 Foundation) | 3 | 25 |
| V Semester | 6 (5 Core + 1 Professional Elective) | 3 | 29 |
| VI Semester | 6 (3 Core + 1 Professional Elective + 1 Open Elective + 1 Foundation) | 3 + Ideation and Product Development | 28 |
| VII Semester | Full Semester Internship (FSI) | | 16 |
| VIII Semester | 4 (3 Core + 1 Professional Elective) | 3 + Comprehensive Examination | 21 |
| **Total** | **26 (6 Foundation + 16 Core + 3 Professional Electives + 1 Open Electives) + Mandatory Course + Audit Course** | **14 + Comprehensive Examination + Ideation and Product Development + FSI** | **144** |

### 7.7 For Three year lateral entry program (Non FSI Model):

| Semester | No. of Theory Courses | No. of Lab Courses | Total Credits |
|---|---|---|---|
| III Semester | 5 + Mandatory Course (2 Core + 3 Foundation) | 3 | 25 |
| IV Semester | 5 + Audit Course (3 Core + 2 Foundation) | 3 | 25 |
| V Semester | 6 (4 Core + 1 Skill + 1 Professional Elective) | 3 | 25 |
| VI Semester | 5 (3 Core + 1 Professional Elective + 1 Open Elective) | 3 + Ideation and Product Development | 25 |
| VII Semester | 5 (3 Core + 1 Professional Elective + 1 Open Elective) | 3 | 24 |
| VIII Semester | 3 (2 Core + 1 Professional Elective) | Project Work + Comprehensive Examination | 20 |
| **Total** | **29 (05 Foundation + 17 Core + 4 Professional Electives + 2 Open Electives + 1 Skill) + Mandatory Course + Audit Course** | **15 + Ideation and Product Development + Comprehensive Examination + Project work** | **144** |

### 7.8 Course wise break-up for the total credits (FSI Model):

| | | |
|---|---|---|
| **Total Theory Courses (36)**<br>Core Courses (16) + Foundation Courses (11+ 5) + Professional Electives (03) + Open Elective (01) | 16 @ 4 credits + 11 @ 4 credits + 05 @ 3 credits + 03 @ 3 credits + 01 @ 3 credits | 134 |
| Total Laboratory Courses (16 + 08) | 16 @ 2 credits +<br>08 @ 1 credit | 40 |
| Comprehensive Examination | 1 @ 1 credit | 01 |
| Ideation and Product Development | 1 @ 1 credit | 01 |
| Full Semester Internship (FSI) | 1 @ 16 credits | 16 |
| **TOTAL CREDITS** | | **192** |

### 7.9 For Four year regular program (Non FSI Model):

| | | |
|---|---|---|
| **Total Theory Courses (38)**<br>Core Courses (16) + Foundation Courses (11+ 5) + Professional Electives (04) + Open Electives (02) + Skill (01) | 14 @ 4 credits + 02 @ 3 credits + 11 @ 4 credits + 05 @ 3 credits + 04 @ 3 credits + 02 @ 3 credits + 01 @ 3 credits | 142 |
| Total Laboratory Courses (15 + 08) | 15 @ 2 credits +<br>08 @ 1 credit | 38 |
| Comprehensive Examination | 1 @ 1 credit | 01 |
| Ideation and Product Development | 1 @ 1 credit | 01 |
| Project work | 1 @ 10 credits | 10 |
| **TOTAL CREDITS** | | **192** |

### 7.10 For three year lateral entry program (FSI Model):

| | | |
|---|---|---|
| **Total Theory Courses (26)**<br>Core Courses (16) + Foundation Courses (5+2) + Professional Electives (03) + Open Electives (01) | 14 @ 4 credits + 02 @ 3 credits + 05 @ 4 credits + 02 @ 3 credits + 03 @ 3 credits + 01 @ 3 credits | 100 |
| Total Laboratory Courses (11 + 04) | 11 @ 2 credits + 04 @ 1 credit | 26 |
| Comprehensive Examination | 1 @ 1 credit | 01 |
| Ideation and Product Development | 1 @ 1 credit | 01 |
| Full Semester Internship | 1 @ 16 credits | 16 |
| **TOTAL CREDITS** | | **144** |

### 7.11 For three year lateral entry program (Non FSI Model):

| | | |
|---|---|---|
| **Total Theory Courses (28)**<br>Core Courses (16) + Foundation Courses (5+1) + Professional Electives (04) + Open Electives (02) + Skill (01) | 14 @ 4 credits + 02 @ 3 credits + 05 @ 4 credits + 01 @ 3 credits + 04 @ 3 credits + 02 @ 3 credits + 01@ 3 credits | 106 |
| Total Laboratory Courses (11 + 04) | 11 @ 2 credits + 04 @ 1 credit | 26 |
| Comprehensive Examination | 1 @ 1 credit | 01 |
| Ideation and Product Development | 1 @ 1 credit | 01 |
| Project work | 1 @ 10 credits | 10 |
| **TOTAL CREDITS** | | **144** |

## 8.0 EVALUATION METHODOLOGY

### 8.1 Theory Course:

Each theory course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two sessional examinations or the marks scored in the make-up examination conducted.

#### 8.1.1 Semester End Examination (SEE):

The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows.

Two full questions with 'either' 'or' choice will be drawn from each unit. Each question carries 14 marks. There could be a maximum of three sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

| | |
|---|---|
| 50 % | To test the objectiveness of the concept |
| 30 % | To test the analytical skill of the concept |
| 20 % | To test the application skill of the concept |

#### 8.1.2 Continuous Internal Assessment (CIA):

For each theory course the CIA shall be conducted by the faculty/teacher handling the course as given in Table-5. CIA is conducted for a total of 30 marks, with 25 marks for Continuous Internal Examination (CIE) and 05 marks for Quiz / Alternative Assessment Tool (AAT).

**Table-5: Assessment pattern for Theory Courses**

| COMPONENT | THEORY | | TOTAL MARKS |
|---|---|---|---|
| **Type of Assessment** | CIE Exam (Sessional) | Quiz / AAT | |
| **Max. CIA Marks** | 25 | 05 | 30 |

##### 8.1.2.1 Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the $8^{th}$ and $17^{th}$ week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams. The valuation and verification of answer scripts of CIE exams shall be completed within a week after the conduct of the Internal Examination.

##### 8.1.2.2 Quiz / Alternative Assessment Tool (AAT)

Two Quiz exams shall be online examination consisting of 20 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in the testing of knowledge, skills, application, analysis, evaluation and understanding of the students. Marks shall be awarded considering the average of two quizzes for every course.

In order to encourage innovative methods while delivering a course, the faculty members have been encouraged to use the Alternative Assessment Tool (AAT) in place of two quizzes. This AAT enables faculty to design own assessment patterns during the CIA. However, the usage of AAT is completely optional. The AAT enhances the autonomy (freedom and flexibility) of individual faculty and enables them to create innovative pedagogical practices. If properly applied, the AAT converts the classroom into an effective learning centre. The AAT may include seminars, assignments, term paper, open ended experiments, micro-projects, five minutes video, MOOCs etc.

However, it is mandatory for a faculty to obtain prior permission from the concerned HOD and spell out the teaching/assessment pattern of the AAT prior to commencement of the classes.

## 8.2 Laboratory Course:

8.2.1 Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment. The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

8.2.2 All the drawing related courses are evaluated in line with laboratory courses. The distribution shall be 30 marks for internal evaluation (20 marks for day–to–day work, and 10 marks for internal tests) and 70 marks for semester end lab examination. There shall be ONE internal test for 10 marks in each semester.

## 8.3 MOOC Courses:

Meeting with the global requirements, to inculcate the habit of self learning and in compliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives.

8.3.1 The proposed MOOC courses would be additional choices in all the elective groups subject to the availability during the respective semesters and respective departments will declare the list of the courses at the beginning of the semester. Course content for the selected MOOC courses shall be drawn from respective MOOCs links or shall be supplied by the department. Course will be mentored by faculty members and Assessment & Evaluation of the courses shall be done by the department.

8.3.2 There shall be one Mid Continuous Internal Examination (Quiz exam for 30 marks) after 8 weeks of the commencement of the course and semester end examination (Descriptive exam for 70 marks) shall be done along with the other regular courses.

8.3.3 Two credits will be awarded upon successful completion of each MOOC courses. Students need to complete three such MOOC courses to compensate any two elective courses (one open and one professional) having three credits.

8.3.4 Students interested in doing MOOC courses shall register the course title at their department office at the start of the semester against the courses that are announced by the department.

### 8.4 Audit Courses (AC) / Mandatory Courses (MC):

These courses are among the compulsory courses and do not carry any credits.

a) Gender Sensitivity is a mandatory course in III semester for all the students.

b) The student has to choose one audit course at the beginning of IV semester under self study mode. By the end of VI semester, all the students (regular and lateral entry students) shall complete the audit course.

c) The students will have four chances in total to clear the audit / mandatory course. Further, the student has an option to change the audit course in case if s/he is unable to clear the audit course in the first two chances. However, the audit course should be completed by VI semester and its result will be given in the VI semester grade sheet.

d) Audit / Mandatory courses will not carry any credits; but, a pass in each such course after attaining required CIE and SEE requirements during the programme shall be necessary requirement for the student to qualify for the award of Degree. Its result shall be declared with “Satisfactory” or “Not Satisfactory” performance.

### 8.5 Value Added Courses:

The value added courses are audit courses in nature offered through joint ventures with various organizations provide ample scope for the students as well as faculty to keep pace with the latest technologies pertaining to their chosen field of studies. A plenty of value added programs will be proposed by the departments one week before the commencement of classwork. The students are given the option to choose the courses according to their desires and inclinations as they choose the desired items in a cafeteria. The expertise gained through the value added programs should enable them to face the formidable challenges of the future and also assist them in exploring new opportunities. Its result shall be declared with “Satisfactory” or “Not Satisfactory” performance.

### 8.6 Comprehensive Examination

The comprehensive Examination is aimed at assessing the students understanding of various Foundation, Skill and Core courses studied till the end of VII semester and is intended to test the students’ grasp of the chosen field of study.

The Comprehensive Examination consists of two parts. Part A is a written examination and part B is the oral examination. The written examination shall be objective type of one hour duration and shall have 50 marks and is to be conducted by the concerned department under the supervision of Dean Academics. Oral examination shall be conducted by the department and carry 50 marks. The examination shall be conducted during the VIII semester.

### 8.7 Ideation and Product Development

The Ideation and Product Development shall be carried out either during VI semester along with other lab courses by having regular weekly slots. Students will take Ideation and Product Development batch wise and the batches will be divided as per the guidelines issued. The topic of Ideation and Product Development should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of the Ideation and Product Development could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with a specific outcome. Ideation and Product Development report will be evaluated for 100 marks in total. Assessment will be done by the supervisor/guide for 30 marks based on the work and presentation/execution of the Ideation and Product Development. Subdivision for the remaining 70 marks is based on report, presentation, execution and viva-voce. Evaluation shall be done by a committee comprising the Ideation and Product Development supervisor, Head of the department and an examiner nominated by the Principal from the panel of experts recommended by Chairman, BOS in consultation with Head of the department.

## 8.8 Project work

In the non-FSI Model, the project work shall be evaluated for 100 marks out of which 30 marks for internal evaluation and 70 marks for semester end evaluation. The project work shall be spread over in VII semester and in VIII semester. The project work shall be somewhat innovative in nature, exploring the research bent of the mind of the student. A project batch shall comprise not more than three students.

At the end of VII semester, students should submit synopsis summarizing the work done in VII semester. The project is expected to be completed by the end of VIII semester. In VII semester, a first mid review is conducted by Project Review Committee (PRC) (on the progress) for 10 marks.

In VIII semester, a second mid review is conducted by PRC (on the progress) for 10 marks. On completion of the project, a third evaluation is conducted for award of internal marks of another 10 marks before the report is submitted, making the total internal marks 30.

The end semester examination shall be based on the report submitted and a viva-voce exam for 70 marks by a committee comprising the Head of the department, project supervisor and an external examiner nominated by the Principal. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

## 8.9 Full Semester Internship (FSI)

FSI is a full semester internship programme carries 16 credits. During the FSI, student has to spend one full semester in an identified industry / firm / organization and has to carry out the internship as per the stipulated guidelines of that industry / firm / organization and the institute.

**Following are the evaluation guidelines:**

- Quizzes: 2 times
- Quiz #1 - About the industry profile, weightage: 5%
- Quiz #2 - Technical-project related, weightage: 5%
- Seminars - 2 times (once in six weeks), weightage: 7.5% + 7.5%
- Viva-voce: 2 times (once in six weeks), weightage: 7.5% + 7.5%
- Project Report, weightage: 15%
- Internship Diary, weightage: 5 %
- Final Presentation, weightage: 40%

FSI shall be open to all the branches with a ceiling of maximum 10% distributed in both semesters. The selection procedure is:

- Choice of the students
- CGPA (> 7.5) up to IV semester
- Competency Mapping / Allotment

## 9.0 MAKE-UP EXAMINATION

The make-up examination facility shall be available to students who may have missed to attend CIE exams in one or more courses in a semester for valid genuine reasons. The make-up examination shall have comprehensive online objective type questions. The syllabus for the make-up examination shall be the whole syllabus covered till the end of the semester under consideration and will be conducted at the end of the semester.

## 10.0 ATTENDANCE REQUIREMENTS AND DETENTION POLICY

10.1 It is desirable for a candidate to put on 100% attendance in each course. In every course (theory/laboratory), student has to maintain a minimum of 75% attendance including the days of attendance in sports, games, NCC and NSS activities to be eligible for appearing in Semester End Examination of the course.

10.2 For cases of medical issues, deficiency of attendance in each course to the extent of 10% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the department if their attendance is between 75% to 65% in every course, subjected to submission of medical certificates, medical case file and other needful documents to the concerned departments.

10.3 The basis for the calculation of the attendance shall be the period prescribed by the institute by its calendar of events. For late admission, attendance is reckoned from the date of admission to the program. However, in case of a student having less than 65% attendance in any course, s/he shall be detained in the course and in no case such process will be relaxed.

10.4 A candidate shall put in a minimum required attendance at least three (3) theory courses for getting promoted to next higher class / semester. Otherwise, s/he shall be declared detained and has to repeat semester.

10.5 Students whose shortage of attendance is not condoned in any subject are not eligible to write their semester end examination of that courses and their registration shall stand cancelled.

10.6 A prescribed fee shall be payable towards condonation of shortage of attendance.

10.7 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

10.8 Any student against whom any disciplinary action by the institute is pending shall not be permitted to attend any SEE in that semester.

## 11.0 CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

11.1 Semester end examination shall be conducted by the Controller of Examinations (COE) by inviting Question Papers from the External Examiners.

11.2 Question papers may be moderated for the coverage of syllabus, pattern of questions by a Semester End Examination Committee chaired by Head of the Department one day before the commencement of semester end examinations. Internal Examiner shall prepare a detailed scheme of valuation.

11.3 The answer papers of semester end examination should be evaluated by the internal examiner immediately after the completion of exam and the award sheet should be submitted to COE in a sealed cover before the same papers are kept for second evaluation by external examiner.

11.4 In case of difference of more than 15% of marks, the answer paper shall be re-evaluated by a third examiner appointed by the Examination Committee and marks awarded by this examiner shall be taken as final.

11.5 COE shall invite 3 - 9 external examiners to evaluate all the end-semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

11.6 Examinations Control Committee shall consolidate the marks awarded by internal and external examiners and award grades.

## 12.0 SCHEME FOR THE AWARD OF GRADE

12.1 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory course, if s/he secures

i. Not less than 35% marks for each theory course in the semester end examination, and

ii. A minimum of 40% marks for each theory course considering both internal and semester end examination.

12.2 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each Lab / Comprehensive Examination / Ideation and Product Development / Project, if s/he secures

i. Not less than 40% marks for each Lab / Comprehensive Examination / Ideation and Product Development / Project course in the semester end examination,

ii. A minimum of 40% marks for each Lab / Comprehensive Examination / Ideation and Product Development / Project course considering both internal and semester end examination.

12.3 If a candidate fails to secure a pass in a particular course, it is mandatory that s/he shall register and reappear for the examination in that course during the next semester when examination is conducted in that course. It is mandatory that s/he should continue to register and reappear for the examination till s/he secures a pass.

## 13.0 LETTER GRADES AND GRADE POINTS

13.1 Performances of students in each course are expressed in terms of marks as well as in Letter Grades based on absolute grading system. The UGC recommends a 10-point grading system with the following letter grades as given in the Table-6.

**Table-6: Grade Points Scale (Absolute Grading)**

| Range of Marks | Grade Point | Letter Grade |
|---|---|---|
| 100 – 90 | 10 | S (Superior) |
| 89 – 80 | 9 | A+ (Excellent) |
| 79 – 70 | 8 | A (Very Good) |
| 69 – 60 | 7 | B+ (Good) |
| 59 – 50 | 6 | B (Average) |
| 49 – 40 | 5 | C (Pass) |
| Below 40 | 0 | F (Fail) |
| Absent | 0 | AB (Absent) |
| Authorized Break of Study | 0 | ABS |

13.2 A student is deemed to have passed and acquired to correspondent credits in particular course if s/he obtains any one of the following grades: “S”, “A+”, “A”, “B+”, “B”, “C”.

13.3 A student obtaining Grade F shall be considered Failed and will be required to reappear in the examination.

13.4 For non credit courses, ‘Satisfactory’ or “Not Satisfactory” is indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

13.5 “SA” denotes shortage of attendance (as per item 10) and hence prevention from writing Semester End Examination.

13.6 “W” denotes **withdrawl** from the exam for the particular course.

13.7 At the end of each semester, the institute issues grade sheet indicating the SGPA and CGPA of the student. However, grade sheet will not be issued to the student if s/he has any outstanding dues.

## 14.0 COMPUTATION OF SGPA AND CGPA

The UGC recommends to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The credit points earned by a student are used for calculating the Semester Grade Point Average (SGPA) andthe Cumulative Grade Point Average (CGPA), both of which are important performance indices of the student. SGPA is equal to the sum of all the total points earned by the student in a given semester divided by the number of credits registered by the student in that semester. CGPA gives the sum of all the total points earned in all the previous semesters and the current semester divided by the number of credits registered in all these semesters. Thus,

$$SGPA = \sum_{i=1}^{n} (C_i G_i) / \sum_{i=1}^{n} C_i$$

Where, $C_i$ is the number of credits of the $i^{th}$ course and $G_i$ is the grade point scored by the student in the $i^{th}$ course and $n$ represent the number of courses in which a student is registered in the concerned semester.

$$CGPA = \sum_{j=1}^{m} (C_j S_j) / \sum_{j=1}^{m} C_j$$

Where, $S_j$ is the SGPA of the $j^{th}$ semester and $C_j$ is the total number of credits upto the semester and $m$ represent the number of semesters completed in which a student registered upto the semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

## 15.0 ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA

### 15.1 Illustration for SGPA

| Course Name | Course Credits | Grade letter | Grade point | Credit Point (Credit x Grade) |
|---|---|---|---|---|
| Course 1 | 3 | A | 8 | 3 x 8 = 24 |
| Course 2 | 4 | B+ | 7 | 4 x 7 = 28 |
| Course 3 | 3 | B | 6 | 3 x 6 = 18 |
| Course 4 | 3 | S | 10 | 3 x 10 = 30 |
| Course 5 | 3 | C | 5 | 3 x 5 = 15 |
| Course 6 | 4 | B | 6 | 4 x 6 = 24 |
| | **20** | | | **139** |

$$Thus,\ SGPA = 139 / 20 = 6.95$$

### 15.2 Illustration for CGPA

| Semester 1 | Semester 2 | Semester 3 | Semester 4 |
|---|---|---|---|
| Credit: 20<br>SGPA: 6.9 | Credit: 22<br>SGPA: 7.8 | Credit: 25<br>SGPA: 5.6 | Credit: 26<br>SGPA: 6.0 |
| **Semester 5** | **Semester 6** | | |
| Credit: 26<br>SGPA: 6.3 | Credit: 25<br>SGPA: 8.0 | | |

$$Thus,\ CGPA = \frac{20x6.9 + 22x7.8 + 25x5.6 + 26x6.0 + 26x6.3 + 25x8.0}{144} = 6.73$$

## 16.0 PHOTOCOPY / REVALUATION

A student, who seeks the re-valuation of the answer script, is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s), within 2 working days from the declaration of results in the prescribed format to the Controller of Examinations through the Head of the department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses.

## 17.0 PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 10.

17.1 For students admitted into B.Tech (Regular) program

17.1.1 A student will not be promoted from II semester to III semester unless s/he fulfills the academic requirement of securing 24 credits from I and II semesters examinations, whether or not the candidate takes the examinations.

17.1.2 A student will not be promoted from IV semester to V semester unless s/he fulfills the academic requirement of securing 37 credits upto III semester **or** 49 credits upto IV semester, from all the examinations, whether or not the candidate takes the examinations.

17.1.3 A student shall be promoted from VI semester to VII semester only if s/he fulfills the academic requirements of securing 62 credits upto V semester **or** 74 credits upto VI semester from all the examinations, whether or not the candidate takes the examinations.

17.1.4 A student shall register for all the 192 credits and earn all the 192 credits. Marks obtained in all the 192 credits shall be considered for the award of the Grade.

17.2 For students admitted into B.Tech (lateral entry students)

17.2.1 A student will not be promoted from IV semester to V semester unless s/he fulfills the academic requirement of securing 25 credits upto IV semester, from all the examinations, whether or not the candidate takes the examinations.

17.2.2 A student shall be promoted from VI semester to VII semester only if s/he fulfills the academic requirements of securing 38 credits upto V semester **or** 50 credits upto VI semester from all the examinations, whether or not the candidate takes the examinations.

17.2.3 A student shall register for all the 144 credits and earn all the 144 credits. Marks obtained in all the 144 credits shall be considered for the award of the Grade.

## 18.0 GRADUATION REQUIREMENTS

The following academic requirements shall be met for the award of the B.Tech degree.

18.1 Student shall register and acquire minimum attendance in all courses and secure 192 credits for regular program and 144 credits for lateral entry program.

18.2 A student of a regular program, who fails to earn 192 credits within eight consecutive academic years from the year of his/her admission with a final CGPA $< 5.0$, shall forfeit his/her degree and his/her admission stands cancelled.

18.3 A student of a lateral entry program who fails to earn 144 credits within six consecutive academic years from the year of his/her admission with a final CGPA $< 5.0$, shall forfeit his/her degree and his/her admission stands cancelled.

## 19.0 BETTERMENT OF MARKS IN THE COURSES ALREADY PASSED

Students who clear all the courses in their first attempt and wish to improve their CGPA shall register and appear for betterment of marks for one course of any theory courses within a period of subsequent two semesters. The improved marks shall be considered for classification / distinction but not for ranking. If there is no improvement, there shall not be any change in the original marks already awarded.

## 20.0 AWARD OF DEGREE

20.1 Classification of degree will be as follows:

| CGPA $\geq 7.5$ | CGPA $\geq 6.5$ and $< 7.5$ | CGPA $\geq 5.0$ and $< 6.5$ | CGPA $< 5.0$ |
|---|---|---|---|
| **First Class with Distinction** | **First Class** | **Second Class** | **Fail** |

20.2. In order to extend the benefit to the students with one/two backlogs after either VI semester or VIII semester, GRAFTING option is provided to the students enabling their placements and fulfilling graduation requirements. Following are the guidelines for the Grafting:

a. Grafting will be done among the courses within the semester shall draw a maximum of 7 marks from the any one of the cleared courses in the semester and will be grafted to the failed course in the same semester.

b. Students shall be given a choice of grafting only once in the 4 years program, either after VI semester (Option #1) or after VIII semester (Option #2).

c. Option#1: Applicable to students who have maximum of TWO theory courses in V and / or VI semesters.

Option#2: Applicable to students who have maximum of TWO theory courses in VII and / or VIII semesters.

d. Eligibility for grafting:

i. Prior to the conduct of the supplementary examination after the declaration of VI or VIII semester results.

ii. S/he must appear in all regular or supplementary examinations as per the provisions laid down in regulations for the courses s/he appeals for grafting.

iii. The marks obtained by her/him in latest attempt shall be taken into account for grafting of marks in the failed course(s).

20.3 Student, who clears all the courses upto VII semester, shall have a chance to appear for Quick Supplementary Examination to clear the failed courses of VIII semester.

20.4 By the end of VI semester, all the students (regular and lateral entry students) shall complete one of the audit course and mandatory course with acceptable performance.

20.5 In case, a student takes more than one attempt in clearing a course, the final marks secured shall be indicated by * mark in the grade sheet.

All the candidates who register for the semester end examination will be issued grade sheet by the institute. Apart from the semester wise grade sheet, the institute will issue the provisional certificate and consolidated grade sheet subject to the fulfillment of all the academic requirements.

## 21.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

21.1 A candidate is normally not permitted to break the study. However, if a candidate intends to temporarily discontinue the program in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the program in a later respective semester, s/he shall apply to the Principal in advance. Such application shall be submitted before the last date for payment of examination fee of the semester in question and forwarded through the Head of the department stating the reasons for such withdrawal together with supporting documents and endorsement of his / her parent / guardian.

21.2 The institute shall examine such an application and if it finds the case to be genuine, it may permit the student to temporarily withdraw from the program. Such permission is accorded only to those who do not have any outstanding dues / demand at the College / University level including tuition fees, any other fees, library materials etc.

21.3 The candidate has to rejoin the program after the break from the commencement of the respective semester as and when it is offered.

21.4 The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in clause 18.0. The maximum period includes the break period.

21.5 If any candidate is detained for any reason, the period of detention shall not be considered as ‘Break of Study’.

## 22.0 TERMINATION FROM THE PROGRAM

The admission of a student to the program may be terminated and the student is asked to leave the institute in the following circumstances:

a. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

b. A student shall not be permitted to study any semester more than three times during the entire Program of study.

c. The student fails to satisfy the norms of discipline specified by the institute from time to time.

## 23.0 WITH-HOLDING OF RESULTS

If the candidate has not paid any dues to the institute / if any case of indiscipline / malpractice is pending against him, the results of the candidate will be withheld. The issue of the degree is liable to be withheld in such cases.

## 24.0 GRADUATION DAY

The institute shall have its own annual Graduation Day for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

## 25.0 DISCIPLINE

Every student is required to observe discipline and decorum both inside and outside the institute and not to indulge in any activity which will tend to bring down the honor of the institute. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations he/she shall be liable for punitive action as prescribed by the Institute from time to time.

## 26.0 GRIEVANCE REDRESSAL COMMITTEE

The institute shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD as the members. This Committee shall solve all grievances related to the course under consideration.

## 27.0 TRANSITORY REGULATIONS

A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

### a) Four Year B.Tech Regular course:

A student who is following Jawaharlal Nehru Technological University (JNTUH) curriculum and detained due to shortage of attendance at the end of the first semester shall join the autonomous batch of first semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUH curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUH for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUH regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

**b) Three Year B.Tech program under Lateral Entry Scheme:**

A student who is following JNTUH curriculum and detained due to shortage of attendance at the end of the first semester of second year shall join the autonomous batch of third semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with Lateral Entry regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUH curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of second year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUH for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUH regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

**c) Transfer candidates (from non-autonomous college affiliated to JNTUH):**

A student who is following JNTUH curriculum, transferred from other college to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in their place as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUH for the award of degree. The total number of credits to be secured for the award of the degree will be the sum of the credits upto previous semester under JNTUH regulations and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

**d) Transfer candidates (from an autonomous college affiliated to JNTUH):**

A student who has secured the required credits upto previous semesters as per the regulations of other autonomous institutions shall also be permitted to be transferred to this institute. A student who is transferred from the other autonomous colleges to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The total number of credits to be secured for the award of the degree will be the sum of the credits upto previous semester as per the regulations of the college from which he is transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

## REVISION OF REGULATIONS AND CURRICULUM

The Institute from time to time may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall come into force and shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

**FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE**

## ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE STRUCTURE

### I SEMESTER

| Course Code | Course Name | Subject Area | Category | Periods per week | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIA | SEE | Total |
| **THEORY** | | | | | | | | | | |
| AHS002 | Linear Algebra and Ordinary Differential Equations | BS | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AHS003 | Computational Mathematics and Integral Calculus | BS | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AHS006 | Engineering Physics | BS | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AHS005 | Engineering Chemistry | BS | Foundation | 3 | - | - | 3 | 30 | 70 | 100 |
| ACS001 | Computer Programming | ES | Foundation | 3 | - | - | 3 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| AHS104 | Engineering Physics and Chemistry Laboratory | BS | Foundation | - | - | 3 | 2 | 30 | 70 | 100 |
| ACS101 | Computer Programming Laboratory | ES | Foundation | - | - | 3 | 2 | 30 | 70 | 100 |
| AME103 | Computer Aided Engineering Drawing | ES | Foundation | - | - | 2 | 1 | 30 | 70 | 100 |
| AHS102 | Computational Mathematics Laboratory | BS | Foundation | - | - | 2 | 1 | 30 | 70 | 100 |
| **TOTAL** | | | | **15** | **03** | **10** | **24** | **270** | **630** | **900** |

### II SEMESTER

| Course Code | Course Name | Subject Area | Category | Periods per week | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIA | SEE | Total |
| **THEORY** | | | | | | | | | | |
| AHS001 | English for Communication | HS | Foundation | 3 | - | - | 3 | 30 | 70 | 100 |
| AHS004 | Complex Analysis and Probability Distributions | BS | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AHS009 | Environmental Studies | HS | Foundation | 3 | - | - | 3 | 30 | 70 | 100 |
| ACS002 | Data Structures | ES | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEE002 | Electrical Circuits | ES | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| AHS101 | Communication Skills Laboratory | HS | Foundation | - | - | 2 | 1 | 30 | 70 | 100 |
| ACS102 | Data Structures Laboratory | ES | Foundation | - | - | 3 | 2 | 30 | 70 | 100 |
| AEE102 | Electrical Circuits Laboratory | ES | Foundation | - | - | 3 | 2 | 30 | 70 | 100 |
| ACS112 | Engineering Practice Laboratory | ES | Foundation | - | - | 2 | 1 | 30 | 70 | 100 |
| **TOTAL** | | | | **15** | **03** | **10** | **24** | **270** | **630** | **900** |

### III SEMESTER

| Course Code | Course Name | Subject Area | Category | Periods per week | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIA | SEE | Total |
| **THEORY** | | | | | | | | | | |
| AEC001 | Electronic Devices and Circuits | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AHS011 | Mathematical Transform Techniques | BS | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC002 | Digital System Design | PC | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC003 | Probability Theory and Stochastic Processes | BS | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEE017 | Electrical Technology | ES | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AHS017 | Gender Sensitivity | MC | Perspective | - | - | - | - | - | - | - |
| **PRACTICAL** | | | | | | | | | | |
| AEC101 | Electronic Devices and Circuits Laboratory | PC | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| AEE114 | Electrical Technology Laboratory | ES | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| AHS107 | Simulation Laboratory | BS | Core | - | - | 3 | 1 | 30 | 70 | 100 |
| **TOTAL** | | | | **15** | **05** | **09** | **25** | **240** | **560** | **800** |

## IV SEMESTER

| Course Code | Course Name | Subject Area | Category | Periods per week | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIA | SEE | Total |
| **THEORY** | | | | | | | | | | |
| AEC004 | Electronic Circuit Analysis | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC005 | Analog Communications | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEE009 | Control Systems | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC006 | Pulse and Digital Circuits | PC | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC007 | Electromagnetic Theory and Transmission Lines | PC | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| | Audit Course | MC | Perspective | - | - | - | - | - | - | - |
| **PRACTICAL** | | | | | | | | | | |
| AEC102 | Electronic Circuit and Pulse Circuits Laboratory | PC | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| AEC103 | Digital System Design Laboratory | PC | Core | - | 2 | 3 | 2 | 30 | 70 | 100 |
| AEC104 | Analog Communications Laboratory | PC | Core | - | - | 3 | 1 | 30 | 70 | 100 |
| **TOTAL** | | | | **15** | **07** | **09** | **25** | **240** | **560** | **800** |

## V SEMESTER

| Course Code | Course Name | Subject Area | Category | Periods per week | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIA | SEE | Total |
| **THEORY** | | | | | | | | | | |
| AEC008 | Integrated Circuits Applications | PC | Core | 3 | - | - | 3 | 30 | 70 | 100 |
| AEC009 | Digital Communications | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC010 | Computer Organization | PC | Core | 3 | - | - | 3 | 30 | 70 | 100 |
| AEC011 | Antennas and Propagation | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AHS015 | Business Economics and Financial Analysis | HS | Foundation | 3 | - | - | 3 | 30 | 70 | 100 |
| | **Professional Elective – I** | PE | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| | Available and Selected MOOC Courses | | | | | | | | | |
| AHS106 | Research and Content Development | HS | Skill | - | - | 2 | 1 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| AEC105 | Digital Communications Laboratory | PC | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| AEC106 | Integrated Circuits Applications Laboratory | PC | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| **TOTAL** | | | | **18** | **02** | **08** | **25** | **270** | **630** | **900** |

## VI SEMESTER

| Course Code | Course Name | Subject Area | Category | Periods per week | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIA | SEE | Total |
| **THEORY** | | | | | | | | | | |
| AEC012 | Digital Signal Processing | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC013 | Microprocessors and Microcontrollers | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC014 | Electronic Measurement and Instrumentation | ES | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| | **Professional Elective - II** | PE | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| | Available and Selected MOOC Courses | | | | | | | | | |
| | **Open Elective – I** | OE | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| | Available and Selected MOOC Courses | | | | | | | | | |
| | Value Added Course – I | AC | Skill | - | - | - | - | - | - | - |
| AEC201 | Ideation and Product Development | - | Skill | - | - | 2 | 1 | 30 | 70 | 100 |
| **PRACTICAL** | | | | | | | | | | |
| AEC107 | Digital Signal Processing Laboratory | PC | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| AEC108 | Microprocessors and Microcontrollers Laboratory | PC | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| AEC109 | Instrumentation Laboratory | PC | Core | - | - | 2 | 2 | 30 | 70 | 100 |
| **TOTAL** | | | | **15** | **03** | **10** | **25** | **270** | **630** | **900** |

## VII SEMESTER

| Course Code | Course Name | Subject Area | Category | Periods per week | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIA | SEE | Total |
| **THEORY** | | | | | | | | | | |
| AEC015 | Microwave Engineering | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC016 | Embedded Systems | PC | Core | 3 | - | - | 3 | 30 | 70 | 100 |
| AEC017 | VLSI Design | PC | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| | **Professional Elective - III** | PE | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| | Available and Selected MOOC Courses | | | | | | | | | |
| | **Open Elective – II** | OE | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| | Available and Selected MOOC Courses | | | | | | | | | |
| | Value Added Course – II | AC | Skill | - | - | - | - | - | - | - |
| **PRACTICAL** | | | | | | | | | | |
| AEC110 | Microwave Engineering Laboratory | PC | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| AEC111 | Embedded System Laboratory | PC | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| AEC112 | VLSI Design Laboratory | PC | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| AEC301 | Project Work (Phase- I) | PC | Core | - | - | - | - | - | - | - |
| **TOTAL** | | | | **15** | **02** | **09** | **23** | **240** | **560** | **800** |

## VIII SEMESTER

| Course Code | Course Name | Subject Area | Category | Periods per week | | | Credits | Scheme of Examination Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIA | SEE | Total |
| **THEORY** | | | | | | | | | | |
| AIT003 | Computer Networks | ES | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| AEC018 | Optical Communication | PC | Core | 3 | - | - | 3 | 30 | 70 | 100 |
| | **Professional Elective – IV** | PE | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| | Available and Selected MOOC Courses | | | | | | | | | |
| **PRACTICAL** | | | | | | | | | | |
| AEC401 | Comprehensive Examination | PC | Skill | - | - | - | 1 | - | 100 | 100 |
| AEC302 | Project Work (Phase- II) | PC | Core | - | - | 4 | 10 | 30 | 70 | 100 |
| **TOTAL** | | | | **09** | **01** | **04** | **21** | **120** | **380** | **500** |

## PROFESSIONAL ELECTIVES

## GROUP - I: SEMICONDUCTOR TECHNOLOGY

| Course Code | Course Title |
|---|---|
| AEC501 | Sensors and Actuators |
| AEC502 | Automotive and Optical Sensors |
| AEC503 | Device Modeling |
| AEC504 | Biomedical Instrumentation |
| AEC505 | Silicon on Insulator and Advanced MOSFET based Structures |
| AEC506 | Power Semiconductor devices |

## GROUP - II: SIGNAL, IMAGE AND SPEECH PROCESSING

| Course Code | Course Title |
|---|---|
| AEC507 | Digital Signal Processors and Architecture |
| AEC508 | Digital Image Processing |
| AEC509 | Pattern Recognition |
| AEC510 | Advanced Digital Signal Processing |
| AEC511 | Adaptive Signal Processing |
| AEC512 | Remote Sensing and Radar Signal Processing |

## GROUP - III: MICRO ELECTRONICS AND INTEGRATED CIRCUIT DESIGN

| Course Code | Course Title |
|---|---|
| AEC513 | Field Programmable Gate Array& Complex Programmable Logic Devices |
| AEC514 | VLSI Signal Processing |
| AEC515 | Design for Testability |
| AEC516 | Digital IC Applications using VHDL |
| AEC517 | Low Power Very Large Scale Integration |
| AEC518 | System Verilog |

## GROUP - IV: WIRELESS AND TELECOMMUNICATIONS

| Course Code | Course Title |
|---|---|
| AEC519 | Multi input and multi output Wireless Communication |
| AEC520 | Cellular and Mobile Communications |
| AEC521 | Radar systems |
| AEC522 | Satellite Communication |
| AEC523 | Telecommunication Switching Theory and Applications |
| AEC524 | Wireless Communications and Networks |

## GROUP - V: NETWORKING AND CODING

| Course Code | Course Title |
|---|---|
| AEC525 | Voice Over Internet Protocol |
| AEC526 | Wireless Sensor Networks and Architecture |
| AEC527 | Mobile Adhoc Network |
| AEC528 | Cognitive Radio |
| AEC529 | Cipher Systems |
| AEC530 | Neural Networks and Fuzzy logic |

## GROUP - VI: EMBEDDED SYSTEMS AND ROBOTICS

| Course Code | Course Title |
|---|---|
| AEC531 | Microcontroller Programming |
| AEC532 | Advanced RISC Machine Architecture |
| AEC533 | Embedded C |
| AEC534 | Real Time Operating System |
| AEC535 | Embedded Networking |
| AEC536 | Robotic Control Systems |

## OPEN ELECTIVE-I

| Course Code | Course Title |
|---|---|
| AME551 | Elements of Mechanical Engineering |
| ACE551 | Disaster Management |
| ACE552 | Geospatial Techniques |
| ACS551 | Principles of Operating System |
| ACS552 | JAVA Programming |
| AEC551 | Embedded System Design* |
| AME552 | Introduction to Automobile Engineering |
| AME553 | Introduction to Robotics |
| AAE551 | Aerospace Propulsion and Combustion |
| Note: * indicates that subject not offered to the students of Electronics and Communication Engineering department. | |

## OPEN ELECTIVES- II

| Course Code | Course Title |
|---|---|
| AEC552 | Fundamentals of Image Processing* |
| ACS553 | Fundamentals of Database Management Systems |
| AIT551 | Basics of Information Security and Cryptography |
| AHS551 | Modeling and Simulation |
| AHS552 | Research Methodologies |
| AEE551 | Energy from Waste |
| AAE552 | Finite Element Analysis |
| AME554 | Basic Refrigeration and Air-Conditioning |
| AAE553 | Launch Vehicles and Controls |
| Note: * indicates that subject not offered to the students of Electronics and Communication Engineering department. | |

## AUDIT COURSES

| Course Code | Course Title |
|---|---|
| AHS601 | Intellectual Property Rights |
| AHS602 | Total Quality Management |
| AHS603 | Professional Ethics and Human Values |
| AHS604 | Legal Sciences |
| AHS605 | Clinical Psychology |
| AHS606 | English for Special Purposes |
| AHS607 | Entrepreneurship |
| AHS608 | Any Foreign Language |
| AHS609 | Design History |
| AHS017 | Gender Sensitivity |

## VALUE ADDED COURSES - I

| Course Code | Course Title |
|---|---|
| AEC801 | Elements of Machine Learning |
| AEC802 | IoT & Applications |
| AEC803 | Artificial Intelligence |
| AEC804 | VLSI Testing |

## VALUE ADDED COURSES - II

| Course Code | Course Title |
|---|---|
| AEC805 | Arm Processor Architectures |
| AEC806 | Nano Technology |
| AEC807 | Verilog HDL |
| AEC808 | Television Engineering |

# SYLLABUS
# (Semesters I –VIII)

# LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

**I Semester:** **Common for all Branches**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AHS002 | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Analyze and solve linear system of equations by using elementary transformations.
II. Apply differential equations on real time applications
III. Determine the maxima and minima of functions of several variables by using partial differential coefficients.

| UNIT-I | THEORY OF MATRICES | Classes: 08 |
|---|---|---|

Real matrices: Symmetric, skew-symmetric and orthogonal matrices; Complex matrices: Hermitian, Skew-Hermitian and unitary matrices; Elementary row and column transformations, elementary matrix, finding rank of a matrix by reducing to Echelon form and normal form; Finding the inverse of a matrix using elementary row/column transformations: Gauss-Jordan method; Solving of linear system of equations by LU decomposition method.

| UNIT-II | LINEAR TRANSFORMATIONS | Classes: 10 |
|---|---|---|

Cayley-Hamilton theorem: Statement, verification, finding inverse and powers of a matrix; Linear dependence and independence of vectors; Linear transformation; Eigen values and Eigen vectors of a matrix; Properties of Eigen values and Eigen vectors of real and complex matrices; Diagonalization of matrix.

| UNIT-III | DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS | Classes: 08 |
|---|---|---|

Solution of first order linear differential equations by exact, non exact, linear equations; Bernoulli equation.

Applications of first order differential equations: Orthogonal trajectories; Newton's law of cooling; Law of natural growth and decay.

| UNIT-IV | HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS | Classes: 10 |
|---|---|---|

Linear differential equations of second and higher order with constant coefficients, non-homogeneous term of the type $f(x) = e^{ax}, \sin ax, \cos ax$ and $f(x) = x^n, e^{ax}v(x), x^n v(x)$; Method of variation of parameters; Applications to electrical circuits and simple harmonic motion.

| UNIT-V | FUNCTIONS OF SINGLE AND SEVERAL VARIABLES | Classes: 09 |
|---|---|---|
| Mean value theorems: Rolle's theorem, Lagrange's theorem, Cauchy's theorem-without proof; Functions of several variables: Partial differentiation, chain rule, total derivative, Euler's theorem, functional dependence, Jacobian, maxima and minima of functions of two variables without constraints and with constraints; Method of Lagrange multipliers. | | |

**Text Books:**


1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2013.


**Reference Books:**


1. R K Jain, S R K Iyengar, "Advanced Engineering Mathematics", Narosa Publishers, 5th Edition, 2016.
2. Ravish R Singh, Mukul Bhatt, "Engineering Mathematics-1", Tata McGraw-Hill Education, 1st Edition, 2009.
3. Srimanthapal, Suboth C. Bhunia, "Engineering Mathematics", Oxford Publishers, 3rd Edition, 2015.


**Web References:**

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resources/#Mathematics
3. http://www.sosmath.com/
4. http://www.mathworld.wolfram.com/

**E-Text Books:**

1. http://www.e-booksdirectory.com/details.php?ebook=10166
2. http://www.e-booksdirectory.com/details.php?ebook=7400re

**Course Home Page:**

# COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS

**I Semester: CSE / ECE / EEE / IT | II Semester: AE / CE / ME**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AHS003 | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes:15** | **Practical Classes: Nil** | | | | **Total Classes: 60** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Enrich the knowledge of solving algebraic, transcendental and differential equation by numerical methods.

II. Apply multiple integration to evaluate mass, area and volume of the plane.

III. Analyze gradient, divergence and curl to evaluate the integration over a vector field.

IV. Understand the Bessels equation to solve them under special conditions with the help of series solutions.

| UNIT-I | ROOT FINDING TECHNIQUES AND INTERPOLATION | Classes: 09 |
|---|---|---|

Root finding techniques: Solving algebraic and transcendental equations by bisection method, method of false position, Newton-Raphson method; Interpolation: Finite differences, forward differences, backward differences and central differences; Symbolic relations; Newton's forward interpolation, Newton's backward interpolation; Gauss forward central difference formula, Gauss backward central difference formula; Interpolation of unequal intervals: Lagrange's interpolation.

| UNIT-II | CURVE FITTING AND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS | Classes: 08 |
|---|---|---|

Fitting a straight line; Second degree curves; Exponential curve, power curve by method of least squares; Taylor's series method; Step by step methods: Euler's method, modified Euler's method and Runge-Kutta method for first order differential equations.

| UNIT-III | MULTIPLE INTEGRALS | Classes: 10 |
|---|---|---|

Double and triple integrals; Change of order of integration.

Transformation of coordinate system; Finding the area of a region using double integration and volume of a region using triple integration.

| UNIT-IV | VECTOR CALCULUS | Classes: 08 |
|---|---|---|

Scalar and vector point functions; Gradient, divergence, curl and their related properties; Solenoidal and irrotational vector point functions; Scalar potential function; Laplacian operator; Line integral, surface integral and volume integral; Vector integral theorems: Green's theorem in a plane, Stoke's theorem and Gauss divergence theorem without proofs.

| UNIT-V | SPECIAL FUNCTIONS | Classes: 10 |
|---|---|---|
| Gamma function, properties of gamma function; Ordinary point and regular singular point of differential equations; Series solutions to differential equations around zero, Frobenius method about zero; Bessel's differential equation: Bessel functions properties, recurrence relations, orthogonality, generating function, trigonometric expansions involving Bessel functions. | | |
| **Text Books:** | | |
| 1. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014.<br>2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012. | | |
| **Reference Books:** | | |
| 1. R K Jain, S R K Iyengar, "Advanced Engineering Mathematics", Narosa Publishers, 5th Edition, 2016.<br>2. S. S. Sastry, "Introduction Methods of Numerical Analysis", Prentice-Hall of India Private Limited, 5th Edition, 2012. | | |
| **Web References:** | | |
| 1. http://www.efunda.com/math/math_home/math.cfm<br>2. http://www.ocw.mit.edu/resources/#Mathematics<br>3. http://www.sosmath.com/<br>4. http://www.mathworld.wolfram.com | | |
| **E-Text Books:** | | |
| 1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html<br>2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks | | |
| **Course Home Page:** | | |

# ENGINEERING PHYSICS

<table>
<tr><td colspan="9">I Semester: CSE / ECE / EEE / IT</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>AHS006</td><td>Foundation</td><td>3</td><td>1</td><td>-</td><td>4</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: 15</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 60</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Develop strong fundamentals of nanomaterials.
II. Meliorate the knowledge of theoretical and technological aspects of lasers.
III. Correlate principles with applications of the quantum mechanics, dielectric and magnetic materials.
IV. Enrich knowledge in modern engineering materials like semiconductors.

| UNIT-I | DIELECTRIC AND MAGNETIC PROPERTIES | Classes: 09 |
|---|---|---|

Dielectric properties: Basic definitions, electronic, ionic and orientation polarizations-qualitative; Internal field in solids; Magnetic properties: Basic definitions, origin of magnetic moment, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, domain theory of ferro magnetism on the basis of hysteresis curve.

| UNIT-II | LASERS | Classes: 09 |
|---|---|---|

Lasers: Characteristics of lasers, spontaneous and stimulated emission of radiation, metastable state, population inversion, lasing action, Einstein's coefficients, ruby laser, He-Ne laser, semiconductor diode laser and applications of lasers.

| UNIT-III | NANOMATERIAL | Classes: 09 |
|---|---|---|

Nanomaterial: Origin of nanomaterial, nano scale, surface to volume ratio, quantum confinement; Properties of nanomaterials: Physical, chemical, electrical, optical, magnetic and mechanical.

Bottom-up fabrication: Sol-gel; Top-down fabrication: Chemical vapour deposition; Applications of nanomaterials, characterization by XRD, TEM.

| UNIT-IV | QUANTUM MECHANICS | Classes: 09 |
|---|---|---|

Quantum mechanics: Waves and particles, De Broglie hypothesis, matter waves, Heisenberg's uncertainty principle, Davisson and Germer experiment, Schrodinger's time independent wave equation, physical significance of the wave function, infinite potential well and its extension to three dimensions.

| UNIT-V | SEMICONDUCTOR PHYSICS | Classes: 09 |
|---|---|---|

Semiconductor physics: Fermi level in intrinsic and extrinsic semiconductors, calculation of carrier concentration in intrinsic and extrinsic semiconductors, energy gap, direct and indirect band gap semiconductors, Hall effect.

| **Text Books:** |
|---|
| 1. Dr. K. Vijaya Kumar, Dr. S. Chandralingam, “Modern Engineering Physics”, S. Chand & Co., New Delhi, 1st Edition, 2010.<br>2. P. K. Palanisamy, “Engineering Physics”, Scitech Publishers, 4th Edition, 2014. |
| **Reference Books:** |
| 1. Rajendran, “Engineering Physics”, Tata Mc Graw Hill Book Publishers, 1st Edition, 2010.<br>2. R. K. Gaur, S. L. Gupta, “Engineering Physics”, Dhanpat Rai Publications, 8th Edition, 2001.<br>3. A. J. Dekker, “Solid State Physics”, Macmillan India ltd, 1st Edition, 2000.<br>4. Hitendra K. Malik, A. K. Singh, “Engineering Physics”, Mc Graw Hill Education, 1st Edition, 2009. |
| **Web References:** |
| 1. http://www.link.springer.com/book<br>2. http://www.thphys.physics.ox.ac.uk<br>3. http://www.sciencedirect.com/science<br>4. http://www.e-booksdirectory.com |
| **E-Text Books:** |
| 1. http://www.peaceone.net/basic/Feynman<br>2. http://www.physicsdatabase.com/free-physics-books<br>3. http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf<br>4. http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html |
| **Course Home Page:** |

# ENGINEERING CHEMISTRY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **I Semester:** **Common for all Branches** | | | | | | | | |
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AHS005 | **Foundation** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Apply the electrochemical principles in batteries.
II. Understand the fundamentals of corrosion and development of different techniques in corrosion control.
III. Analysis of water for its various parameters and its significance in industrial applications.
IV. Improve the fundamental science and engineering principles relevant to materials.

| | | |
|---|---|---|
| **UNIT-I** | **ELECTROCHEMISTRY AND BATTERIES** | **Classes: 10** |

Electrochemistry: Basic concepts of electrochemistry; Conductance: Specific, equivalent and molar conductance and effect of dilution on conductance; Electrochemical cells: Galvanic cell (daniel cell); Electrode potential; Electrochemical series and its applications; Nernst equation; Types of electrodes: Calomel electrode, quinhydrone electrode; Batteries: Classification of batteries, primary cells (dry cells) and secondary cells (lead-acid battery, Ni-Cd cell), applications of batteries, numerical problems.

| | | |
|---|---|---|
| **UNIT-II** | **CORROSION AND ITS CONTROL** | **Classes: 08** |

Corrosion: Introduction, causes and effects of corrosion; Theories of corrosion: Chemical and electrochemical corrosion with mechanism; Factors affecting the rate of corrosion: Nature of the metal and nature of the environment; Types of corrosion: Waterline and crevice corrosion; Corrosion control methods: Cathodic protection- sacrificial anodic protection and impressed current cathodic protection; Surface coatings: Metallic coatings, methods of application of metallic coatings-hot dipping(galvanizing, tinning), electroplating(copper plating); Organic coatings: Paints, its constituents and their functions.

| | | |
|---|---|---|
| **UNIT-III** | **WATER TECHNOLOGY** | **Classes: 09** |

Water: Sources and impurities of water, hardness of water, expression of hardness-units; Types of hardness: Temporary hardness, permanent hardness and numerical problems; Estimation of temporary and permanent hardness of water by EDTA method; Determination of dissolved oxygen by Winkler's method; Boiler troubles: Priming, foaming, scales, sludges and caustic embrittlement.

Treatment of water: Internal treatment of boiler feed water- carbonate, calgon and phosphate conditioning, softening of water by Zeolite process and Ion exchange process; Potable water-its specifications, steps involved in the treatment of potable water, sterilization of potable water by chlorination and ozonization, purification of water by reverse osmosis process.

| | | |
|---|---|---|
| **UNIT-IV** | **MATERIALS CHEMISTRY** | **Classes: 10** |

Materials chemistry: Polymers-classification with examples, polymerization-addition, condensation and co-polymerization; Plastics: Thermoplastics and thermosetting plastics; Compounding of plastics; Preparation, properties and applications of polyvinyl chloride, Teflon, Bakelite and Nylon-6, 6; Rubbers: Natural rubber its process and vulcanization; Elastomers: Buna-s and Thiokol rubber; Fibers:

| | | |
|---|---|---|
| Characteristics of fibers, preparation properties and applications of Dacron; Characteristics of fiber reinforced plastics; Cement: Composition of Portland cement, setting and hardening of Portland cement; Lubricants: Classification with examples; Properties: Viscosity, flash, fire, cloud and pour point; Refractories: Characteristics and classification with examples. | | |
| **UNIT-V** | **FUELS AND COMBUSTION** | **Classes: 08** |
| Fuel: Definition, classification of fuels and characteristics of a good fuels; Solid fuels: Coal; Analysis of coal: Proximate and ultimate analysis; Liquid fuels: Petroleum and its refining; Cracking: Fixed bed catalytic cracking; Knocking: Octane and cetane numbers; Gaseous fuels: Composition, characteristics and applications of natural gas, LPG and CNG; Combustion: Calorific value: Gross Calorific Value(GCV) and Net Calorific Value(NCV), calculation of air quantity required for complete combustion of fuel, numerical problems. | | |

**Text Books:**

1. P. C. Jain, Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, 15th Edition, 2015.
2. Shasi Chawla, "Text Book of Engineering Chemistry", Dhantpat Rai Publishing Company, New Delhi, 1st Edition, 2011.

**Reference Books:**

1. B. Siva Shankar, "Engineering Chemistry", Tata Mc Graw Hill Publishing Limited, 3rd Edition, 2015.
2. S. S. Dara, Mukkanti, "Text of Engineering Chemistry", S. Chand & Co., New Delhi, 12th Edition, 2006.
3. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5th Edition, 2013.
4. R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.

**Web References:**

1. https://www.tndte.com
2. https://www.nptel.ac.in/downloads
3. https://www.scribd.com
4. https://www.cuiet.info
5. https://www.sbtebihar.gov.in
6. https://www.ritchennai.org

**E-Text Books:**

1. https://www.Corrosion.ksc.nasa.gov/electrochem_cells.htm
2. https://www.science.uwaterloo.ca/~cchieh/cact/applychem/watertreatment.html
3. https://www.acs.org/content/acs/en/careers/college-to-career/areas-of-chemistry/polymer-chemistry.html
4. https://www.darvill.clara.net/altenerg/fossil.htm
5. https://www.Library.njit.edu/research helpdesk/subject guides/chemistry.php

**Course Home Page:**

# COMPUTER PROGRAMMING

| I Semester: CSE / ECE / EEE / IT \| II Semester: AE / CE / ME | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| ACS001 | Foundation | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Learn adequate knowledge by problem solving techniques.
II. Understand programming skills using the fundamentals and basics of C Language.
III. Improve problem solving skills using arrays, strings, and functions.
IV. Understand the dynamics of memory by pointers.
V. Study files creation process with access permissions.

| UNIT-I | INTRODUCTION | Classes: 10 |
|---|---|---|

Introduction to computers: Computer systems, computing environments, computer languages, creating and running programs, algorithms, flowcharts; Introduction to C language: History of C, basic structure of C programs, process of compiling and running a C program, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types; Operators and expressions: Operators, arithmetic, relational and logical, assignment operators, increment and decrement operators, bitwise and conditional operators, special operators, operator precedence and associativity, evaluation of expressions, type conversions in expressions, formatted input and output.

| UNIT-II | CONTROL STRUCTURES, ARRAYS AND STRINGS | Classes: 10 |
|---|---|---|

Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements; Arrays: Concepts, one dimensional arrays, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays; Strings concepts: String handling functions, array of strings.

| UNIT-III | FUNCTIONS AND POINTERS | Classes: 09 |
|---|---|---|

Functions: Need for user defined functions, function declaration, function prototype, category of functions, inter function communication, function calls, parameter passing mechanisms, recursion, passing arrays to functions, passing strings to functions, storage classes, preprocessor directives.

Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, pointers and arrays, pointers as functions arguments, functions returning pointers.

| UNIT-IV | STRUCTURES AND UNIONS | Classes: 08 |
|---|---|---|

Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, passing structures through pointers, self referential structures, unions, bit fields, typedef, enumerations; Dynamic memory allocation: Basic concepts, library functions.

| UNIT-V | FILES | Classes: 08 |
|---|---|---|
| Files: Streams, basic file operations, file types, file opening modes, file input and output functions, file status functions, file positioning functions, command line arguments. | | |

**Text Books:**

1. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.
2. B. A. Forouzan, R. F. Gillberg, "C Programming and Data Structures", Cengage Learning, India, 3rd Edition, 2014.

**Reference Books:**

1. W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd Edition, 1988.
2. Yashavant Kanetkar, "Exploring C", BPB Publishers, 2nd Edition, 2003.
3. E. Balagurusamy, "Programming in ANSI C", Mc Graw Hill Education, 6th Edition, 2012.
4. Schildt Herbert, "C: The Complete Reference", Tata Mc Graw Hill Education, 4th Edition, 2014.
5. R. S. Bichkar, "Programming with C", Universities Press, 2nd Edition, 2012.
6. Dey Pradeep, Manas Ghosh, "Computer Fundamentals and Programming in C", Oxford University Press, 2nd Edition, 2006.

**Web References:**

1. https://www.bfoit.org/itp/Programming.html
2. https://www.khanacademy.org/computing/computer-programming
3. https://www.edx.org/course/programming-basics-iitbombayx-cs101-1x-0
4. https://www.edx.org/course/introduction-computer-science-harvardx-cs50x

**E-Text Books:**

1. http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download.htm
2. http://www.imada.sdu.dk/~svalle/courses/dm14-2005/mirror/c/
3. http://www.enggnotebook.weebly.com/uploads/2/2/7/1/22718186/ge6151-notes.pdf

**MOOC Course**

1. https://www.alison.com/courses/Introduction-to-Programming-in-c
2. http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s096-effective-programming-in-c-and-c-january-iap-2014/index.htm

**Course Home Page:**

# ENGINEERING PHYSICS AND CHEMISTRY LABORATORY

**I Semester:** CSE / ECE / EEE / IT

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AHS104 | Foundation | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 42 | | | | Total Classes: 42 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Elevate practical knowledge to understand technological aspects of LED, energy gap and solar cell.
II. Enrich real-time application aspect of R-C, magnetic field intensity and numerical aperture of optical fiber.
III. Enlighten the phenomenon of instrumentation, physical properties and preparations.

## LIST OF EXPERIMENTS

### Week-l INTRODUCTION TO PHYSICS/CHEMISTRY LABORATORY

Introduction to physics/chemistry laboratory. Do's and Don'ts in physics/chemistry laboratory.

### Week-2 PHY: LED AND LASER CHARACTERISTICS, CHE: VOLUMETRIC ANALYSIS

Batch I: Characteristics of LED and LASER.
Batch II: Estimation of hardness of water by EDTA method.

### Week-3 CHE: VOLUMETRIC ANALYSIS, PHY: LED AND LASER CHARACTERISTICS

Batch I: Estimation of hardness of water by EDTA method.
Batch II: Characteristics of LED and LASER.

### Week-4 PHY: STEWART GEE’S METHOD, CHE: INSTRUMENTATION

Batch I: Magnetic field along the axis of current carrying coil-Stewart and Gee’s method.
Batch II: Conductometric titration of strong acid vs strong base.

### Week-5 CHE: INSTRUMENTATION, PHY: STEWART GEE’S METHOD

Batch I: Conductometric titration of strong acid vs strong base.
Batch II: Magnetic field along the axis of current carrying coil-Stewart and Gee’s method.

### Week-6 PHY: SOLAR CELL, CHE: INSTRUMENTATION

Batch I: Study of characteristics of solar cell.
Batch II: Potentiometric titration of strong acid vs strong base.

### Week-7 CHE: INSTRUMENTATION, PHY: SOLAR CELL

Batch I: Potentiometric titration of strong acid vs strong base.
Batch II: Study of characteristics of solar cell.

| | |
|---|---|
| **Week-8** | **PHY: R C CIRCUIT, CHE: INSTRUMENTATION** |
| Batch I: Time constant of an R C circuit.<br>Batch II: Determination of $P^H$ of a given solution by $P^H$ meter. | |
| **Week-9** | **CHE: INSTRUMENTATION, PHY: R C CIRCUIT** |
| Batch I: Determination of $P^H$ of a given solution by $P^H$ meter.<br>Batch II: Time constant of an R C circuit. | |
| **Week-10** | **PHY: OPTICAL FIBER, CHE: PHYSICAL PROPERTIES** |
| Batch I: Evaluation of numerical aperture of given fiber.<br>Batch II: Determination of surface tension and viscosity of lubricants. | |
| **Week-11** | **CHE: PHYSICAL PROPERTIES, PHY: OPTICAL FIBER** |
| Batch I: Determination of surface tension and viscosity of lubricants.<br>Batch II: Evaluation of numerical aperture of given fiber. | |
| **Week-12** | **PHY: ENERGY GAP, CHE: PREPARATION OF ORGANIC COMPOUNDS** |
| Batch I: Estimating energy gap of given semiconductor diode.<br>Batch II: Preparation of Aspirin and Thiokol rubber. | |
| **Week-13** | **CHE: PREPARATION OF ORGANIC COMPOUNDS, PHY: ENERGY GAP** |
| Batch I : Preparation of Aspirin and Thiokol rubber.<br>Batch II: Estimating energy gap of given semiconductor diode. | |
| **Week-14** | **REVISION** |
| Revision. | |
| **Reference Books:** | |
| 1. C. L. Arora, "Practical Physics", S. Chand & Co., New Delhi, 3rd Edition, 2012.<br>2. Vijay Kumar, Dr. T. Radhakrishna, "Practical Physics for Engineering Students", S M Enterprises, 2nd Edition, 2014.<br>3. Vogel's, "Quantitative Chemical Analaysis", Prentice Hall, 6th Edition, 2000.<br>4. Gary D. Christian, "Analytical Chemistry", Wiley Publications, 6th Edition, 2007. | |
| **Web Reference:** | |
| http://www.iare.ac.in | |
| **Course Home Page:** | |

**LIST OF PHYSICS LABORATORY EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS:**

| S. No | Name of the Component | Qty | Range |
|---|---|---|---|
| 1 | LED circuit | 10 | I/P 0-10V DC, Resistors 1k Ω-4kΩ |
| 2 | Digital ammeter | 10 | Digital Meter DC 0-20mA |
| 3 | Digital voltmeter | 10 | Digital Meter DC 0-20V |
| 4 | Probes | 30 | Dia - 4mm |
| 5 | Stewart and Gees's set | 10 | Coil 2, 50, 200 turns |
| 6 | DC Ammeter | 10 | Digital Meter DC 0-20V |
| 7 | Battery eliminator | 10 | DC 2Amps |
| 8 | Solar cell Kit with panel | 10 | XL-10 |
| 9 | Bulb | 20 | 0 – 100W, 230V |
| 10 | Numerical aperture kit | 10 | Optical power meter 660nm |
| 11 | RC Circuit | 10 | I/P 15V, Voltmeter 0-20V, Ammeter 0-2000mA, Resistors 4K7- 100K Ω, Capacitors 0.047-2200µF |
| 12 | Stop clock | 20 | +/- 1s |
| 13 | Energy gap | 10 | Heating element - 35W, $E_g$ = 0.2-0.4eV I/P 0-10V, Ammeter 0-200µA |
| 14 | Laser diode circuit | 10 | I/P 0-10V DC, Resistors 1k Ω-4K Ω |

**LIST OF CHEMISTRY LABORATORY EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS:**

| S. No | Name of the Apparatus | Quantity of the apparatus | Total numbers of apparatus required |
|---|---|---|---|
| 1 | Analytical balance | 100 gm | 04 |
| 2 | Beaker | 100 ml | 30 |
| 3 | Burette | 50 ml | 30 |
| 4 | Burette Stand | Metal | 30 |
| 5 | Clamps with Boss heads | Metal | 30 |
| 6 | Conical Flask | 250 ml | 30 |
| 7 | Conductivity cell | K=1 | 05 |
| 8 | Calomel electrode | Glass | 06 |
| 9 | Digital Potentiometer | EI | 05 |
| 10 | Digital Conductivity meter | EI | 05 |
| 11 | Digital electronic balance | RI | 01 |
| 12 | Distilled water bottle | 500 ml | 30 |
| 13 | Funnel | Small | 30 |
| 14 | Glass rods | 20 cm length | 30 |
| 15 | Measuring Cylinders | 10 ml | 10 |
| 16 | Oswald Viscometer | Glass | 30 |
| 17 | Pipette | 20 ml | 30 |
| 18 | Platinum Electrode | PP | 05 |
| 19 | Porcelain Tiles | White | 30 |
| 20 | Reagent bottle | 250 ml | 30 |
| 21 | Standard Flask | 100 ml | 30 |
| 22 | Stalagmo meter | Glass | 30 |
| 23 | Digital $P^H$ meter | $P^H$ 0-14 | 05 |

# COMPUTER PROGRAMMING LABORATORY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **I Semester:** Common for CSE / ECE / EEE / IT \| **II Semester:** Common for AE / CE / ME | | | | | | | | |
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| ACS101 | **Foundation** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: 36** | | | | **Total Classes: 36** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Formulate problems and implement algorithms using C programming language.
II. Develop programs using decision structures, loops and functions.
III. Learn memory allocation techniques using pointers.
IV. Use structured programming approach for solving of computing problems in real world.

## LIST OF EXPERIMENTS

### Week-1 OPERATORS AND EVALUATION OF EXPRESSIONS

a. Write a C program to check whether a number is even or odd using ternary operator.
b. Write a C program to perform the addition of two numbers without using + operator.
c. Write a C program to evaluate the arithmetic expression ((a + b / c * d - e) * (f - g)). Read the values a, b, c, d, e, f, g from the standard input device.
d. Write a C program to find the sum of individual digits of a 3 digit number.
e. Write a C program to read the values of x and y and print the results of the following expressions in one line:
   i. (x + y) / (x - y)
   ii. (x + y)(x - y)

### Week-2 CONTROL STRUCTURES

a. Write a C program to find the sum of individual digits of a positive integer.
b. A Fibonacci sequence is defined as follows: The first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
d. A character is entered through keyboard. Write a C program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol using if-else and switch case. The following table shows the range of ASCII values for various characters.

| **Characters** | **ASCII values** |
|---|---|
| A – Z | 65 – 90 |
| a – z | 97 – 122 |
| 0 – 9 | 48 – 57 |
| Special symbols | 0 – 47, 58 – 64, 91 – 96, 123 – 127 |

e. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Write a C program to determine how much profit or loss incurred in percentage.

| Week-3 | CONTROL STRUCTURES |
|---|---|

a. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use switch statement).
b. Write a C program to calculate the following sum:

$$sum = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$

c. Write a C program to find the roots of a quadratic equation.
d. Write a C program to check whether a given 3 digit number is Armstrong number or not.
e. Write a C program to print the numbers in triangular form

```
1
1 2
1 2 3
1 2 3 4
```

| Week-4 | ARRAYS |
|---|---|

a. Write a C program to find the second largest integer in a list of integers.
b. Write a C program to perform the following:
   i. Addition of two matrices
   ii. Multiplication of two matrices
c. Write a C program to count and display positive, negative, odd and even numbers in an array.
d. Write a C program to merge two sorted arrays into another array in a sorted order.
e. Write a C program to find the frequency of a particular number in a list of integers.

| Week-5 | STRINGS |
|---|---|

a. Write a C program that uses functions to perform the following operations:
   i. To insert a sub string into a given main string from a given position.
   ii. To delete n characters from a given position in a given string.
b. Write a C program to determine if the given string is a palindrome or not.
c. Write a C program to find a string within a sentence and replace it with another string.
d. Write a C program that reads a line of text and counts all occurrence of a particular word.
e. Write a C program that displays the position or index in the string S where the string T begins, or 1 if S doesn't contain T.

| Week-6 | FUNCTIONS |
|---|---|

a. Write C programs that use both recursive and non-recursive functions
   i. To find the factorial of a given integer.
   ii. To find the greatest common divisor of two given integers.
b. Write C programs that use both recursive and non-recursive functions
   i. To print Fibonacci series.
   ii. To solve towers of Hanoi problem.
c. Write a C program to print the transpose of a given matrix using function.
d. Write a C program that uses a function to reverse a given string.

| Week-7 | POINTERS |
|---|---|

a. Write a C program to concatenate two strings using pointers.
b. Write a C program to find the length of string using pointers.
c. Write a C program to compare two strings using pointers.
d. Write a C program to copy a string from source to destination using pointers.
e. Write a C program to reverse a string using pointers.

| Week-8 | STRUCTURES AND UNIONS |
|---|---|

a. Write a C program that uses functions to perform the following operations:
   i. Reading a complex number
   ii. Writing a complex number
   iii. Addition and subtraction of two complex numbers
   iv. Multiplication of two complex numbers. Note: represent complex number using a structure.
b. Write a C program to compute the monthly pay of 100 employees using each employee's name, basic pay. The DA is computed as 52% of the basic pay. Gross-salary (basic pay + DA). Print the employees name and gross salary.
c. Create a Book structure containing book_id, title, author name and price. Write a C program to pass a structure as a function argument and print the book details.
d. Create a union containing 6 strings: name, home_address, hostel_address, city, state and zip. Write a C program to display your present address.
e. Write a C program to define a structure named DOB, which contains name, day, month and year. Using the concept of nested structures display your name and date of birth.

| Week-9 | ADDITIONAL PROGRAMS |
|---|---|

a. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$ . For example: if n is 3 and x is 5, then the program computes 1+5+25+125. Print x, n, the sum. Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if $n<0$, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.
b. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
c. Write a C program to convert a Roman numeral to its decimal equivalent. E.g. Roman number CD is equivalent to 400.

| Week-10 | PREPROCESSOR DIRECTIVES |
|---|---|

a. Define a macro with one parameter to compute the volume of a sphere. Write a C program using this macro to compute the volume for spheres of radius 5, 10 and 15 meters.
b. Define a macro that receives an array and the number of elements in the array as arguments. Write a C program for using this macro to print the elements of the array.
c. Write symbolic constants for the binary arithmetic operators +, -, *, and /. Write a C program to illustrate the use of these symbolic constants.

| Week-11 | FILES |
|---|---|

a. Write a C program to display the contents of a file.
b. Write a C program to copy the contents of one file to another.
c. Write a C program to reverse the first n characters in a file, where n is given by the user.
d. Two files DATA1 and DATA2 contain sorted lists of integers. Write a C program to merge the contents of two files into a third file DATA i.e., the contents of the first file followed by those of the second are put in the third file.
e. Write a C program to count the no. of characters present in the file.

| Week-12 | COMMAND LINE ARGUMENTS |
|---|---|

a. Write a C program to read arguments at the command line and display it.
b. Write a C program to read two numbers at the command line and perform arithmetic operations on it.
c. Write a C program to read a file name at the command line and display its contents.

**Reference Books:**


1. Yashavant Kanetkar, "Let Us C", BPB Publications, New Delhi, 13th Edition, 2012.
2. Oualline Steve, "Practical C Programming", O'Reilly Media, 3rd Edition, 1997.
3. King K N, "C Programming: A Modern Approach", Atlantic Publishers, 2nd Edition, 2015.
4. Kochan Stephen G, "Programming in C – A Complete Introduction to the C Programming Language", Sam's Publishers, 3rd Edition, 2004.
5. Linden Peter V, "Expert C Programming: Deep C Secrets", Pearson India, 1st Edition, 1994.


**Web References:**


1. http://www.sanfoundry.com/c-programming-examples
2. http://www.geeksforgeeks.org/c
3. http://www.cprogramming.com/tutorial/c
4. http://www.cs.princeton.edu


**Course Home Page:**

# COMPUTER AIDED ENGINEERING DRAWING

| I Semester: CSE / ECE / EEE / I T | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AME103 | Foundation | L | T | P | C | CIA | SEE | Total |
| | | - | - | 2 | 1 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 30 | | | | Total Classes: 30 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the basic principles of engineering drawing.
II. Understand the construction of scales.
III. Apply the knowledge of interpretation of dimensions of different quadrant projections.
IV. Convert the pictorial views into orthographic views and vice versa.
V. Create intricate details of components through sections and to develop its surfaces.

| UNIT-I | INTRODUCTION TO ENGINEERING DRAWING AND AUTOCAD | Classes : 06 |
|---|---|---|

Introduction to engineering drawing: Introduction to engineering drawing, drawing instruments and accessories, types of lines, lettering practice and rules of dimensioning, geometrical constructions, basic geometrical shapes; Introduction to AutoCAD familiarization of graphical user interface, toggle functional keys and tool bars; Drawing of closed form entities like line, circle, ellipse, polygon; Lettering and standard drawing templates.

| UNIT-II | DRAFTING AND MODELING COMMANDS | Classes : 06 |
|---|---|---|

Drafting and modeling commands: Geometric commands, layers, display control command, editing, dimensioning and solid modeling.

| UNIT-III | ORTHOGRAPHIC PROJECTION | Classes : 06 |
|---|---|---|

Orthographic projection: Principles of orthographic projections, conventions, first and third angle projections.

Projection of points, straight lines, planes and regular solid, prisms, cylinders, pyramids and cones.

| UNIT-IV | ISOMETRIC PROJECTIONS | Classes : 06 |
|---|---|---|

Isometric projections: Principle of isometric projection, isometric scale, isometric projections and isometric views, isometric projections of solids.

| UNIT-V | TRANSFORMATION OF PROJECTIONS | Classes : 06 |
|---|---|---|

Transformation of projections: Conversion of isometric views to orthographic views and conversion of orthographic views to isometric views.

**Text Books:**

1. N. D. Bhatt, "Engineering Drawing", Charotar Publications, 49th Edition,2012.
2. C. M. Agrawal, Basant Agrawal, "Engineering Drawing'', Tata McGraw-Hill, 2nd Edition, 2013.

| Reference Books: |
|---|
| 1. K. Venugopal, "Engineering Drawing and Graphics", New Age Publications, 2nd Edition, 2010.<br>2. Dhananjay. A. Johle, "Engineering Drawing", Tata McGraw Hill, 1st Edition, 2008.<br>3. S. Trymbaka Murthy, "Computer Aided Engineering Drawing", I K International Publishers, 3rd Edition, 2011.<br>4. A. K. Sarkar, A. P. Rastogi, "Engineering graphics with Auto CAD", PHI Learning, 1st Edition, 2010. |
| **Web References:** |
| 1. http://nptel.ac.in/courses/112103019/<br>2. http://www.autocadtutorials.net/<br>3. https://grabcad.com/questions/tutorial-16-for-beginner-engineering-drawing-1 |
| **E-Text Book:** |
| https://books.google.co.in/books?id=VRN7e09Rq0C&pg=PA9&source=gbs_toc_r&cad=4#v=onepage&q&f=false |
| **Course Home Page:** |
| |

# COMPUTATIONAL MATHEMATICS LABORATORY

| **I Semester:** CSE / ECE / EEE / IT \| **II Semester:** AE / CE / ME | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AHS102 | **Foundation** | **L** | **T** | **P** | **C** | **CIE** | **SEE** | **Total** |
| | | - | - | 2 | 1 | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: 24** | | | | **Total Classes: 24** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Train the students how to approach for solving engineering problems.
II. Understand the concepts of algebra, calculus and numerical solutions using MATLAB software.
III. Enrich the knowledge in MATLAB and can apply for project works.

## LIST OF EXPERIMENTS

### Week-l BASIC FEATURES

a. Features and uses.
b. Local environment setup.

### Week-2 ALGEBRA

a. Solving basic algebraic equations.
b. Solving system of equations.
c. Two dimensional plots.

### Week-3 CALCULUS

a. Calculating limits.
b. Solving differential equations.
c. Finding definite integral.

### Week-4 MATRICES

a. Addition, subtraction and multiplication of matrices.
b. Transpose of a matrix.
c. Inverse of a matrix.

### Week-5 SYSTEM OF LINEAR EQUATIONS

a. Rank of a matrix.
b. Gauss Jordan method.
c. LU decomposition method.

### Week-6 LINEAR TRANSFORMATION

a. Characteristic equation.
b. Eigen values.
c. Eigen vectors.

| Week-7 | DIFFERENTIATION AND INTEGRATION |
|---|---|
| a. Higher order differential equations.<br>b. Double integrals.<br>c. Triple integrals. | |
| **Week-8** | **INTERPOLATION AND CURVE FITTING** |
| a. Lagrange polynomial.<br>b. Straight line fit.<br>c. Polynomial curve fit. | |
| **Week-9** | **ROOT FINDING** |
| a. Bisection method.<br>b. Regula false method.<br>c. Newton Raphson method. | |
| **Week-10** | **NUMERICAL DIFFERENTION AND INTEGRATION** |
| a. Trapezoidal, Simpson's method.<br>b. Euler method.<br>c. Runge Kutta method. | |
| **Week-11** | **3D PLOTTING** |
| a. Line plotting.<br>b. Surface plotting.<br>c. Volume plotting. | |
| **Week-12** | **VECTOR CALCULUS** |
| a. Gradient.<br>b. Divergent.<br>c. Curl. | |

**Reference Books:**


1. Cleve Moler, "Numerical Computing with MATLAB", SIAM, Philadelphia, 2nd Edition, 2008.
2. Dean G. Duffy, "Advanced Engineering Mathematics with MATLAB", CRC Press, Taylor & Francis Group, 6th Edition, 2015.


**Web Reference:**

http://www.iare.ac.in

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:**

**SOFTWARE:** Microsoft Windows 7 and MATLAB – V 8.5, which is also R2015a

**HARDWARE:** 30 numbers of Intel Desktop Computers with 2 GB RAM

# ENGLISH FOR COMMUNICATION

| I Semester: AE / CE / ME \| II Semester: CSE / ECE / EEE / IT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AHS001 | Skill | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Communicate in an intelligible English accent and pronunciation.
II. Effectively use the four language skills i.e., Listening, Speaking, Reading and Writing.
III. Develop the art of writing simple English with correct spelling, grammar and punctuation.

| UNIT-I | LISTENING SKILL | Classes: 08 |
|---|---|---|

Significance, essentials, barriers and effectiveness of listening; Listening to dialogues, conversation, discussions, monologues; Listening to sounds, silent letters, stressed syllables in English; Listening for the gist of the text, for identifying the topic, general meaning and specific information; Listening for multiple choice questions, positive and negative comments for interpretation

**Note:** Instructions in theory and practice in the lab

| UNIT-II | SPEAKING SKILL | Classes: 10 |
|---|---|---|

Significance, essentials, barriers and effectiveness of speaking; Simple oral or casual interaction, dialogue, conversation; Debates: Differences between disagreeing and being disagreeable; Brief presentations; Role plays; Generating talks based on visual or written prompts; Addressing a small group or a large formal gathering; Speaking about present, past experiences and future plans; Arguing outs a topic without verbal fights; Paper presentation.

**Note:** Instructions in theory and practice in the lab

| UNIT-III | READING SKILL | Classes: 09 |
|---|---|---|

Techniques of reading: Skimming, scanning, intensive and extensive reading; Reading comprehension: Exercises for multiple choice questions and contextual meaning – Values in Dr. Kalam.

Vocabulary enrichment and grammar exercises based on selective readings: Swami Vivekananda: Chicago Speech, 1893; Passages for intellectual and emotional comments; Reading for the gist of a text, for specific information, for information transfer and interpretation.

| UNIT-IV | WRITING SKILL | Classes: 08 |
|---|---|---|

Significance, essentials and effectiveness of writing; Writing emails; Writing paragraphs: Comparing, contrasting, presentations with an introduction, body and conclusion; Writing formal and informal letters: Letter of invitation, accepting, declining, requesting, complaint, seeking information; Cover letter enclosing a CV.

| UNIT-V | VOCABULARY AND GRAMMAR | Classes: 10 |
|---|---|---|

Punctuation, parts of speech, articles, prepositions, tenses, concords, phrasal verbs; Forms of verbs: Regular and irregular, direct and indirect speech, change of voice; prefixes, suffixes, Synonyms, antonyms, one word substitutes, idioms and phrases, technical vocabulary.

**Text Books:**

1. Meenakshi Raman, Sangeetha Sharma, "Technical Communication Principles Practices", Oxford University Press, New Delhi, 3rd Edition , 2015.

**Reference Books:**

1. Norman Whitby, "Business Benchmark: Pre-Intermediate to Intermediate – BEC Preliminary", Cambridge University Press, 2nd Edition, 2008.
2. Devaki Reddy, Shreesh Chaudhary, "Technical English", Macmillan, 1st Edition, 2009.
3. Rutherford, Andrea J, "Basic Communication Skills for Technology", Pearson Education, 2nd Edition, 2010
4. Raymond Murphy, "Essential English Grammar with Answers" Cambridge University Press, 2nd Edition.

**Web References:**

1. http://www.edufind.com
2. http://www.myenglishpages.com
3. http://www.grammar.ccc.comment.edu
4. http://www.owl.english.prudue.edu

**E-Text Books:**

1. http://www.bookboon.com/en/communication-ebooks-zip
2. http://www.bloomsbury-international.com/images/ezone/ebook/writing-skills-pdf.pdf
3. https://www.americanenglish.state.gov/files/ae/resource_files/developing_writing.pdf
4. http://www.learningenglishvocabularygrammar.com/files/idiomsandphraseswithmeaningsandexamplespdf.pdf
5. http://www.robinwood.com/Democracy/GeneralEssays/CriticalThinking.pdf

**Course Home Page:**

# COMPLEX ANALYSIS AND PROBABILITY DISTRIBUTIONS

| **II Semester:** ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AHS004 | **Foundation** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 15** | **Practical Classes: Nil** | | | | **Total Classes: 60** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the basic theory of complex functions to express the power series.
II. Evaluate the contour integration using Cauchy residue theorem.
III. Enrich the knowledge of probability on single random variables and probability distributions.

| **UNIT-I** | **COMPLEX FUNCTIONS AND DIFFERENTIATION** | **Classes: 09** |
|---|---|---|

Complex functions differentiation and integration: Complex functions and its representation on argand plane, concepts of limit, continuity, differentiability, analyticity, Cauchy-Riemann conditions and harmonic functions; Milne-Thomson method.

| **UNIT-II** | **COMPLEX INTEGRATION** | **Classes: 09** |
|---|---|---|

Line integral: Evaluation along a path and by indefinite integration; Cauchy's integral theorem; Cauchy's integral formula; Generalized integral formula; Power series expansions of complex functions and contour Integration: Radius of convergence.

| **UNIT -III** | **POWER SERIES EXPANSION OF COMPLEX FUNCTION** | **Classes: 09** |
|---|---|---|

Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point; Isolated singular point; Pole of order m; Essential singularity; Residue: Cauchy Residue Theorem.

Evaluation of Residue by Laurent Series and Residue Theorem.
Evaluation of integrals of the type

1. $\int_{0}^{2\Pi} f(\cos\theta, \sin\theta)d\theta$ 2. $\int_{-\infty}^{\infty} f(x)dx$ ,

Bilinear Transformation.

| **UNIT-IV** | **SINGLE RANDOM VARIABLES** | **Classes: 09** |
|---|---|---|

Random variables: Discrete and continuous, probability distributions, mass function-density function of a probability distribution. Mathematical expectation. Moment about origin, central moments, moment generating function of probability distribution.

| **UNIT-V** | **PROBABILITY DISTRIBUTIONS** | **Classes: 09** |
|---|---|---|

Binomial, Poisson and normal distributions and their properties.

| **Text Books:** |
|---|
| 1. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons Publishers, 10th Edition, 2014.<br>2. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 42nd Edition, 2012. |
| **Reference Books:** |
| 1. Churchill, R.V. and Brown, J.W, “Complex Variables and Applications”, Tata McGraw-Hill, 8th Edition, 2012.<br>2. A. K. Kapoor, “Complex Variables Principles and Problem Sessions”, World Scientific Publishers, 1st Edition, 2011.<br>3. Murray Spiegel, John Schiller, “Probability and Statistics”, Schaum’s Outline Series, 3rd Edition, 2010. |
| **Web References:** |
| 1. http://www.efunda.com/math/math_home/math.cfm<br>2. http://ocw.mit.edu/resources/#Mathematics<br>3. http://www.sosmath.com/<br>4. http://mathworld.wolfram.com/ |
| **E-Text Books:** |
| 1. http://keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html<br>2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks. |
| **Course Home Page:** |

# ENVIRONMENTAL STUDIES

<table>
<tr><td colspan="10">II Semester: Common for all Branches</td></tr>
<tr><td rowspan="3">Course Code</td><td rowspan="3">Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>AHS009</td><td>Foundation</td><td colspan="8"></td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Analyze the interrelationship between living organism and environment.
II. Understand the importance of environment by assessing its impact on the human world.
III. Enrich the knowledge on themes of biodiversity, natural resources, pollution control and waste management.

| | | |
|---|---|---|
| **UNIT-I** | **ENVIRONMENT AND ECOSYSTEMS** | **Classes: 08** |

Environment: Definition, scope and importance of environment, need for public awareness; Ecosystem: Definition, scope and importance of ecosystem, classification, structure and function of an ecosystem, food chains, food web and ecological pyramids, flow of energy; Biogeochemical cycles; Biomagnifications.

| | | |
|---|---|---|
| **UNIT-II** | **NATURAL RESOURCES** | **Classes: 08** |

Natural resources: Classification of resources, living and nonliving resources; Water resources: Use and over utilization of surface and ground water, floods and droughts, dams, benefits and problems; Mineral resources: Use and exploitation; Land resources; Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

| | | |
|---|---|---|
| **UNIT-III** | **BIODIVERSITY AND BIOTIC RESOURCES** | **Classes: 10** |

Biodiversity and biotic resources: Introduction, definition, genetic, species and ecosystem diversity; Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and optional values; India as a mega diversity nation; Hot spots of biodiversity.

Threats to biodiversity: Habitat loss, poaching of wildlife, human-wildlife conflicts; Conservation of biodiversity: In situ and ex situ conservation; National biodiversity act.

| | | |
|---|---|---|
| **UNIT-IV** | **ENVIRONMENTAL POLLUTION, POLLUTION CONTROL TECHNOLOGIES AND GLOBAL ENVIRONMENTAL PROBLEMS** | **Classes: 10** |

Environmental pollution: Definition, causes and effects of air pollution, water pollution, soil pollution, noise pollution; Solid waste: Municipal solid waste management, composition and characteristics of e-waste and its management; Pollution control technologies: Waste water treatment methods, primary, secondary and tertiary; Concepts of bioremediation; Global environmental problems and global efforts: Climate change, ozone depletion, ozone depleting substances, deforestation and desertification; International conventions / protocols: Earth summit, Kyoto protocol and Montreal protocol.

| | | |
|---|---|---|
| **UNIT-V** | **ENVIRONMENTAL LEGISLATIONS AND SUSTAINABLE DEVELOPMENT** | **Classes: 09** |

Environmental legislations: Environmental protection act, air act1981, water act, forest act, wild life act, municipal solid waste management and handling rules, biomedical waste management and handling rules2016, hazardous waste management and handling rules, Environmental impact assessment(EIA); Towards sustainable future: Concept of sustainable development, population and its explosion, crazy consumerism, environmental education, urban sprawl, concept of green building.

**Text Books:**

1. Benny Joseph, “Environmental Studies”, Tata Mc Graw Hill Publishing Co. Ltd, New Delhi, $1^{st}$ Edition, 2006.
2. Erach Bharucha, “Textbook of Environmental Studies for Under Graduate Courses”, Orient Black Swan, $2^{nd}$ Edition, 2013.
3. Dr. P. D Sharma, “Ecology and Environment”, Rastogi Publications, New Delhi, $12^{th}$ Edition, 2015.

**Reference Books:**

1. Tyler Miller, Scott Spoolman, “Environmental Science”, Cengage Learning, $14^{th}$ Edition, 2012.
2. Anubha Kaushik, “Perspectives in Environmental Science”, New Age International, New Delhi, $4^{th}$ Edition, 2006.
3. Gilbert M. Masters, Wendell P. Ela, “Introduction to Environmental Engineering and Science, Pearson, $3^{rd}$ Edition, 2007.

**Web References:**

1. https://www.elsevier.com
2. https://www. libguides.lib.msu.edu
3. https://www.fao.org
4. https://www nrc.gov
5. https://www istl.org
6. https://www.ser.org
7. https://www.epd.gov.
8. https://www.nptel.ac.in

**E-Text Books:**

1. http://www.ilocis.org
2. http://www.img.teebweb.org
3. http://www.ec.europa.eu
4. http://www.epa.ie
5. http://www.birdi.ctu.edu.vn

**Course Home Page:**

# DATA STRUCTURES

| II Semester: CSE / ECE / EEE / IT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| ACS002 | Foundation | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | Total Classes: 60 | | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Learn the basic techniques of algorithm analysis.
II. Demonstrate several searching and sorting algorithms.
III. Implementation of linear data structure mechanisms.
IV. Demonstrate various tree and graph traversal algorithms.
V. Analyze and choose appropriate data structure to solve problems in real world.

| UNIT-I | INTRODUCTION TO DATA STRUCTURES, SEARCHING AND SORTING | Classes: 10 |
|---|---|---|

Basic concepts: Introduction to data structures, classification of data structures, operations on data structures, abstract data type, algorithms, different approaches to design an algorithm, recursive algorithms; Searching techniques: Linear search, binary search and Fibonacci search; Sorting techniques: Bubble sort, selection sort, insertion sort, quick sort, merge sort, and comparison of sorting algorithms.

| UNIT-II | LINEAR DATA STRUCTURES | Classes: 10 |
|---|---|---|

Stacks: Primitive operations, implementation of stacks using Arrays, applications of stacks arithmetic expression conversion and evaluation; Queues: Primitive operations; Implementation of queues using Array, applications of linear queue, circular queue and double ended queue (deque).

| UNIT-III | LINKED LISTS | Classes: 09 |
|---|---|---|

Linked lists: Introduction, singly linked list, representation of a linked list in memory, operations on a single linked list; Applications of linked lists: Polynomial representation and sparse matrix manipulation.

Types of linked lists: Circular linked lists, doubly linked lists;
Linked list representation and operations of Stack, linked list representation and operations of queue.

| UNIT-IV | NON LINEAR DATA STRUCTURES | Classes: 08 |
|---|---|---|

Trees: Basic concept, binary tree, binary tree representation, array and linked representations, binary tree traversal, binary search tree, tree variants, application of trees; Graphs: Basic concept, graph terminology, graph implementation, graph traversals, Application of graphs, Priority Queue.

| UNIT-V | BINARY TREES AND HASHING | Classes: 08 |
|---|---|---|

Binary search trees: Binary search trees, properties and operations; Balanced search trees: AVL trees; Introduction to M-Way search trees, B trees; Hashing and collision: Introduction, hash tables, hash functions, collisions, applications of hashing.

**Text Books:**

1. Mark A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson, 2nd Edition, 1996.
2. Ellis Horowitz, Satraj Sahni, Susan Anderson Freed, “Fundamentals of Data Structures in C”, Universities Press, 2nd Edition, 2008.

**Reference Books:**

1. Reema Thareja, “Data Structures using C”, Oxford University Press, 2nd Edition, 2014.
2. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition, 2008.
3. D. Samanta, “Classic Data Structures”, PHI Learning, 2nd Edition, 2004.
4. Tanenbaum, Langsam, Augenstein, “Data Structures Using C”, Pearson, 1st Edition, 2003.

**Web References:**

1. http://www.tutorialspoint.com/data_structures_algorithms
2. http://www.geeksforgeeks.org/data-structures/
3. http://www.studytonight.com/data-structures/
4. https://www.coursera.org/specializations/data-structures-algorithms

**E-Text Books:**

1. https://www.scribd.com/doc/268924096/c-Data-Structures-Balaguruswamy-eBook
2. https://www.safaribooksonline.com/library/view/data-structures-using/9789332524248/
3. http://www.amazon.com/Data-Structures-C-Noel-Kalicharan/dp/1438253273
4. https://www.scribd.com/doc/40147240/Data-Structures-Using-c-by-Aaron-m-Tenenbaum-946

**Course Home Page:**

# ELECTRICAL CIRCUITS

**II Semester:** **ECE / EEE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEE002 | Foundation | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Classify circuit parameters and apply Kirchhoff's laws for network reduction.
II. Apply mesh analysis and nodal analysis to solve electrical networks.
III. Illustrate single phase AC circuits and apply steady state analysis to time varying circuits.
IV. Apply network theorems to obtain the equivalent circuit of electrical networks.

| UNIT-I | INTRODUCTION TO ELECTRICAL CIRCUITS | Classes: 09 |
|---|---|---|

Circuit concept: R, L, C Parameters, voltage and current sources, independent and dependent sources, source transformation, voltage current relationship for passive elements (for different input signal Square, Ramp, Saw tooth and Triangular); Kirchhoff's laws, network reduction techniques series, parallel, series parallel.

| UNIT-II | ANALYSIS OF ELECTRICAL CIRCUITS | Classes: 09 |
|---|---|---|

Mesh analysis: Mesh equations by inspection method, super mesh analysis; Nodal analysis: Nodal equations by inspection method, super node analysis, star to delta or delta to star transformation; Network topology: Definitions, graph, tree, basic tie set and basic cut set matrices for planar networks duality and dual networks.

| UNIT-III | SINGLE PHASE A.C. CIRCUITS | Classes: 10 |
|---|---|---|

Single phase AC circuits: RMS and average values and form factor for different periodic wave forms, steady state analysis of RL and RC (in Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation, concept of reactance, impedance, susceptance and admittance, phase and phase difference, concept of power factor, real and reactive powers, complex and Polar forms of representation, Complex power.

Steady state analysis of RLC: (in series, parallel and series parallel combinations) with sinusoidal excitation; concept of reactance, impedance, susceptance and admittance, phase and phase difference, concept of power factor, real and reactive powers, complex and polar forms of representation, complex power.

| UNIT-IV | RESONANCE AND MAGNETIC CIRCUITS | Classes: 08 |
|---|---|---|

Resonance: Series, parallel circuits, concept of band width and Q factor; Magnetic circuits: Faraday's laws of electromagnetic induction, concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, analysis of series and parallel magnetic circuits.

| UNIT-V | NETWORK THEOREMS (AC & DC) | Classes: 09 |
|---|---|---|

Theorems: Tellegen's, Superposition, Reciprocity, Thevinin's, Norton's, maximum power transfer, Milliman's and compensation theorems for DC and AC excitations, numerical problems.

**Text Books:**

1. A. Chakrabarthy, "Electric Circuits", Dhanipat Rai & Sons, 6th Edition, 2010.
2. A. Sudhakar, Shyammohan S Palli, "Circuits and Networks", Tata McGraw Hill, 4th Edition, 2010.
3. M. E. Van Valkenberg, "Network Analysis", PHI, 3 rd Edition, 2014.

**Reference Books:**

1. John Bird, "Electrical Circuit Theory and Technology", Newnes, 2nd Edition, 2003.
2. C. L. Wadhwa, "Electrical Circuit Analysis Inclucing Passive Network Synthesis", New Age International, 2nd Edition, 2009.
3. David A. Bell, "Electric circuits", Oxford University Press, 7th Edition, 2009.

**Web References:**

1. http://www.igniteengineers.com
2. http://www.ocw.nthu.edu.tw
3. http://www.uotechnology.edu.iq
4. http://www.iare.ac.in

**E-Text Books :**

1. http://www.bookboon.com/en/concepts-in-electric-circuits-ebook
2. http://www.www.jntubook.com
3. http://www.allaboutcircuits.com
4. http://www.archive.org

**Course Home Page:**

# COMMUNICATION SKILLS LABORATORY

| I Semester: AE / CE / ME \| II Semester: CSE / ECE / EEE / IT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AHS101 | **Foundation** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | - | - | 2 | 1 | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: 24** | | | | **Total Classes: 24** | | |

**OBJECTIVES:**

**The course enables the students to:**

I. Improve their ability to listen and comprehend a given text.
II. Upgrade the fluency and acquire a functional knowledge of English Language.
III. Enrich thought process by viewing a problem through multiple angles.

## LIST OF EXPERIMENTS

**Week-l** | **LISTENING SKILL**

a. Listening to conversations and interviews of famous personalities in various fields, listening practice related to the TV talk shows, news.
b. Listening for specific information, listening for summarizing information.

**Week-2** | **LISTENING SKILL**

a. Listening to films of short duration and monologues for taking notes, listening to answer multiple choice questions.
b. Listening to telephonic conversations; Listening to native Indian, British and American speakers to analyze intercultural differences.

**Week-3** | **SPEAKING SKILL**

a. Functions of English Language; Introduction to phonetics, exercises on pronunciation, symbols of phonetics.
b. Speaking exercises involving the use of stress and intonation, improving pronunciation through tongue twisters.
c. Tips on how to develop fluency, body language and communication; Introducing oneself: Talking about yourself others, leave taking.

**Week-4** | **SPEAKING SKILL**

a. Just a minute (JAM) sessions, public speaking, situational conversation/role-play.
b. Greetings for different occasions with feedback preferably through video recording; Speaking about present, past experiences and future plans; Acting as a compere and news reader.

**Week-5** | **READING SKILL**

a. Reading anecdotes to predict the content, reading for interpretation.
b. Suggested reading: Short stories and poem; Critical reading.

| Week-6 | READING SKILL |
|---|---|
| a. Reading for information transfer; Reading newspaper and magazine articles, memos, letters, notices and minutes for critical commentary.<br>b. Reading selective autobiographies. | |
| **Week-7** | **READING SKILL** |
| a. Reading brochures, advertisements, pamphlets for improved presentation.<br>b. Reading comprehension exercises with critical and analytical questions based on context. | |
| **Week-8** | **WRITING SKILL** |
| a. Writing messages, leaflets, notice; Writing tasks; Flashcard.<br>b. Filling gaps while listening short stories. | |
| **Week-9** | **WRITING SKILL** |
| a. Write a slogan related to the image.<br>b. Write a short story of 6-10 lines based on the hints given. | |
| **Week-10** | **WRITING SKILL** |
| a. Writing a short story on their own; Writing a review on: Video clippings on inspirational speeches.<br>b. Writing a review on short films, advertisements, recipe and recently watched film. | |
| **Week-11** | **THINKING SKILL** |
| a. Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms, proverbs.<br>b. Argumentative skills; Debates. | |
| **Week-12** | **THINKING SKILL** |
| a. Inculcating interest in English using thinking blocks.<br>b. Making pictures and improvising diagrams to form English words, phrases and proverbs. | |
| **Reference Books:** | |
| 1. Meenakshi Raman, Sangeetha Sharma, "Technical Communication Principles Practices", Oxford University Press, New Delhi, 3rd Edition, 2015.<br>2. Rhirdion, Daniel, "Technical Communication", Cengage Learning, New Delhi, 1st Edition, 2009. | |
| **Web References:** | |
| 1. http://learnenglish.britishcouncil.org<br>2. http://www.esl-lab.com/<br>3. http://www.elllo.org/ | |
| **Course Home Page:** | |

# DATA STRUCTURES LABORATORY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **II Semester:** **CSE / ECE / EEE / IT** | | | | | | | | |
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| ACS102 | **Foundation** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: 36** | | | | **Total Classes: 36** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Implement linear and non linear data structures.
II. Analyze various algorithms based on their time complexity.
III. Choose appropriate data structure and algorithm design method for a specific application.
IV. Identify suitable data structure to solve various computing problems.

## LIST OF EXPERIMENTS

### Week-1 SEARCHING TECHNIQUES

Write C programs for implementing the following searching techniques.
a. Linear search.
b. Binary search.
c. Fibonacci search.

### Week-2 SORTING TECHNIQUES

Write C programs for implementing the following sorting techniques to arrange a list of integers in ascending order.
a. Bubble sort.
b. Insertion sort.
c. Selection sort.

### Week-3 SORTING TECHNIQUES

Write C programs for implementing the following sorting techniques to arrange a list of integers in ascending order.
a. Quick sort.
b. Merge sort.

### Week-4 IMPLEMENTATION OF STACK AND QUEUE

Write C programs to
a. Design and implement Stack and its operations using Arrays.
b. Design and implement Queue and its operations using Arrays

### Week-5 APPLICATIONS OF STACK

Write C programs for the following:
a. Uses Stack operations to convert infix expression into postfix expression.
b. Uses Stack operations for evaluating the postfix expression.

### Week-6 IMPLEMENTATION OF SINGLE LINKED LIST

Write C programs for the following:
a. Uses functions to perform the following operations on single linked list.
(i) Creation (ii) insertion (iii) deletion (iv) traversal
b. To store a polynomial expression in memory using linked list.

| | |
|---|---|
| **Week-7** | **IMPLEMENTATION OF CIRCULAR SINGLE LINKED LIST** |
| Write C programs for the following:<br>Uses functions to perform the following operations on Circular linked list.<br>(i) Creation (ii) insertion (iii) deletion (iv) traversal | |
| **Week-8** | **IMPLEMENTATION OF DOUBLE LINKED LIST** |
| Write C programs for the following:<br>Uses functions to perform the following operations on double linked list.<br>(i) Creation (ii) insertion (iii) deletion (iv) traversal in both ways. | |
| **Week-9** | **IMPLEMENTATION OF STACK USING LINKED LIST** |
| Write C programs to implement stack using linked list. | |
| **Week-10** | **IMPLEMENTATION OF QUEUE USING LINKED LIST** |
| Write C programs to implement queue using linked list. | |
| **Week-11** | **GRAPH TRAVERSAL TECHNIQUES** |
| Write C programs to implement the following graph traversal algorithms:<br>a. Depth first search.<br>b. Breadth first search. | |
| **Week-12** | **IMPLEMENTATION OF BINARY SEARCH TREE** |
| Write a C program that uses functions to perform the following:<br>a. Create a binary search tree.<br>b. Traverse the above binary search tree recursively in pre-order, post-order and in-order.<br>c. Count the number of nodes in the binary search tree. | |

**Reference Books:**


1. Kernighan Brian W, Dennis M. Ritchie, "The C Programming Language", Prentice Hall of India, Re-Print, 2008.
2. Balagurusamy E, "Programming in ANSI C", Tata Mc Graw Hill, 6th Edition, 2008.
3. Gottfried Byron, "Schaum's Outline of Programming with C", Tata McGraw-Hill, 1st Edition, 2010.
4. Lipschutz Seymour, " Data Structures Schaum's Outlines Series", Tata Mc Graw Hill, 3rd Edition, 2014
5. Horowitz Ellis, Satraj Sahni, Susan Anderson, Freed, "Fundamentals of Data Structures in C", W. H. Freeman Company, 2nd Edition, 2011.


**Web References:**


1. http://www.tutorialspoint.com/data_structures_algorithms
2. http://www.geeksforgeeks.org/data-structures/
3. http://www.studytonight.com/data-structures/
4. http://www.coursera.org/specializations/data-structures-algorithms


**Course Home Page:**

# ELECTRICAL CIRCUITS LABORATORY

| **II Semester:** ECE / EEE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| AEE102 | **Foundation** | - | - | 3 | 2 | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: 42** | | | | **Total Classes: 42** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Implement different circuits and verify circuit concepts.
II. Study the concepts of mesh and nodal analysis in electrical circuits.
III. Design electric circuits to verify network theorems.
IV. Gain knowledge about resonance and magnetic circuits.

## LIST OF EXPERIMENTS

**Week-1 KIRCHOFF'S LAWS**

Verification of Kirchhoff's current law and voltage law using hardware and digital simulation.

**Week-2 MESH ANALYSIS**

Verification of mesh analysis using hardware and digital simulation.

**Week-3 NODAL ANALYSIS**

Verification of nodal analysis using hardware and digital simulation.

**Week-4 SINGLE PHASE AC CIRCUITS**

Determination of average value, RMS value, form factor, peak factor of sinusoidal wave, square wave using hardware and digital simulation.

**Week-5 SUPERPOSITION THEOREM**

Verification of superposition theorem using hardware and digital simulation.

**Week-6 RECIPROCITY THEOREM**

Verification of reciprocity theorem using hardware and digital simulation.

**Week-7 MAXIMUM POWER TRANSFER THEOREM**

Verification of maximum power transfer theorem using hardware and digital simulation.

**Week-8 THEVENINS THEOREM**

Verification of Thevenin's theorem using hardware and digital simulation.

**Week-9 NORTON'S THEOREM**

| | |
|---|---|
| Verification of Norton’s theorem using hardware and digital simulation. | |
| **Week-10** | **COMPENSATION THEOREM** |
| Verification of compensation theorem using hardware and digital simulation. | |
| **Week-11** | **MILLIMAN’S THEOREM** |
| Verification of Milliman’s theorem using hardware and digital simulation. | |
| **Week-12** | **SERIES RESONANCE** |
| Verification of series resonance using hardware and digital simulation. | |
| **Week-13** | **PARALLEL RESONANCE** |
| Verification of parallel resonance using hardware and digital simulation. | |
| **Week-14** | **SELF INDUCTANCE AND MUTUAL INDUCTANCE** |
| Determination of self inductance and mutual inductance by using hardware. | |

**Reference Books:**


1. A. Chakrabarti, “Circuit Theory”, Dhanpat Rai Publications, $6^{th}$ Edition, 2006.
2. William Hayt, Jack E. Kemmerly S.M. Durbin, “Engineering Circuit Analysis”, Tata McGraw-Hill, $7^{th}$ Edition, 2010.
3. K. S. Suresh Kumar, “Electric Circuit Analysis”, Pearson Education, $1^{st}$ Edition, 2013.


**Web References:**

1. http://www.ee.iitkgp.ac.in
2. http://www.citchennai.edu.in
3. http://www.iare.ac.in

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:**

**SOFTWARE:** Microsoft Windows 7 and MATLAB – V 8.5, which is also R2015a

**HARDWARE:** 30 numbers of Intel Desktop Computers with 2 GB RAM

## LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS:

| S. No | Name of the Equipment | Range |
|---|---|---|
| 1 | Regulated Power Supply | 0-30V DC |
| 2 | CRO | 0-20 MHz |
| 3 | Digital voltmeter | 0-20 V |
| 4 | Digital ammeter | 0-200 mA |
| 5 | Resistors | 47Ω, 82 Ω, 100 Ω, 150 Ω, 220 Ω, 470 Ω, 560 Ω, 1k Ω, 2.2k Ω, 3.3k Ω.5k Ω,10k Ω |
| 6 | Inductors | 0.01mH, 0.1mH,10mH, 50mH |
| 7 | Capacitors | 0.01μF, 0.1μF, 0.47μF, 470μF, 33μF |
| 8 | 1-ϕ Transformer | 3KVA, 115/230V |
| 9 | 1-ϕ Auto Transformer | 230/(0-270V), 10A |
| 10 | Ammeter | 0-2.5/5A MI |
| 11 | Ammeter | 0-10/20 A MI |
| 12 | Voltmeter | 0-150/300V MI |
| 13 | Voltmeter | 0-300/600V MI |
| 14 | Wattmeter | 5/10A,75/150/300V LPF |
| 15 | Wattmeter | 10/20A,150/300/600V UPF |
| 16 | Multimeter | 10 Nos |
| 17 | Bread boards | 30 Nos |
| 18 | Probes / Connecting wires | 400 Nos |

# ENGINEERING PRACTICE LABORATORY

| II Semester: CSE / ECE / EEE / IT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credit** | **Maximum Marks** | | |
| ACS112 | **Foundation** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | - | - | 2 | 1 | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: 48** | | | | **Total Classes: 48** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the fundamental concepts of computer networking.
II. Design blogs and view the Skype installation.
III. Prepare productivity tools like word processors, spreadsheets, presentations.
IV. Develop models using fitting, carpentry and Tin-Smithy trades.
V. Demonstrate the process of house wiring for connecting and controlling home appliances.
VI. Illustrate metal joining arc welding process, plumbing, and power tools.

## LIST OF EXPERIMENTS

### WEEK-1 NETWORK DEVICES

1 Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
2 Study of following Network Devices in Detail
- Repeater
- Hub
- Switch
- Bridge
- Router
- Gate Way

### WEEK-2 IP ADDRESS

1 Study of network IP Classification of IP address, Sub netting, Super netting
2 Connect the computers in Local Area Network
3 Study of basic network command and Network configuration commands

### WEEK-3 PACKET TRACER

1 Configure a Network topology using packet tracer software
2 Configure a Network using Distance Vector Routing protocol(RIP)
3 Configure Network using Link State Vector Routing protocol(OSPF)

### WEEK-4 BLOG CRAETION, SKYPE INSTALLATION AND CYBER HYGIENE

Creating blogs import the data into blogs, blog templates, blog design. Skype installation and usages of Skype. Install antivirus software; Configure their personal firewall and windows update on their computer.

### WEEK-5 LATEX

To create project certificate, Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in LaTeX.

| WEEK-6 | LATEX |
|---|---|
| Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check and Track Changes using LaTeX. | |
| **WEEK-7** | **LATEX** |
| Mathematical expressions, Subscripts and superscripts, Brackets and Parentheses, Fractions and Binomials, Aligning Equations, Operators, Spacing in math mode, Integrals, sums and limits, Display style in math mode, List of Greek letters and math symbols, Mathematical fonts. | |
| **WEEK-8** | **LATEX** |
| Producing Simple Documents, a LaTeX Input File and Ordinary Text using LaTeX. | |
| **WEEK-9** | **LATEX** |
| Prepare class timetable and student marks list using LaTex . | |
| **WEEK-10** | **SHARE LATEX** |
| Create your first ShareLaTeX document, Uploading a project, Copying a project, Creating a project from a template, Including images in ShareLaTeX. | |
| **WEEK-11** | **SHARE LATEX** |
| Exporting your work from ShareLaTeX,Using bibliographies in ShareLaTeX,Sharing your work with others,Debugging Compilation timeout errors,Code Check. | |
| **WEEK-12** | **HOUSE WIRING** |
| Power point, light fitting and switches, television, home theater. | |
| **WEEK-13** | **CARPENTRY** |
| Study of tools and joints; Practice in planning, chiseling, marking and sawing; Joints: Cross joint, T joint, Dove tail joint. | |
| **WEEK-14** | **SOLDERING** |
| Electronic components (PCB'S), resistance soldering, desoldering, and soldering effects. | |
| **WEEK-15** | **FITTING** |
| Study of tools, practice in filing, cutting, drilling and tapping; Male and female joints, stepped joints**.** | |
| **WEEK-16** | **ELECTRICAL WINDING** |
| Lap winding, wave winding and design of transformer. | |

**Reference Books:**


1. Peter Norton, "Introduction to Computers", Tata Mc Graw Hill Publishers, 6th Edition, 2010.
2. Scott Muller, Que, "Upgrading and Repairing", Pearson Education, PC's 18th Edition, 2009.
3. H. S. Bawa, "Workshop Practice", Tata Mc Graw Hill Publishing Company Limited, New Delhi, 2nd
4. Edition, 2007.


**Web References:**


1. http://www.cl.cam.ac.uk/teaching/1011/CompFunds
2. http://www.bibcol.com.
3. http://www.tutorialspoint.com/computer_fundamentals
4. http://www.craftsmanspace.com

# ELECTRONIC DEVICES AND CIRCUITS

| III Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC001 | Foundation | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Be acquainted with electrical characteristics of ideal and practical diodes under forward and reverse bias to analyze and design diode application circuits such as rectifiers and voltage regulators.
II. Utilize operational principles of bipolar junction transistors and field effect transistors to derive appropriate small-signal models and use them for the analysis of basic amplifier circuits.
III. Perform DC analysis (algebraically and graphically using current voltage curves with super imposed load line) and design of CB,CE and CC transistor circuits.
IV. Compare and contrast different biasing and compensation techniques

| UNIT-I | SEMICONDUCTOR DIODES | Classes: 08 |
|---|---|---|

PN Junction Diode : Theory of PN diode, energy band diagram of PN diode, PN junction as a diode, operation and V-I characteristics , static and dynamic resistances, diode equivalent circuits, diffusion and transition capacitance, diode current equation, temperature dependence of V-I characteristics, Zener diode characteristics ,break down mechanisms in semiconductor diodes, Zener diode as a voltage regulator.

| UNIT-II | SPECIAL PURPOSE ELECTRONIC DEVICES AND RECTIFIERS | Classes: 10 |
|---|---|---|

Special purpose electronic devices: principles of operation and characteristics of silicon controlled rectifier, tunnel diode, varactor diode, photodiode; Half wave rectifier, full wave rectifier, general filter consideration, harmonic components in a rectifier circuit , Inductor Filter, capacitor filter, L-Section filter, multiple L-C section, RC filter, comparison of filters.

| UNIT-III | TRANSISTORS | Classes: 08 |
|---|---|---|

Bipolar Junction Transistors: Construction of BJT, operation of BJT, minority carrier distributions and current components, configurations, characteristics, BJT specifications; Applications: Amplifier, switch.

Field Effect Transistors: Types of FET, FET construction, symbol, principle of operation, V-I characteristics, FET parameters, FET as voltage variable resistor, comparison of BJT and FET; MOSFET construction and operation; Uni-Junction Transistor: Symbol, principle of operation, characteristics, applications (UJT as relaxation oscillator).

| UNIT-IV | BIASING AND COMPENSATION TECHNIQUES | Classes: 10 |
|---|---|---|

Need for biasing, BJT operating point, The DC and AC load lines, types of biasing circuits, bias stability, stabilization factors, stabilization against variations in $V_{BE}$ and $\beta$; Bias compensation techniques, thermal runaway, thermal stability, biasing the FET and MOSFET.

| UNIT-V | BJT AND FET AMPLIFIERS | Classes: 09 |
|---|---|---|

BJT small signal analysis, BJT hybrid model, determination of h-parameters from transistor characteristics, transistor amplifiers analysis using h- parameters; FET small signal model, FET as common source amplifier, FET as common drain amplifier, FET as common gate amplifier, generalized FET amplifier .

**Text Books:**


1. J. Millman, C.C.Halkias, "Millman's Integrated Electronics", Tata McGraw-Hill, 2nd Edition, 2001.
2. J. Millman, C.C.Halkias, Satyabrata Jit, "Millman's Electronic Devices and Circuits", Tata McGrawHill, 2nd Edition, 1998.
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press ,5th Edition,2008.


**Reference Books:**


1. Sedha.R.S, "A Text Book of Applied Electronics", Sultan Chand Publishers,1st Edition, 2008.
2. R.L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits", PEI/PHI, 9th edition, 2006.
3. Gupta.J.B, "Electron Devices and Circuits", S.K.Kataria & Sons, 2nd Edition, 2012.
4. S. Salivahanan, N. Suresh Kumar,A. Vallavaraj, "Electronic Devices and Circuits", Tata McGraw Hill, 2nd edition, 2011.
5. Anil K. Maini, Varsha Agarwal, "Electronic Devices and Circuits", Wiley India Pvt. Ltd, 1st edition, 2009.
6. Floyd, "Electron Devices" Pearson Asia, 5th Edition, 2001.
7. Mohammad Rashid, "Electronic Devices and Circuits", Cengage learning ,1st Edition, 2014.


**Web References:**

1. http://www-mdp.eng.cam.ac.uk/web/library/enginfo/electrical/hong1.pdf
2. https://archive.org/details/ElectronicDevicesCircuits
3. http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASIC ELECTRONICS/home_page.htm
4. http://www.vidyarthiplus.in/2011/11/electronic-device-and-circuits-edc.html
5. http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html

**E-Text Books:**

1. http://services.eng.uts.edu.au/pmcl/ec/Downloads/LectureNotes.pdf
2. http://nptel.ac.in/courses/122106025/
3. http://www.freebookcentre.net/electronics-ebooks-download/Electronic-Devices-and-Circuits-(PDF-313p).html
4. https://www.jntubook.com/electronic-device-circuits-textbook-free-download/
5. http://www.faadooengineers.com/threads/32735-Electronic-Devices-And-Circuits-(EDC)-by-J-B-Gupta-full-book-pdf

**Course Home Page:**

# MATHEMATICAL TRANSFORM TECHNIQUES

<table>
<tr><td colspan="10">III Semester: ECE</td></tr>
<tr><td rowspan="1">Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">AHS011</td><td rowspan="2">Foundation</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: 15</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 60</td></tr>
<tr><td colspan="9">OBJECTIVES:<br>The course should enable the students to:<br>I. Express non periodic function to periodic function using Fourier series and Fourier transforms.<br>II. Apply Laplace transforms and Z-transforms to solve differential equations.<br>III. Formulate and solve partial differential equations.</td></tr>
<tr><td>UNIT-I</td><td colspan="6">FOURIER SERIES</td><td colspan="2">Classes: 08</td></tr>
<tr><td colspan="9">Definition of periodic function, determination of Fourier coefficients; Fourier expansion of periodic function in a given interval of length 2π; Fourier series of even and odd functions; Fourier series in an arbitrary interval; Half- range Fourier sine and cosine expansions.</td></tr>
<tr><td>UNIT-II</td><td colspan="6">FOURIER TRANSFORMS</td><td colspan="2">Classes: 10</td></tr>
<tr><td colspan="9">Fourier integral theorem, Fourier sine and cosine integrals; Fourier transforms; Fourier sine and cosine transform, properties, inverse transforms, finite Fourier transforms.</td></tr>
<tr><td>UNIT-III</td><td colspan="6">LAPLACE TRANSFORMS</td><td colspan="2">Classes: 08</td></tr>
<tr><td colspan="9">Definition of Laplace transform, linearity property, piecewise continuous function, existence of Laplace transform, function of exponential order, first and second shifting theorems, change of scale property, Laplace transforms of derivatives and integrals, multiplied by t, divided by t, Laplace transform of periodic functions;<br><br>Inverse Laplace transform: Definition of inverse Laplace transform, linearity property, first and second shifting theorems, change of scale property, multiplied by s, divided by s; Convolution theorem and applications</td></tr>
<tr><td>UNIT-IV</td><td colspan="6">Z –TRANSFORMS</td><td colspan="2">Classes: 10</td></tr>
<tr><td colspan="9">Z-transforms: Elementary properties, inverse Z-transform, convolution theorem, formation of difference equations.</td></tr>
<tr><td>UNIT-V</td><td colspan="6">PARTIAL DIFFERENTIAL EQUATIONS</td><td colspan="2">Classes: 09</td></tr>
<tr><td colspan="9">Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equation, Lagrange equation and nonlinear standard type equations, method of separation of variables.</td></tr>
<tr><td colspan="9">Text Books:</td></tr>
<tr><td colspan="9">1. Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons Publishers, 10th Edition, 2010.<br>2. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 42nd Edition, 2013.</td></tr>
</table>

| **Reference Books:** |
|---|
| 1. S. S. Sastry, "Introduction methods of numerical analysis", Prentice-Hall of India Private Limited, $5^{th}$ Edition, 2005<br>2. G. Shanker Rao, "Mathematical Methods", I. K. International Publications, $1^{st}$ Edition, 2011. |
| **Web References:** |
| 1. http://www.efunda.com/math/math_home/math.cfm<br>2. http://www.ocw.mit.edu/resources/#Mathematics<br>3. http://www.sosmath.com/<br>4. http://www.mathworld.wolfram.com/ |
| **E-Text Books:** |
| 1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook- download.html<br>2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks |
| **Course Home Page:** |

# DIGITAL SYSTEM DESIGN

| **III Semester:** ECE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| AEC002 | **Foundation** | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 15** | **Practical Classes: Nil** | | | | **Total Classes: 60** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Formulate and solve problems involving number systems and operations related to them and generate different digital codes.

II. Describe and analyze functions of logic gates and optimize the logic functions using K -map and Quine - McClusky methods.

III. Demonstrate knowledge of combinational and sequential logic circuits elements like Adders, Multipliers, flip-flops and use them in the design of latches, counters, sequence detectors, and similar circuits.

IV. Design a simple finite state machine from a specification and be able to implement this in gates and edge triggered flip-flops.

| UNIT-I | FUNDAMENTALS OF DIGITAL TECHNIQUES | Classes:08 |
|---|---|---|

Review of number systems: Decimal, binary, octal and hexa decimal, base conversion methods, complements of numbers; binary codes: Binary coded decimal, excess-3, gray codes, error detecting and error correcting codes.

| UNIT-II | BOOLEAN ALGEBRA AND THEOREMS | Classes:10 |
|---|---|---|

Boolean algebra: Postulates and theorems; Logic gates and truth tables, representation of switching functions, sum of products and product of sums forms, karnaugh map representation, minimization using karnaugh map  Quine - McClusky method of minimization.

| UNIT-III | DESIGN OF COMBINATIONAL CIRCUITS | Classes: 08 |
|---|---|---|

Design of combinational circuits using conventional AND, OR, NOT, NAND, NOR and EX-OR gates; Adders and subtractors: Half adder, full adder, half subtractor, full subtractor.

Parallel adder, serial adder, carry look ahead adder, binary coded decimal adder, 1’ s complement subtractor, 2’s complement subtractor.

| UNIT-IV | SEQUENTIAL CIRCUITS | Classes: 10 |
|---|---|---|

Flip Flops: SR flip flop, JK flip flop, D flip flop, T flip flop, excitation tables, race around condition, master slave flip flop; Counters: Design of synchronous and asynchronous counters; Shift registers: Modes of operation, bidirectional shift registers, ring counters, Johnson counters.

| UNIT-V | CAPABILITIES AND MINIMIZATION OF SEQUENTIAL MACHINES | Classes: 09 |
|---|---|---|

Synchronous sequential circuits: State table, state diagram, state assignment, state minimization; Sequential circuits example: Sequence detectors, binary counters; Mealy and Moore machines: Capabilities and limitations of finite state machine, state equivalence and machine minimization of completely specified or incompletely specified machines, partition method, Merger table and graph method.

**Text Books:**

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", Pearson Education/PHI, 3rd Edition, 2008.
2. Zvi. Kohavi, "Switching and Finite Automata Theory", Tata McGraw Hill, 3rd Edition, 2004.
3. John M. Yarbrough, "Digital logic applications and design", Thomson publications, 2nd Edition, 2006.

**Reference Books:**

1. Roth, "Fundamentals of Logic Design", Cengage learning, 5th Edition, 2004.
2. A. Anand Kumar, "Switching Theory and Logic Design", Prentice Hall of India, 1st Edition, 2014.

**Web References:**

1. mcsbzu.blogspot.com
2. http://books.askvenkat.com
3. http://worldclassprogramme.com
4. http://www.daenotes.com
5. http://nptel.ac.in/courses/117106086/1

**E-Text Books:**

1. https://books.google.co.in/books/about/Switching_Theory_and_Logic_Design
2. https://www.smartzworld.com/notes/switching-theory-and-logic-design-stld
3. https://www.researchgate.net/.../295616521_Switching_Theory_and_Logic_Design
4. https://books.askvenkat.com/switching-theory-and-logic-design-textbook-by-anand-kumar/
5. http://www.springer.com/in/book/9780387285931

**Course Home Page:**

# PROBABILITY THEORY AND STOCHASTIC PROCESSES

<table>
<tr><td colspan="10">III Semester: ECE</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>AEC003</td><td>Foundation</td><td>3</td><td>1</td><td>-</td><td>4</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: 15</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 60</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Know the theoretical formulation of probability, random variables and stochastic processes
II. Be familiar with the basic concepts of the theory of random variables in continuous and discrete time domains and analyze various analytical properties such as statistical averages.
III. Understand the concept of stationarity in random processes and study various properties such as auto -correlation, cross -correlation and apply them for signal analysis.
IV. Relate time domain and frequency domain representations of random processes and model different scenarios of random environment in signal processing and applications.

| UNIT-I | PROBABILITY AND RANDOM VARIABLE | Classes:08 |
|---|---|---|

Introduction to probability through sets and probability: Relative frequency; Experiments and sample spaces, discrete and continuous sample spaces; Events; Probability definitions and axioms; Mathematical model of experiments; Probability as a relative frequency; Joint probability; Conditional probability, total probability; Baye's theorem and independent events. Random variable: Definition of random variable, conditions for a function to be a random variable, discrete ,continuous and mixed random variable.

| UNIT-II | DISTRIBUTION AND DENSITY FUNCTIONS | Classes:10 |
|---|---|---|

Distribution and density functions: Distribution and density functions definitions and properties; Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional distribution, methods of defining conditioning on an event, conditional density, properties. Operation on one random variable expectations: Introduction, expected value of a random variable, function of a random variable, moments about the origin, central moments, variance and skew; Chebychev's inequality; Characteristic function; Moment generating function; Transformations of a random variable: Monotonic transformations for a continuous random variable; Non monotonic transformations of continuous random variable; Transformation of a discrete random variable.

| UNIT-III | MULTIPLE RANDOM VARIABLES AND OPERATIONS | Classes: 08 |
|---|---|---|

Multiple random variables: Vector random variables, joint distribution function, properties of joint distribution; Marginal distribution functions, conditional distribution and density: Point conditioning, conditional distribution and density: Interval conditioning, statistical independence, sum of two random variables, sum of several random variables; Central limit theorem.

Operations on multiple random variables: Expected value of functions of random variables: Joint moments about the origin, joint central moments, joint characteristic functions and jointly Gaussian random variables: Two random variables case and N random variable case, properties; Transformations of multiple random variables; Linear transformations of Gaussian random variables.

| UNIT-IV | STOCHASTIC PROCESSES: TEMPORALCHARACTERISTICS | Classes: 10 |
|---|---|---|

The random process concept, classification of processes, deterministic and non deterministic processes, distribution and density functions, concept of stationary and statistical independence; First order stationary processes; Second order and wide sense stationarity, N Order and strict sense stationarity, time averages and ergodicity, mean ergodic processes, correlation ergodic processes; Autocorrelation function and its properties; Cross correlation function and its properties; Covariance functions; Gaussian random processes; Poisson random process.

| UNIT-V | STOCHASTIC PROCESSES: SPECTRAL CHARACTERISTICS | Classes: 09 |
|---|---|---|

Power spectrum: Properties, relationship between power spectrum and autocorrelation function; The cross power density spectrum, properties, relationship between cross power spectrum and cross correlation function. Spectral characteristics of system response: Power density spectrum of response; cross-power density spectrums of input and output of a linear system. Introduction to white Gaussian noise process and its properties.

**Text Books:**


1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", Tata McGraw-Hill, $4^{th}$ Edition, 2001.
2. Scott Miler, Donald Childers, "Probability and random process", Elsevier, $2^{nd}$ Edition, 2012.
3. S.P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications, $1^{st}$ Edition, 2003.


**Reference Books:**


1. Athanasius Papoulis, S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", PHI, $4^{th}$ Edition, 2002.
2. Henry Stark, John W. Woods, "Probability and Random Processes with Application to Signal Processing", Pearson Education, $3^{rd}$ Edition, 2014.
3. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis", Oxford, $3^{rd}$ Edition, 1999.


**Web References:**

1. www.britannica.com/topic/probability-theory
2. www.math.uiuc.edu/~r-ash/BPT.html
3. https://www.ma.utexas.edu/users/gordanz/.../introduction_to_stochastic_processes.pdf
4. nptel.ac.in/courses/111102014/
5. http://vceece2k10.blogspot.in/p/semester-2-1.html

**E-Text Books:**

1. http://freecomputerbooks.com/mathProbabilityBooks.html
2. http://www.springer.com/in/book/9780387878584
3. http://www.e-booksdirectory.com/listing.php?category=15

**Course Home Page:**

# ELECTRICAL TECHNOLOGY

| III Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEE017 | Core | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 15** | | **Practical Classes: Nil** | | | **Total Classes: 60** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Analyze the transient response of RL, RC and RLC circuits for DC excitation.
II. Discuss the configurations of two port networks and evaluate two port network parameters.
III. Understand the classification and design principles of filters and symmetrical attenuators.
IV. Describe the principle of operation and testing methods of DC machines and single phase transformers.

| UNIT - I | TRANSIENT ANALYSIS | Classes: 08 |
|---|---|---|

Transient response of RL, RC series, RLC circuits for DC excitations, initial conditions, solution using differential equations approach and Laplace transform method.

| UNIT - II | TWO PORT NETWORKS | Classes: 10 |
|---|---|---|

Two port networks: Impedance parameters, admittance parameters, hybrid Parameters, transmission (ABCD) parameters, conversion of one parameter to another, conditions for reciprocity and symmetry, interconnection of two port networks in series, parallel and cascaded configurations, image parameters.

| UNIT - III | FILTERS AND ATTENUATORS | Classes: 10 |
|---|---|---|

Filters: Classification of filters, filter networks, classification of pass band and stop band, characteristic impedance in the pass and stop bands, constant-k low pass filter, high pass filter, m-derived T-section, band pass filter and band elimination filter.

Symmetrical attenuators: T-type attenuator, pi-type attenuator, bridged T type attenuator, lattice attenuator.

| UNIT - IV | DC MACHINES | Classes: 08 |
|---|---|---|

DC Generators: Principle of operation of DC Machines, EMF equation, types of generators, concept of armature reaction, voltage build up, critical field resistance, magnetization and load characteristics of DC generators; DC Motors: Types of DC motors, back EMF, torque equation, characteristics, losses, efficiency, Swinburne’s test, brake test on DC shunt motor, speed control of DC shunt motor, three point starter, applications, numerical problems.

| UNIT - V | SINGLE PHASE TRANSFORMERS | Classes: 09 |
|---|---|---|

Transformers: Principle of operation of single phase transformer, types, constructional features, phasor diagram on no load and load, equivalent circuit, losses and efficiency of transformer and regulation, OC diagram on no load and load, equivalent circuit, losses, efficiency and regulation, OC and SC tests, simple problems.

| **Text Books:** |
| --- |
| 1. William Hayt and Jack E Kemmerly, "Engineering Circuits Analysis", McGraw-Hill Publications, 7th Edition, 2013.<br>2. A Chakrabarhty, "Electric Circuits", Dhanipat Rai & Sons Publication 6th Edition, 2010.<br>3. P S Bimbra, "Electrical Machines", Khanna Publishers, New Delhi,2004<br>4. I J Nagrath, D P Kothari, "Electrical Machines", Tata Mc Graw Hill Publication, New Delhi, 2nd Edition, 2010. |
| **Reference Books:** |
| 1. V K Mehta, "Principles of Electrical Engineering", S Chand Publications, Re print, 2005.<br>2. I J Nagarath, D P Kothari, "Theory and Problems of basic electrical engineering", PHI Publications, 1st Edition, 2013.<br>3. N C Jagan, C Lakhminaraya, "Network Analysis", BS Publications 2nd Edition, 2011.<br>4. Sudhakar, Shyam Mohan, "Electrical Circuits", Mc Graw Hill Publication, 3rd Edition, 2015. |
| **Web References:** |
| 1. https://www.nptel.ac.in/video.php?subjectId=108106075<br>2. https://www.freevideolectures.com/Course/2349/Networks-and-Systems/34<br>3. https://www.onlinevideolecture.com/index.php?course_id=512&lecture_no=37 |
| **E-Text Books:** |
| 1. https://www.freeengineeringbooks.com/Electrical/DC-Motors-Books.php<br>2. https://www.bookboon.com/en/electrical-electronic-engineering-ebooks<br>3. https://www.e-booksdirectory.com/listing.php?category=105 |
| **Course Home Page:** |

## ELECTRONIC DEVICES AND CIRCUITS LABORATORY

<table>
<tr><td colspan="10">III Semester: ECE</td></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours / Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">AEC101</td><td rowspan="2">Core</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>-</td><td>-</td><td>3</td><td>2</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: Nil</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: 39</td><td colspan="3">Total Classes: 39</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Implement and study the characteristics of Diodes and Transistors.
II. Illustrate the concept of rectification using half wave and full wave rectifiers.
III. Design and Construct different amplifier circuits.

### LIST OF EXPERIMENTS

**WEEK-1 ELECTRONIC WORKSHOP PRACTICE**

Identification, specifications, testing of R, L, C components (Color Codes), potentiometers, switches (SPDT, DPDT and DIP), coils, gang condensers, relays, bread boards, PCBs, identification, specifications and testing of active devices, diodes, BJTs, low power JFETs, MOSFETs, power transistors, LEDs, LCDs, optoelectronic devices, SCR, UJT,DIACs.

**WEEK-2 ELECTRONIC WORKSHOP PRACTICE**

Study and operation of
a. Multimeters (Analog and Digital)
b. Function Generator
c. Regulated Power Supplies
d. Study and Operation of CRO

**WEEK-3 PN DIODE CHARACTERISTICS**

Verification of V-I characteristics of PN diode and calculate static and dynamic resistance using hardware and digital simulation.

**WEEK-4 ZENER DIODE CHARACTERISTICS AND VOLTAGE REGULATOR**

Verification of V-I characteristics of Zener diode and perform Zener diode as a Voltage regulator using hardware and digital simulation.

**WEEK-5 HALF WAVE RECTIFIER**

Verification of half wave rectifier without and with filters using hardware and digital simulation.

**WEEK-6 FULL WAVE RECTIFIER**

Verification of Full Wave Rectifier without and with filters using hardware and digital simulation.

**WEEK-7 TRANSISTOR CB CHARACTERISTICS**

Verification of Input and Output characteristics of CB configuration using hardware and digital simulation.

| | |
|---|---|
| **WEEK-8** | **TRANSISTOR CE CHARACTERISTICS** |
| Verification of Input and Output Characteristics of CE configuration using hardware and digital simulation. | |
| **WEEK-9** | **FREQUENCY RESPONSE OF CE AMPLIFIER** |
| Determine the Gain and Bandwidth of CE amplifier using hardware and digital simulation. | |
| **WEEK-10** | **FREQUENCY RESPONSE OF CC AMPLIFIER** |
| Determine the Gain and Bandwidth of CC amplifier using hardware and digital simulation. | |
| **WEEK-11** | **UJT CHARACTERISTICS** |
| Verification of V-I Characteristics of UJT using hardware and digital simulation. | |
| **WEEK-12** | **SCR CHARACTERISTICS** |
| Verification of V-I Characteristics of SCR using hardware and digital simulation. | |
| **WEEK-13** | **FET CHARACTERISTICS** |
| Verification of V-I Characteristics of FET using digital simulation. | |
| **WEEK-14** | **FREQUENCY RESPONSE OF CS AMPLIFIER** |
| Determine the Gain and Bandwidth of CS amplifier using digital simulation. | |
| **WEEK-15** | **FREQUENCY RESPONSE OF CD AMPLIFIER** |
| Determine the Gain and Bandwidth of CS amplifier using digital simulation. | |

**Reference Books:**


1. J. Millman, C.C.Halkias, "Millman's Integrated Electronics",Tata McGraw Hill, 2nd Edition, 2001.
2. J. Millman, C.C.Halkias and Satyabrata Jit, "Millman's Electronic Devices and Circuits", Tata McGraw Hill, 2nd Edition, 1998.
3. Mohammad Rashid, "Electronic Devices and Circuits", Cengage learning, 1st Edition, 2014.
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2009.


**Web References:**

1.https://archive.org/details/ElectronicDevicesCircuits
2.http://www.tedpavlic.com/teaching/osu/ece327/

**Course Home Page:**

## LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS

| S. No | Name of the Equipment | Range |
|---|---|---|
| 1 | Regulated Power Supply | 0-30V DC |
| 2 | Cathode Ray Oscilloscope | 0-20 MHz |
| 3 | Digital voltmeter | 0-1V, 0-20 V |
| 4 | Digital ammeter | 0-200 mA, 0-200 μA |
| 5 | Resistors | 1KΩ, 100KΩ, 470 Ω, 150 Ω,10KΩ, 47K Ω,1MΩ, 2.2k Ω, 220KΩ |
| 6 | Capacitors | 0.01μF, 0.01μF, 100 μF(Electrolytic) , 10μF (Electrolytic) |
| 7 | Diodes | 1N4007, 4V7, 6V2. |
| 8 | Transistors | BC107, 2N2646, C106MG /XL084. |
| 9 | Semiconductor Trainer Kit | -- |
| 10 | Connecting Wires and Patch cords | -- |
| 11 | Decade resistance box | 10 Ω -100k Ω |
| 12 | Decade Capacitance box | 10μF-100 μF |
| 13 | Function Generator | 10Hz-1M Hz |
| 14 | Digital Multimeters | 0-20V/ 0-200mA/10 Ω -10k Ω |
| 15 | Bread Board | -- |

# ELECTRICAL TECHNOLOGY LABORATORY

| III Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEE114 | Foundation | L | T | P | C | CIA | SEE | Total |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 42 | | | | Total Classes: 42 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Apply different techniques used in electric circuit analysis to calculate two port network parameters.
II. Conduct various tests on DC shunt machines to calculate the efficiency and to control speed.
III. Determine the performance characteristics, voltage regulation and efficiency of single phase transformer by conducting various tests.

## LIST OF EXPERIMENTS

| Week | Experiment |
|---|---|
| **Week - 1** | **RC AND RL NETWORKS** |
| Time response of first order RC and RL networks. | |
| **Week - 2** | **Z AND Y NETWORKS** |
| Determination of impedance (Z) and admittance (Y) parameters of two port network. | |
| **Week - 3** | **ABCD AND HYBRID PARAMETERS** |
| Determination of transmission and hybrid parameters of two port network. | |
| **Week - 4** | **OPEN CIRCUIT CHARACTERISTICS OF DC SHUNT GENERATOR** |
| Plot the Magnetization characteristics of a DC shunt generator. | |
| **Week - 5** | **LOAD TEST ON DC SHUNT GENERATOR** |
| Determination of efficiency by conducting load test on DC shunt generator. | |
| **Week - 6** | **NO LOAD TEST ON DC SHUNT MACHINE (SWINBURNE'S TEST)** |
| Predetermination of efficiency of a DC shunt machine. | |
| **Week - 7** | **BRAKE TEST ON DC SHUNT MOTOR** |
| Study the performance characteristics of DC shunt motor on load. | |
| **Week - 8** | **SPEED CONTROL OF DC SHUNT MOTOR** |
| Study the speed characteristics of a DC shunt motor. | |

| Week - 9 | OC AND SC TEST ON SINGLE PHASE TRANSFORMER |
|---|---|
| Determination of equivalent circuit parameters and plot the performance characteristics of a single phase transformer. | |
| **Week - 10** | **LOAD TEST ON SINGLE PHASE TRANSFORMER** |
| Plot the efficiency of single phase transformer for various loads. | |
| **Week - 11** | **TRANSIENT RESPONSE OF RLC CIRCUIT** |
| Study and plot the transient response of series and parallel RLC circuit using digital simulation. | |
| **Week - 12** | **HIGH PASS AND LOW PASS FILTERS** |
| Analysis of low pass and high pass filters using digital simulation. | |
| **Week - 13** | **MAGNETIZATION CHARACTERISTICS OF DC SHUNT GENERATOR** |
| Open circuit characteristics of DC shunt generator using SIMSCAPE power systems. | |
| **Week - 14** | **DIRECT TEST ON DC SHUNT GENERATOR** |
| Load test on DC shunt generator using SIMSCAPE power systems. | |

**Reference Books:**


1. V K Mehta, "Principles of Electrical Engineering", S Chand Publications, Re print, 2005.
2. I J Nagarath, D P Kothari, "Theory and Problems of basic electrical engineering", PHI Publications, 1st Edition, 2013.
3. N C Jagan and C Lakhminaraya, "Network Analysis", BS Publications 2nd Edition, 2011.
4. Sudhakar and Shyam Mohan, "Electrical Circuits", McGraw Hill Publication, 3rd Edition, 2015


**Web References:**

1. https://www.ee.iitkgp.ac.in
2. https://www.citchennai.edu.in
3. https://www.iare.ac.in

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS**

**HARDWARE:** Desktop Computer Systems (04 nos)

**SOFTWARE:** Application Software: MATLAB

## LIST OF EQUIPMENTS REQUIRED FOR A BATCH OF 36 STUDENTS

| S. No | Name of the Equipment | Range |
|---|---|---|
| 1 | Regulated Power Supply | 0-30V |
| 2 | Digital volt meter | 0-20V |
| 3 | Digital Ammeter | 0-200 mA |
| 4 | Resistive load | 4A |
| 5 | DC Shunt Motor coupled with DC Generator | 3KW |
| 6 | DC Shunt Motor | 5HP |
| 7 | Digital Multimeter | -- |
| 8 | Tachometers | (0-9999 RPM) |
| 9 | 1-ϕ Variac | 0-230/270V, 8A |
| 10 | 1-ϕ Transformers | 3KVA |
| 11 | Ammeter | 0-2MC |
| 12 | Ammeter | 0-10/20A MC |
| 13 | Voltmeter | 0-150/300V MC |
| 14 | Ammeter | 0-2.5/5A MI |
| 15 | Ammeter | 0-10/20A MI |
| 16 | Voltmeter | 0-150/300V MI |
| 17 | Voltmeter | 0-300/600V MI |
| 18 | Wattmeter | 5/10A, 75/150/300V LPF |
| 19 | Wattmeter | 10/20A, 150/300/600V UPF |
| 20 | Rheostat | 300 Ohms / 2A |
| 21 | Rheostat | 50 Ohms / 5A |
| 22 | Resistors | (47Ω, 82 Ω, 100 Ω, 150 Ω, 220 Ω, 470 Ω, 560 Ω, 1k Ω, 2.2k Ω, 3.3k Ω.5k Ω,10k Ω) |
| 23 | Inductors | 0.01mH, 0.1mH,10mH, 50mH |
| 24 | Capacitors | 0.01μF, 0.1μF, 0.47μF, 470μF, 33μF |
| 25 | Bread boards | -- |
| 26 | Probes / Connecting wires | -- |

# SIMULATION LABORATORY

| III Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AHS107 | Core | L | T | P | C | CIA | SEE | Total |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 39 | | | | Total Classes: 39 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the basics of MATLAB.
II. Simulate the generation of signals and operations on them.
III. Illustrate Gibbs phenomenon.
IV. Analyze the signals using Fourier, Laplace and Z transforms.

## LIST OF EXPERIMENTS

| WEEK-1 | BASIC OPERATIONS ON MATRICES |
|---|---|
| Review basic operations on matrices by using MATLAB | |
| **WEEK-2** | **GENERATIN OF VARIOUS SIGNALS AND SEQUENCE** |
| Generation of various signals and sequences such as unit impulse, sinc, Gaussian, exponential, saw tooth, triangular, sinusoidal by using MATLAB. | |
| **WEEK-3** | **OPERATION ON SIGNALS AND SEQUENCES** |
| Operation on signals and sequences such as addition, subtraction, multiplication, scaling, shifting, folding by using MATLAB. | |
| **WEEK-4** | **GIBBS PHENOMENON** |
| Verification of Gibbs phenomenon by using MATLAB | |
| **WEEK-5** | **FOURIER TRANSFORMS AND INVERSE FOURIER TRANSFORM** |
| Finding the Fourier Transform and inverse Fourier transform of a given signal/sequence and plotting its magnitude and phase spectrum by using MATLAB. | |
| **WEEK-6** | **PROPERTIES OF FOURIER TRANSFORMS** |
| Verifying Time shifting and scaling, time and differentiation properties of Fourier transforms by using MATLAB. | |
| **WEEK-7** | **LAPLACE TRANSFORMS** |
| Finding the Laplace transform of a given signal and locate its zeros and poles in s-plane. | |

| | |
|---|---|
| **WEEK-8** | **Z-TRANSFORMS** |
| Finding the z - transform of a given sequence and locate its zeros and poles in z-plane. | |
| **WEEK-9** | **CONVOLUTION BETWEEN SIGNALS AND SEQUENCES** |
| Finding convolution between two signals /sequences by using MATLAB. | |
| **WEEK-10** | **AUTO CORRELATION AND CROSS CORRELATION** |
| Finding auto correlation and cross correlation between signals and sequences by using MATLAB. | |
| **WEEK-11** | **GAUSS IAN NOISE** |
| Generation of Gaussian noise, computation of its mean, M.S. value and its Skew, kurtosis, and PSD, probability distribution function by using MATLAB. | |
| **WEEK-12** | **WIENER – KHINCHINE RELATIONS** |
| Verification of wiener – Khinchine relations using MATLAB. | |
| **WEEK-13** | **DISTRIBUTION AND DENSITY FUNCTIONS OF STANDARD RANDOM VARIABLES** |
| Finding distribution and density functions of standard random variables and plot them by using MATLAB | |
| **WEEK-14** | **WIDE SENSE STATIONARY RANDOM PROCESS** |
| Checking a random process for stationary in wide sense by using MATLAB. | |

**Reference Books:**


1. S. Varadarajan , M. M. Prasada Reddy , M. Jithendra Reddy , “Signals and systems introduces MATLAB programs”, I K International Publishing House Pvt. Ltd, 2016.
2. Scott L. Miller, Donald G. Childers, “Probability and Random Processes: With Applications to Signal Processing and communications”, Elsevier, 2004.
3. Krister Ahlersten, “An Introduction to Matlab”, BookBoon, 2012.
4. K. S. Suresh Kumar, “Electric Circuit Analysis”, Pearson Education, 1st Edition, 2013.


**Web References:**


1. http://in.mathworks.com/help/matlab
2. http://web.mit.edu/acmath/matlab/course16/16.62x/16.62x_Matlab.pdf
3. https://www.probabilitycourse.com/chapter12/Chapter_12.pdf
4. http://www.iare.ac.in


**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS**

**HARDWARE:** Desktop Computer Systems 36 nos

**SOFTWARE:** MATLAB

# ELECTRONIC CIRCUIT ANALYSIS

| **IV Semester:** ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC004 | **Core** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | 1 | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 15** | **Practical Classes: Nil** | | | | **Total Classes: 60** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Tackle the analysis and design of single stage and multistage amplifiers.
II. Demonstrate the ability to analyze the frequency response of different types of amplifiers.
III. Interpret the concept of feedback and classify various types of feedback amplifiers.
IV. Understand the principle of oscillation and design different types of oscillators.

| **UNIT-I** | **SINGLE STAGE AMPLIFIERS AND FREQUENCY RESPONSE** | **Classes: 10** |
|---|---|---|

Classification of amplifiers, overview of analysis of a transistor amplifier circuit using h-parameter, Millers theorem and its dual, design of Single stage RC coupled amplifier using bipolar junction transistor, low frequency response of bipolar junction transistor amplifier, analysis at low frequency, effect of coupling and bypass capacitor.

| **UNIT-II** | **HIGH FREQUENCY RESPONSE OF AMPLIFIER** | **Classes: 08** |
|---|---|---|

The hybrid-π common emitter transistor model, hybrid π conductance and capacitance, effect of coupling and bypass capacitors, common emitter short circuit current gain, current gain with resistive load, alpha, beta cut-off frequencies, gain bandwidth product ,emitter follower at high frequencies

| **UNIT-III** | **MULTI STAGE AMPLIFIERS AND TUNED AMPLIFIERS** | **Classes: 10** |
|---|---|---|

Multistage amplifier: Different coupling schemes used in amplifiers, RC coupled amplifiers, transformer coupled amplifiers and direct coupled amplifiers, analysis of cascaded RC coupled bipolar junction transistor amplifiers, cascode amplifiers, Darlington pair.

Tuned amplifiers**:** introduction, Q - factor, small signal tuned amplifier, effect of cascading single tuned amplifiers on bandwidth, stagger tuned amplifiers, stability of tuned amplifiers.

| **UNIT-IV** | **FEEDBACK AMPLIFIERS AND OSCILLATORS** | **Classes: 09** |
|---|---|---|

Feedback amplifiers: Concept of feedback, classification of feedback amplifiers, general characteristics of negative feedback amplifiers, analysis of voltage series, voltage shunt, current series and current shunt feedback configurations, problems; Oscillators: Classification of oscillator, conditions for oscillations, RC phase shift oscillator, generalized analysis of LC oscillations, Hartley and Colpitts oscillators, Wien - bridge and crystal oscillators, stability of oscillators.

| UNIT-V | LARGE SIGNAL AMPLIFIERS | Classes: 08 |
|---|---|---|
| Classification, class A large signal amplifiers, transformer coupled class A audio power amplifiers, efficiency of class A amplifier, class B amplifier, efficiency of class B amplifier, class B push-pull amplifier, complementary symmetry class B push-pull amplifier, distortion in power amplifiers, thermal stability and heat sinks | | |

**Text Books:**

1. Jacob Millman, Christor C Halkias, "Integrated Electronics", Tata McGraw Hill, 1st Edition, 2008.
2. Sedra A.S., K.C. Smith, "Micro Electronic Circuits", Oxford University Press, 6th Edition, 2013.
3. Donald A Neamen, " Electronic Circuits Analysis and Design" , Tata McGraw Hill , 3rd Edition, 2007.

**Reference Books:**

1. David A. Bell "Electronic Devices & Circuits" 5th Edition,. Oxford university press, 7th Edition, 2009.
2. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson education, 9th Edition, 2008.
3. S.Salivahana, N. Suresh kumar, "Electronic circuit analysis", McGraw-Hill Education, 1st Edition, 2011.
4. K. Lal Kishore, "Electronic Circuit Analysis", BS Publications,1st Edition, 2004.

**Web References:**

1. http://www.igniteengineers.com
2. http://www.ocw.nthu.edu.tw
3. http://www.uotechnology.edu.iq
4. http://www.iare.ac.in

**E-Text Books:**

1. https://www.jntubook.com/electronic-circuit-analysis-textbook
2. http://tradownload.com/results/neamen-electronic-circuit-analysis-and-design-.html
3. http://www.allaboutcircuits.com
4. http://www.te.kmutnb.ac.th/~msn/225301reports156-2.pdf

**Course Home Page:**

# ANALOG COMMUNICATIONS

<table>
<tr><td colspan="11">IV Semester: ECE</td></tr>
<tr><th rowspan="1">Course Code</th><th>Category</th><th colspan="3">Hours / Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">AEC005</td><td rowspan="2">Core</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: 15</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 60</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Develop skills for analyzing different types of signals in terms of their properties such as energy, power, correlation and apply for analysis of linear time invariant systems.

II. Analyze various techniques of generation and detection of amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) signals.

III. Differentiate the performance of AM, FM and PM systems in terms of Power, Bandwidth and SNR (Signal-to-Noise Ratio).

IV. Evaluate Analog Communication system in terms of the complexity of the transmitters and receivers.

| UNIT-I | SIGNAL ANALYSIS AND LTI SYSTEMS | Classes: 10 |
|---|---|---|

Classification of signals and study of Fourier transforms for standard signals, definition of signal bandwidth; Systems: Definition of system, classification of systems based on properties, linear time invariant system , impulse, step, sinusoidal response of a linear time invariant system, transfer function of a linear time invariant system, distortion less transmission through a linear time invariant system; system bandwidth; Convolution and correlation of signals: Concept of convolution, graphical representation of convolution, properties of convolution; Cross correlation ,auto correlation functions and their properties, comparison between correlation and convolution.

| UNIT-II | AMPLITUDE AND DOUBLE SIDE BAND SUPPRESSED CARRIER MODULATION | Classes: 10 |
|---|---|---|

Introduction to communication system, need for modulation, frequency division multiplexing; Amplitude modulation, definition; Time domain and frequency domain description, single tone modulation, power relations in amplitude modulation waves; Generation of amplitude modulation wave using ,square law and switching modulators; Detection of amplitude modulation waves using square law and envelope detectors; Double side band modulation: Double side band suppressed carrier time domain and frequency domain description; Generation of double side band suppressed carrier waves using balanced and ring modulators; Coherent detection of double side band suppressed carrier modulated waves; Costas loop; Noise in amplitude modulation, noise in double side band suppressed carrier.

| UNIT-III | SINGLE SIDE BAND AND VESTIGIAL SIDE BAND MODULATION | Classes: 08 |
|---|---|---|

Frequency domain description, frequency discrimination method for generation of amplitude modulation single side band modulated wave; time domain description; Phase discrimination method for generating amplitude modulation single side band modulated waves; Demodulation of single side band waves.

Noise in single side band suppressed carrier; Vestigial side band modulation: Frequency description, generation of vestigial side band modulated wave; Time domain description; Envelope detection of a vestigial side band modulation wave pulse carrier; Comparison of amplitude modulation techniques; applications of different amplitude modulation systems.

| UNIT-IV | ANGLE MODULATION | Classes: 09 |
|---|---|---|

Basic concepts, frequency modulation: Single tone frequency modulation, spectrum analysis of sinusoidal frequency modulation wave, narrow band frequency modulation, wide band frequency modulation, transmission bandwidth of frequency modulation wave, phase modulation, comparison of frequency modulation and phase modulation; Generation of frequency modulation waves, direct frequency modulation and indirect frequency modulation, detection of frequency modulation waves: Balanced frequency discriminator, Foster Seeley discriminator, ratio detector, zero crossing detector, phase locked loop, comparison of frequency modulation and amplitude modulation; Noise in angle modulation system, threshold effect in angle modulation system, pre-emphasis and de-emphasis.

| UNIT-V | RECEIVERS AND SAMPLING THEORM | Classes: 08 |
|---|---|---|

Receivers: Introduction, tuned radio frequency receiver, super heterodyne receiver, radio frequency amplifier, mixer, local oscillator, intermediate frequency amplifier, automatic gain control; Receiver characteristics: Sensitivity, selectivity, image frequency rejection ratio, choice of intermediate frequency, fidelity; Frequency modulation receiver, amplitude limiting, automatic frequency control, comparison with amplitude modulation receiver; Sampling: Sampling theorem, graphical and analytical proof for band limited signals, types of sampling, reconstruction of signal from its samples.

**Text Books:**


1. B.P. Lathi, “Signals, Systems and Communications”, BS Publications, 5th Edition, 2009.
2. S. S. Haykin, “Communication Systems”, Wiley Eastern, 2nd Edition, 2006.
3. Taub, Schilling, “Principles of Communication Systems”, Tata McGraw-Hill, 4th Edition, 2013.


**Reference Books:**


1. B.P. Lathi, “Communication Systems”, BS Publication, 2nd Edition, 2006.
2. John G. Proakis, Masond, Salehi, “Fundamentals of Communication Systems”, PEA, 1st Edition, 2006.
3. George Kennedy,Bernard Davis, “Electronics and Communication System”, Tata McGraw Hill , 5th Edition, 2011.
4. B.P. Lathi, Zhi Ding, “Modern analog and digital Communication Systems”, Oxford Publication, 4th Edition, 2011.


**Web References:**

1. http://www.web.eecs.utk.edu
2. https://everythingvtu.wordpress.com
3. http://nptel.ac.in/
4. http://www.iare.ac.in

**E-Text Books:**

1. http://www.bookboon.com/
2. http://www.jntubook.com
3. http://www.smartzworld.com
4. http://www.archive.org

**Course Home Page:**

# CONTROL SYSTEMS

**IV Semester: ECE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AEE009 | Core | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes:15 | | Practical Classes: Nil | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Organize modeling and analysis of electrical and mechanical systems.
II. Evaluate systems by applying block diagrams, signal flow graphs to study the time response.
III. Demonstrate the analytical and graphical techniques to study the stability to design the control system.
IV. Illustrate the frequency domain and state space analysis.

| UNIT-I | INTRODUCTION AND MODELING OF PHYSICAL SYSTEMS | Classes: 08 |
|---|---|---|

Control systems: Introduction, open loop and closed loop systems, examples, comparison, mathematical models and differential equations of physical systems, concept of transfer function, translational and rotational mechanical systems, electrical systems, force voltage and force current analogy.

| UNIT - II | BLOCK DIAGRAM REDUCTION AND TIME RESPONSE ANALYSIS | Classes: 10 |
|---|---|---|

Block Diagrams: Block diagram representation of various systems, block diagram algebra, characteristics of feedback systems, servomotors, signal flow graph, Mason's gain formula; Time response analysis: Standard test signals, shifted unit step, ramp and impulse signals, shifting theorem, convolution integral, impulse response, unit step response of first and second order system, time response specifications, steady state errors and error constants.

| UNIT - III | STABILITY ANALYSIS AND CONTROLLERS | Classes: 09 |
|---|---|---|

Concept of stability: Necessary and sufficient conditions for stability, Routh's and Routh Hurwitz stability criterions.

Root locus technique: Introduction, root locus concept, construction of root loci, graphical determination of 'k' for specified damping ratio, relative stability, effect of adding zeros and poles on stability. Controllers: Proportional, derivative and proportional derivative, proportional integral and PID controllers.

| UNIT - IV | FREQUENCY DOMAIN ANALYSIS | Classes: 10 |
|---|---|---|

Frequency domain analysis: Introduction, frequency domain specifications, stability analysis from Bode plot, polar plot, Nyquist plot, calculation of gain margin and phase margin, determination of transfer function, correlation between time and frequency response.

| UNIT - V | STATE SPACE ANALYSIS AND COMPENSATORS | Classes: 08 |
|---|---|---|

State Space Analysis**:** Concept of state, state variables and state model, derivation of state models from block diagrams, diagonalization, solving the time invariant state equations, state transition matrix and properties, concept of controllability and observability; Compensators: Lag, lead, lag lead networks.

**Text Books:**

1. I. J. Nagrath, M. Gopal, “Control Systems Engineering”, New Age International Publications, 3rd Edition, 2007.
2. K. Ogata, “Modern Control Engineering”, Prentice Hall, 4th Edition, 2003.
3. N. C. Jagan, “Control Systems”, BS Publications, 1st Edition, 2007.

**Reference Books:**

1. A. Anand Kumar, “Control Systems”, PHI Learning, 1st Edition, 2007.
2. S Palani, “Control Systems Engineering”, Tata McGraw Hill Publications, 1st Edition, 2001.
3. N. K. Sinha, “Control Systems”, New Age International Publishers, 1st Edition, 2002.

**Web References:**

1. https://www.researchgate.net
2. https:// www.aar.faculty.asu.edu/classes
3. https://www.facstaff.bucknell.edu/
4. https://www.electrical4u.com
5. https://www.iare.ac.in

**E-Text Books:**

1. https://www.jntubook.com/
2. https://www.freeengineeringbooks.com

**Course Home Page:**

# PULSE AND DIGITAL CIRCUITS

| IV Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC006 | Foundation | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Be proficient in the use of linear and nonlinear wave shaping circuits for sinusoidal, pulse and ramp inputs
II. Construct various multivibrators using transistors, and design sweep circuits and sampling gates.
III. Evaluate the methods to achieve frequency synchronization and division using the uni-junction transistors, multivibrators and symmetric circuits.
IV. Realize logic gates using diodes and transistors and distinguish between various logic families.

| UNIT-I | WAVE SHAPING CIRCUITS | Classes: 10 |
|---|---|---|

Linear wave shaping circuits: High pass RC and low pass RC circuits, response to impulse and pulse inputs with different time constants, high pass RC circuit as a differentiator, low pass RC circuit as an integrator, switching characteristics of diode; Non-linear wave shaping circuits: Clipping circuits, diode clippers, shunt clippers, series clippers, clipping at two independent levels; Clamping circuits: Clamping theorem.

| UNIT-II | MULTIVIBRATORS | Classes: 10 |
|---|---|---|

Multivibrators: Introduction, classification; Bistable multivibrator: Fixed bias, self bias, unsymmetrical triggering, symmetrical triggering; Schmitt trigger: Upper trigger point, lower trigger point, hysteresis, applications of schmitt trigger; Monostable multivibrator: Collector coupled, triggering of monostable multivibrator; Astable multivibrator: Collector coupled, voltage to frequency converter.

| UNIT-III | SAMPLING GATES AND TIME BASE GENERATORS | Classes: 08 |
|---|---|---|

Sampling gates: basic operating principle of sampling gate, uni and bi directional sampling gates.

Time base generators: General features of a time base signal; Methods of generating a time base waveform: Exponential sweep circuits, sweep circuit using uni junction transistor, Miller sweep circuit and Bootstrap sweep circuit.

| UNIT-IV | SYNCHRONIZATION AND FREQUENCY DIVISION | Classes: 09 |
|---|---|---|

Synchronization and frequency division: Pulse synchronization of relaxation devices, frequency division with sweep circuits, other astable relaxation circuits, synchronization of astable multivibrator, monostable relaxation circuits as dividers, stability of relaxation dividers; Synchronization of a sweep circuit with symmetrical signals: Sinusoidal synchronization signals and sine wave frequency division with a sweep circuit.

| UNIT-V | DIGITAL LOGIC FAMILIES | Classes: 08 |
|---|---|---|

Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families, tristate logic; Interfacing of CMOS and TTL families.

**Text Books:**


1. Millman J., Taub, "Pulse, Digital and Switching Waveforms", Tata McGraw-Hill, 2nd Edition, 2007.
2. David A. Bell, "Solid State Pulse circuits", PHI learning, 4th Edition, 2002.
3. David J.Comer, "Digital Logic State Machine Design", Oxford University Press, 3rd Edition, 2008.


**Reference Books:**


1. Ronald J. Tocci, "Fundamentals of Pulse and Digital Circuits", PHI learning, 3rd Edition, 2008.
2. A. Anand Kumar, "Pulse and Digital Circuits", PHI learning, 2nd Edition, 2005.


**Web References:**


1. www.nptel.ac.in
2. notes.specworld.in/pdc-pulse-and-digital-circuits
3. surkur.blogspot.in/p/pdc.html
4. https://books.google.co.in/books?isbn=8131721353


**E-Text Books:**


1. http:// www.introni.it/pdf/Millman-Taub- Pulse and Digital Switching Waveforms 1965.pdf
2. https://www.jntubook.com/pulse-digital-circuits-textbook-free-download/


**Course Home Page:**

# ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

<table>
<tr><td colspan="10">IV Semester: ECE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">AEC007</td><td rowspan="2">Foundation</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: 15</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 60</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Familiarize about 3D vector co-ordinate systems and electromagnetic field concepts.
II. Have skills in selecting appropriate Maxwell's equations in electromagnetic theory for a given application and analyze the problem.
III. Investigate the propagation characteristics of electromagnetic waves at boundary of different media.
IV. Demonstrate the ability to compute various parameters for transmission lines using smith chart and classical theory.

| **UNIT-I** | **ELECTROSTATICS** | **Classes: 10** |
|---|---|---|

Electrostatics**:** Coulomb's law, electric field intensity, fields due to different charge distributions; Electric flux density, Gauss law and its applications; Scalar electric potential; Energy density, illustrative problems; Conductors and dielectrics-characterization; Convection and conduction currents; Dielectric constant, isotropic and homogeneous dielectrics; Continuity equation and relaxation time, conductivity, power absorbed in conductor, Poisson's and Laplace's equations; Capacitance: Parallel plate, co axial, spherical capacitors; Method of images; Illustrative problems.

| **UNIT-II** | **MAGNETOSTATICS** | **Classes: 10** |
|---|---|---|

Magnetostatics: Biot-savart law; Ampere's circuital law and applications; Magnetic flux density; Magnetic scalar and vector potentials; Forces due to magnetic fields; Ampere's force law; Boundary conditions: Dielectric- dielectric, dielectric conductor interfaces; Inductances and magnetic energy; Illustrative problems; Maxwell's equations (Time varying fields**):** Faraday's law; Inconsistency of ampere's law for time varying fields and definition for displacement current density; Maxwell's equations in differential form, integral form and word Statements.

| **UNIT-III** | **UNIFORM PLANE WAVES** | **Classes: 08** |
|---|---|---|

Uniform plane waves: Wave equations for conducting and perfect dielectric media; Relation between E and H; Wave propagation in lossless and conducting media;; Loss tangent, Intrinsic impedance; Skin depth; Polarization; Illustrative problems.

Reflection/refraction of plane waves: Reflection and refraction at normal incidence, reflection and refraction at oblique incidence; Standing waves; Brewster angle, critical angle, total internal reflection, surface impedance; Poynting vector and poynting theorem-applications; Power loss in plane conductor; Illustrative problems.

| **UNIT-IV** | **TRANSMISSION LINE CHARACTERISTICS** | **Classes: 09** |
|---|---|---|

Transmission line characteristics: Types; Transmission line parameters; Transmission line equations; Characteristic impedance, propagation constant; Phase and group velocities; Infinite line concepts, Loss less /low loss transmission line characterization; condition for distortion less and minimum attenuation in transmission lines; Loading: Types of loading; Illustrative problems.

| UNIT-V | UHF TRANSMISSION LINES AND APPLICATIONS | Classes: 08 |
|---|---|---|
| UHF transmission lines and applications: Input impedance relations; SC and OC lines; Reflection coefficient, VSWR; UHF lines as circuit elements, λ/4, λ/2 and λ/8 lines, impedance transformations, significance of $Z_{min}$ and $Z_{max}$; Smith chart: Configuration and applications; Single and double stub matching; Illustrative problems. | | |

**Text Books:**

1. Matthew N.O. Sadiku, "Elements of Electromagnetic", Oxford University Press, 4th Edition, 2009.
2. E.C. Jordan, K.G. Balmain, "Electromagnetic waves and Radiating Systems", PHI learning, 2nd Edition, 2000.
3. Umesh Sinha, Satya Prakashan, "Transmission lines and Networks", Tech India Publications, 1st Edition, 2010.

**Reference Books:**

1. Nathan Ida, "Engineering Electromagnetic", Springer (India) Pvt. Ltd, 2nd Edition, 2005
2. William H. Hayt Jr., John A. Buck, "Engineering electromagnetic", Tata McGraw Hill, 7th Edition, 2006.
3. G. Sashibushana Rao, "Electromagnetic Field theory and Transmission Lines, Wiley India, 2013.
4. John D. Ryder, "Networks, Lines and Fields", PHI learning, 2nd Edition, 1999.

**Web References:**

1. http:// web.stanford.edu/class
2. http://www.electronicagroup.com
3. http://www.cpri.in/about-us/departmentsunits/library-and-information-centre/digital-library-links.html
4. http://nptel.ac.in/courses/antennas
5. http://www.tutorialspoint.com/discrete_mathematics

**E-Text Books:**

1. http://www.bookboon.com/en/concepts-in-electrostatics-ebook
2. http://www.www.jntubook.com
3. http://www.allaboutcircuits.com
4. http://www.archive.org

**Course Home Page:**

# ELECTRONIC CIRCUIT AND PULSE CIRCUITS LABORATORY

| IV Semester: ECE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours /Week | | | Credits | Maximum Marks | | | |
| AEC102 | Core | L | T | P | C | CIA | SEE | Total | |
| | | - | - | 3 | 2 | 30 | 70 | 100 | |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 36 | | | | Total Classes: 36 | | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Simulate and analyze single stage and multi stage amplifiers and oscillators.
II. Demonstrate the principles of feedback amplifiers and oscillators through simulation.
III. Implementation of circuits for linear and non linear wave shaping.
IV. Analyze the characteristics of different multivibrators.

## LIST OF EXPERIMENTS

### WEEK-1 BASIC AMPLIFIERS/ LINEAR WAVESHAPING

a. Simulate frequency response of common emitter amplifier and common base amplifier.
b. Design RC low pass and high pass circuit for different time constants.

### WEEK -2 BASIC AMPLIFIERS/ LINEAR WAVESHAPING

a. Design RC low pass and high pass circuit for different time constants
b. Simulate frequency response of common emitter amplifier and common base amplifier.

### WEEK -3 TWO STAGE RC COUPLED AMPLIFIER/ NON-LINEAR WAVESHAPING

a. Simulate frequency response of two stage RC coupled amplifier.
b. Design transfer characteristics of clippers and clampers

### WEEK - 4 TWO STAGE RC COUPLED AMPLIFIER/ NON-LINEAR WAVESHAPING

a. Design transfer characteristics of clippers and clampers.
b. Simulate frequency response of two stage RC coupled amplifier.

### WEEK -5 SINGLE TUNED AMPLIFIERS/ TRANSISTOR AS A SWITCH

a. Simulate a single tuned amplifier.
b. Design of transistor as a switch.

### WEEK-6 SINGLE TUNED AMPLIFIERS/ TRANSISTOR AS A SWITCH

a. Design of transistor as a switch.
b. Simulate a single tuned amplifier.

### WEEK -7 FEEDBACK AMPLIFIERS/ COMPARATOR

a. Simulate voltage series feedback amplifier and current shunt feedback amplifier.
b. Design of comparator circuit.

| WEEK -8 | FEEDBACK AMPLIFIERS/ COMPARATOR |
|---|---|
| a. Design of comparator circuit.<br>b. Simulate voltage series feedback amplifier and current shunt feedback amplifier | |
| **WEEK -9** | **RC PHASE SHIFT OSCILLATOR USING TRANSISTOR/ MULTIVIBRATORS** |
| a. Simulate sine wave generated for a particular frequency by an RC phase shift oscillator.<br>b. Design different types of multivibrators and plot its waveforms. | |
| **WEEK 10** | **RC PHASE SHIFT OSCILLATOR USING TRANSISTOR/ MULTIVIBRATORS** |
| a. Design different types of multivibrators and plot its waveforms.<br>b. Simulate sine wave generated for a particular frequency by an RC phase shift oscillator. | |
| **WEEK 11** | **OSCILLATORS/ SCHMIT TRIGGER** |
| a. Simulate sine wave generated for a particular frequency by Colpitts and Hartley oscillator.<br>b. Design a Schmitt trigger circuit. | |
| **WEEK12** | **OSCILLATORS/ SCHMIT TRIGGER** |
| a. Design a Schmitt trigger circuit.<br>b. Simulate sine wave generated for a particular frequency by Colpitts and Hartley oscillator. | |
| **WEEK13** | **POWER AMPLIFIERS/ UJT AS A RELAXATION OSCILLATOR** |
| a. Simulate class A power amplifier (transformer less) and class B power amplifier.<br>b. Design of UJT as a relaxation oscillator. | |
| **WEEK14** | **POWER AMPLIFIERS/ UJT AS A RELAXATION OSCILLATOR** |
| a. Design of UJT as a relaxation oscillator.<br>b. Simulate class A power amplifier (transformer less) and class B power amplifier. | |

**Reference Books:**


1. Jacob Millman, Herbert Taub , Mothiki S. PrakashRao, "Pulse Digital and Switching Waveforms", Tata McGraw-Hill, 3rd Edition, 2008.
2. David A. Bell, "Solid State Pulse Circuits", PHI, 4th Edition, 2002.
3. J. Millman, C. C. Halkias, "Integrated Electronics", Tata McGraw-Hill. 1st Edition, 2008.
4. B. P. Singh, Rekha Singh, "Electronic Devices and Circuits", Pearson, 1st Edition, 2006.
5. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw-Hill, 1st Edition, 2002.


**Web References:**

1. http://www.tedpavlic.com/teaching/osu/ece327/

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS**

**HARDWARE**: Desktop Computer Systems 18 nos

**SOFTWARE** : NI Multisim

## LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS

| S. No | Name of the Equipment | Range |
|---|---|---|
| 1 | Dual Dc Regulated Power Supply | 0-30V DC |
| 2 | Cathode Ray Oscilloscope | 0-20 MHz |
| 3 | Function Generator | 0-10 MHz |
| 4 | Semiconductor Kits | 0-15 V |
| 5 | Resistors | 100Ω,150 Ω,820 Ω,1k Ω,1.5k Ω 2.2k Ω,10k Ω,22k Ω,47k Ω |
| 6 | Capacitors | 0.1μF,0.001μF,0.022μF,0.0022μF 0.0033μF,100pF,1000μF,22μF |
| 7 | Diode | 1N4007,4148 |
| 8 | UJT | 2N2646 |
| 9 | Transistors | BC107,2N2222 |
| 10 | Inductors | 1mH,5mH |
| 12 | Probes/ Connecting wires | -- |

# DIGITAL SYSTEM DESIGN LABORATORY

| IV Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC103 | Core | L | T | P | C | CIA | SEE | Total |
| | | - | 2 | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: 24 | Practical Classes: 45 | | | | Total Classes: 69 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Design of combinational circuits using Verilog Hardware Description Language.
II. Implementation of Sequential circuits using Verilog Hardware Description Language.
III. Demonstration of different case studies for Verilog HDL implementation.

## LIST OF EXPERIMENTS

### WEEK - l REALIZATION OF A BOOLEAN FUNCTION

Design and simulate the HDL code to realize three and three variable Boolean functions

### WEEK-2 DESIGN OF DECODER AND ENCODER

Design and simulate the HDL code for the following combinational circuits

a. 3 to 8 Decoder
b. 8 to 3 Encoder (With priority and without priority)

### WEEK-3 DESIGN OF MULTIPLEXER AND DEMULTIPLEXER

Design and simulate the HDL code for the following combinational circuits

a. Multiplexer
b. De-multiplexer

### WEEK -4 DESIGN OF CODE CONVERTERS

Design and simulate the HDL code for the following combinational circuits

a. 4 - Bit binary to gray code converter
b. 4 - Bit gray to binary code converter
c. Comparator

### WEEK -5 FULL ADDER AND FULL SUBTRACTOR DESIGN MODELING

Write a HDL code to describe the functions of a full Adder and full subtractor using three modeling styles

### WEEK -6 DESIGN OF 8-BIT ALU

Design a model to implement 8-bit ALU functionality

### WEEK -7 HDL MODEL FOR FLIP FLOPS

Write HDL codes for the flip-flops - SR, D, JK, T

| WEEK -8 | DESIGN OF COUNTERS |
|---|---|
| Write a HDL code for the following counters<br>a. Binary counter<br>b. BCD counter (Synchronous reset and asynchronous reset) | |
| **WEEK-9** | **HDL CODE FOR UNIVERSAL SHIFT REGISTER** |
| Design and simulate the HDL code for universal shift register | |
| **WEEK-10** | **HDL CODE FOR CARRY LOOK AHEAD ADDER** |
| Design and simulate the HDL code for carry look ahead adder | |
| **WEEK-11** | **HDL CODE TO DETECT A SEQUENCE** |
| Write a HDL code to detect the sequence 1010101 and simulate the code | |
| **WEEK-12** | **CHESS CLOCK CONTROLLER FSM USING HDL** |
| Design a chess clock controller FSM using HDL and simulate the code | |
| **WEEK-13** | **TRAFFIC LIGHT CONTROLLER USING HDL** |
| Design a traffic light controller using HDL and simulate the code | |
| **WEEK-14** | **ELEVATOR DESIGN USING HDL CODE** |
| Write HDL code to simulate Elevator operations and simulate the code | |

**Reference Books:**


1. Samir Palnitkar , "Verilog HDL: A Guide to Digital Design and Synthesis," Sun Microsystems Press, 2nd Edition, 2003.
2. T.R. Padmanabhan, B. Bala Tripura Sundari, "Design Through Verilog HDL," New Jersey, Wiley-IEEE Press, 2009. ISBN: 978-0-471-44148-9
3. Zainalabedin Navabi, "Verilog Digital System Design," TMH, 2nd Edition, 2008. ISBN-13: 978-0070252219
4. Peter Minns, Ian Elliott, "FSM-based Digital Design using Verilog HDL", John Wiley & Sons Ltd, 2008. ISBN: 978-0-470-06070-4


**Web References:**

1. https://inst.eecs.berkeley.edu/~cs150/fa06/Labs/verilog-ieee.pdf
2. http://www.asic-world.com/ www.sxecw.edu.in

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:**

**HARDWARE:** Desktop Computer Systems 36 nos

**SOFTWARE:** Xilinx 13.1

# ANALOG COMMUNICATIONS LABORATORY

| IV Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC104 | Core | L | T | P | C | CIA | SEE | Total |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 36 | | | | Total Classes: 36 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Implement various modulation techniques in communications.
II. Analyze various spectrums of analog modulation using spectrum analyzer.
III. Understand the importance of automatic gain control and Phase locked loop.
IV. Explore receiver characteristics.

## LIST OF EXPERIMENTS

| WEEK-l | LTI SYSTEM AND ITS RESPONSE |
|---|---|
| a) Verification of linearity, time invariance, stability properties of a given system<br>b) Computation of impulse, step, sinusoidal response of a given linear time invariant system using MATLAB | |
| **WEEK-2** | **AMPLITUDE MODULATION AND DEMODULATION** |
| Generation of amplitude modulation and demodulation using hardware and MATLAB | |
| **WEEK-3** | **BALANCED MODULATOR AND SYNCHRONOUS DETECTOR** |
| Generation of double side band suppressed carrier modulation and demodulation using hardware and MATLAB | |
| **WEEK-4** | **SINGLE SIDE BAND MODULATION AND DEMODULATION** |
| Generation of single side band suppressed carrier modulation and demodulation using hardware and MATLAB | |
| **WEEK-5** | **FREQUENCY MODULATION AND DEMODULATION** |
| Generation of frequency modulation and demodulation using hardware and MATLAB | |
| **WEEK-6** | **PRE-EMPHASIS AND DE-EMPHASIS** |
| Verification of pre-emphasis and de-emphasis to boost high frequency modulating signal using hardware and MATLAB | |
| **WEEK-7** | **FREQUENCY DIVISION MULTIPLEXING** |
| Verification of frequency division multiplexing using hardware and MATLAB | |

| | |
|---|---|
| **WEEK-8** | **TIME DIVISION MULTIPLEXING** |
| Verification of Time division multiplexing using hardware and MATLAB | |
| **WEEK-9** | **AUTOMATIC GAIN CONTROL CHARACTERISTICS** |
| Verification of automatic gain control characteristics using hardware and MATLAB | |
| **WEEK-l0** | **CHARACTERISTICS OF MIXER** |
| Verification of characteristics of mixer using hardware | |
| **WEEK-l1** | **PHASE LOCKED LOOP** |
| Verification of phase locked loop using hardware and MATLAB | |
| **WEEK-l2** | **GENERATION OF DOUBLE SIDE BAND SUPPRESSED USING RING MODULATION, OBSERVATION OF OUTPUT WAVEFORM** |
| Generation of double side band suppressed modulation using hardware | |
| **WEEK-l3** | **FREQUENCY SYNTHESIZER** |
| Frequency synthesizer using hardware | |

**Reference Books:**


1. B.P. Lathi, "Signals, Systems and Communications", BS Publications, 5th Edition, 2009.
2. S.S.Haykin, "Communication Systems", Wiley Eastern, 2nd Edition, 2006.
3. Taub, Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 4th edition, 2013.


**Web References:**

1. https://everythingvtu.wordpress.com
2. http://www.iare.ac.in
3. http://www.igniteengineers.com

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS**

**HARDWARE:** Desktop Computer Systems 18 nos

**SOFTWARE :** MATLAB

## LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS

| S. No | Name of the Equipment | Range |
|---|---|---|
| 1 | Cathode ray oscilloscope | 0-25 MHz |
| 2 | RF generator | 0-300 MHz |
| 3 | Function generator | 0-1 MHz |
| 4 | Function generator | 0-2 MHz |
| 5 | Amplitude modulation and demodulation kit | -- |
| 6 | Frequency modulation and demodulation kit | -- |
| 7 | Single side band & suppressed carrier kit | -- |
| 8 | Balanced modulator kit | -- |
| 9 | Double side band and suppressed carrier kit | -- |
| 10 | Pre-emphasis and de-emphasis kit | -- |
| 11 | Time division multiplexing and demultiplexing kit | -- |
| 12 | Frequency division multiplexing and demultiplexing kit | -- |
| 13 | Synchronous detector kit | -- |
| 14 | Characteristics of mixer kit | -- |
| 15 | Frequency Synthesizer kit | -- |
| 16 | Phase locked loop kit | -- |
| 17 | Automatic gain control kit | -- |
| 18 | Digital multimeter | 0-20V/ 0-200mA/10 Ω -10k Ω |
| 19 | Spectrum analyzer | 0-500 MHz |

# INTEGRATED CIRCUITS APPLICATIONS

| **V Semester: ECE** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC008 | **Core** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 15** | **Practical Classes: Nil** | | | | **Total Classes: 60** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Be acquainted to principles and characteristics of op-amp and apply the techniques for the design of comparators, instrumentation amplifier, integrator, differentiator, multivibrators, waveform generators, log and anti-log amplifiers

II. Analyze and design filters, timer, analog to digital and digital to analog Converters.

III. Understand the functionality and characteristics of commercially available digital integrated circuits

| **UNIT-I** | **INTEGRATED CIRCUITS** | **Classes: 08** |
|---|---|---|

Integrated Circuits: Classification of integrated circuits, Package types and temperature ranges; Differential Amplifier: DC and AC analysis of Dual input Balanced output Configuration; Properties of differential amplifier configuration: Dual Input Unbalanced Output, Single Ended Input, Balanced/ Unbalanced Output; DC Coupling and Cascade Differential Amplifier Stages, Level translator. Characteristics of OP-Amps: Op-amp Block Diagram, ideal and practical Op-amp specifications, DC and AC characteristics, 741 op-amp & its features; Op-Amp parameters & Measurement: Input & Out put Off set voltages & currents, slew rate, CMRR, PSRR, drift.

| **UNIT-II** | **APPLICATIONS OF OP- AMPS** | **Classes: 09** |
|---|---|---|

Linear applications of Op- Amps: Inverting and non-inverting amplifier, integrator, differentiator, instrumentation amplifier, AC amplifier; Non-linear applications of Op-Amps: Comparators, multivibrators, triangular and square wave generators, non- linear function generation, log and anti log amplifiers.

| **UNIT-III** | **ACTIVE FILTERS AND TIMERS** | **Classes: 09** |
|---|---|---|

Active Filters: Classification of filters, $1^{st}$ order low pass and high pass filters, $2^{nd}$ order low pass, high pass, band pass, band reject and all pass filters.

Timers: Introduction to 555 timer, functional diagram, monostable, astable operations and applications, Schmitt Trigger; PLL: Introduction, block schematic, principles and description of individual blocks, 565 PLL.

| **UNIT-IV** | **DATA CONVERTERS** | **Classes: 10** |
|---|---|---|

Data converters: Introduction, classification, need of data converters; DAC techniques: Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, DAC characteristics; ADC techniques: Integrating, successive approximation, flash converters, A/D characteristics.

| UNIT-V | DIGITAL IC APPLICATIONS | Classes: 09 |
|---|---|---|

Combinational Design Using TTL/ CMOS ICs: Logic delays, TTL/CMOS interfacing, adders, multiplexer, demultiplexer, decoder, encoder; Sequential design using TTL/ CMOS ICs: SR, JK, T, and D flip-flops; Counters: Synchronous and asynchronous counters, decade counter; Registers: Shift registers, universal shift register, Ring counters and Johnson counters.

**Text Books:**

1. D. Roy Chowdhury, "Linear Integrated Circuits", New age international (p) Ltd, 2nd Edition, 2003.
2. Ramakanth A. Gayakwad, "Op-Amps & linear ICs", PHI, 3rd Edition, 2003.
3. John F. Wakerly, "Digital Design Principles and Practices", Prentice Hall, 3rd Edition, 2005.

**Reference Books:**

1. Salivahanan, "Linear Integrated Circuits and Applications", TMH, 1st Edition, 2008.

**Web References:**

1. https://www.nptel.ac.in
2. https://www.svecw.edu.in
3. https://www.smartzworld.com
4. https://www.crectirupati.com

**E-Text Books:**

1. https://books.google.co.in/books?isbn=8122414702
2. https://books.google.co.in/books?isbn=013186389

**Course Home Page:**

# DIGITAL COMMUNICATIONS

| V Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC009 | Core | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the different digital modulation techniques.
II. Discuss the importance of error detection and correction codes and use them in presence of channel noise.
III. Describe and analyze the methods of transmission of digital data using baseband and carrier modulation techniques.
IV. Decompose codes separately into source codes and channel codes and develop competency in modeling and analyzing communication system elements.

| UNIT-I | PULSE DIGITAL MODULATION | Classes: 08 |
|---|---|---|

Pulse Modulation**:** Analog pulse modulation, Types of pulse modulation; PAM (Single polarity, double polarity); Generation & demodulation of PWM; Generation and demodulation of PPM; Introduction: Elements of digital communication systems, advantages and disadvantages of digital communication systems, applications; Pulse Digital Modulation: Elements of PCM; Sampling, quantization and coding; Quantization error, non-uniform quantization and companding; Differential PCM (DPCM);Adaptive DPCM; Delta modulation and its drawbacks; Adaptive delta modulation; Comparison of PCM and DM systems; Noise in PCM and DM systems.

| UNIT-II | DIGITAL MODULATION TECHNIQUES | Classes: 09 |
|---|---|---|

Digital Modulation Techniques**:** Introduction, ASK modulator, coherent ASK detector, non-coherent ASK detector, FSK, bandwidth and frequency spectrum of FSK, non-coherent FSK detector, coherent FSK detector; BPSK, coherent BPSK detection; QPSK; DPSK, DEPSK; Optimal reception of digital signal**:** Baseband signal receiver; Probability of error; Optimum filter; matched filter, probability of error using matched filter; Probability of error for various line encoding formats; Correlation receiver; Calculation of probability of error for ASK, FSK, BPSK.

| UNIT-III | BASE BAND TRANSMISSION AND PULSE SHAPING | Classes: 09 |
|---|---|---|

Base Band Transmission**:** Requirements of a line encoding format, Various line encoding formats: Unipolar, Polar, Bipolar; Scrambling techniques: BZ8S, HDB3, computation of power spectral densities of various line encoding formats.

Pulse Shaping: Inter symbol interference; pulse shaping to reduce ISI; Nyquist's criterion; Raised cosine filter; Equalization; Correlative level coding; Duo-binary encoding, modified duo –binary coding; Eye diagrams for ASK,PSK,FSK; Cross Talk

| UNIT-IV | INFORMATION THEORY AND SOURCE CODING | Classes: 10 |
|---|---|---|

Information Theory: Information, entropy, conditional entropy; Mutual information; Channel capacity; Various mathematical modeling of communication channels and their capacities; Hartley Shannon law; Tradeoff between bandwidth and S/N ratio; Source coding: Fixed length and variable length Source Coding Schemes, Huffman coding; Source coding to increase average information per bit; Lossy source

| | | |
|---|---|---|
| coding; Spread spectrum modulation: Use of spread spectrum; Direct sequence spread spectrum (DSSS); Code division multiple access using DSSS, frequency hopping spread spectrum; PN-Sequences: Generation and characteristics; Synchronization in spread spectrum systems. | | |
| **UNIT-V** | **LINEAR BLOCK CODES AND CONVOLUTIONAL CODES** | **Classes: 09** |
| Linear Block Codes: Introduction to error control coding; Matrix description of linear block codes, error detection and error correction capabilities of linear block codes; Hamming code; Binary cyclic codes algebraic structure, encoding, syndrome calculation and decoding; Convolution Codes: Introduction, Encoding of convolution codes; Time Domain Approach; Transform Domain Approach; General approach; State, Tree And Trellis Diagram; Decoding using Viterbi Algorithm; Burst Error Correction: Block Interleaving and convolution interleaving. | | |

**Text Books:**

1. Herbert Taub, Donald L. Schilling ,"Principles of Communication Systems", TMH, 3rd edition,2008
2. K. Sam Shanmugam, " Digital and Analog Communication Systems", John Wiley & Sons, 2nd Edition, 2005.
3. Simon Haykin, "Digital communications", John Wiley, 3rd Edition,2005.

**Reference Books:**

1. John Proakis, "Digital Communications", TMH, 2nd Edition 1983.
2. B.P.Lathi, "Modern Analog and Digital Communication", Oxford reprint, 3rd Edition, 2004
3. Singh, Sapre, "Communication Systems Analog and Digital", TMH, 2nd Edition, 2004.

**Web References:**

1. http://nptel.ac.in/courses/117101051/
2. https://ocw.mit.edu/courses/electrical.../6...digital-communications.../lecture-notes
3. https://everythingvtu.wordpress.com
4. http://www.iare.ac.in

**E-Text Books:**

1. http://www.www.jntubook.com
2. http://www.bookboon.com/en/communication-ebook
3. www.e-booksdirectory.com › Engineering
4. www.wiley.com › ... › General Communication Technology

**Course Home Page:**

# COMPUTER ORGANISATION

| V Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC010 | Core | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the basic structure and operation of a digital computer.
II. Understand the operation of the arithmetic unit including the algorithms &implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
III. Interpret the different types of control and the concept of pipelining

| UNIT-I | INTRODUCTION | Classes: 08 |
|---|---|---|

Computing and computers, evolution of computers, VLSI Era, System design, register level, processor level, CPU organization, data representation, fixed-point numbers, floating point numbers, instruction formats, instruction types, addressing modes.

| UNIT-II | DATA PATH DESIGN | Classes: 09 |
|---|---|---|

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequentia lALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, nonrestoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline Design, Modified booth's Algorithm.

| UNIT-III | CONTROL DESIGN | Classes: 09 |
|---|---|---|

Hardwired control, microprogrammed control, multiplier control unit, CPU control unit.

Pipeline control, instruction pipelines, pipeline performance, superscalar processing, nano programming

| UNIT-IV | MEMORY ORGANIZATION | Classes: 10 |
|---|---|---|

Random access memories, serial access memories, RAM interfaces, magnetic surface recording, optical memories, multilevel memories, cache & virtual memory, memory allocation, associative memory.

| UNIT-V | SYSTEM ORGANIZATION | Classes: 09 |
|---|---|---|

Communication methods, buses, bus control, bus interfacing, bus arbitration, IO and system control, IOinterface circuits, handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipel ineinterrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, superscalar and vector processor.

**Text Books:**


1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, 3rd Edition, 1998.
2. V.Carl Hamacher, Zvonko G. Varanesic, Safat G. Zaky, "Computer Organization", Tata McGraw-Hill Inc, 5th Edition, 1996.

**Reference Books:**

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Paraami, "Computer Architecture", BEH R002, Oxford Press.
3. P.Pal Chaudhuri, "Computer organization and design", Prentice Hall, 2nd Edition, 2007.
4. G.Kane, J.Heinrich, "MIPS RISC Architecture", Englewood cliffs, New Jersey, Prentice Hall, 1999.

**Web References:**

1. http://nptel.ac.in/courses/106102062/
2. http://nptel.ac.in/courses/106103068/

**E-Text Books:**

1. http://www.goodreads.com/book/show/4715434-computer-architecture-and-organization
2. http://trove.nla.gov.au/work/10419645?selectedversion=NBD24003156
3. https://sipdrawpdf.files.wordpress.com/2015/04/download-computer-architecture-organisation-by-john-p-hayes-pdf.pdf
4. https://imlearner.files.wordpress.com/2010/08/computer-system-architecture-3rd-ed-morris-mano-p98.pdf

**Course Home Page:**

# ANTENNAS AND PROPAGATION

**V Semester:** **ECE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC011 | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Be Proficient in the radiation phenomena associated with various types of antennas and understand basic terminology and concepts of antennas along with emphasis on their applications.
II. Analyze the electric and magnetic field emission from various basic antennas with mathematical formulation of the analysis.
III. Explain radiation mechanism of different types of antennas and their usage in real time field.
IV. Justify the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure.

| UNIT-I | ANTENNA BASICS AND THIN LINEAR WIRE ANTENNAS | Classes: 08 |
|---|---|---|

Antenna fundamentals: Introduction, radiation mechanism, single wire, 2 wires, dipoles, current distribution on a thin wire antenna; Antenna Parameters, radiation patterns, patterns in principal planes, main lobe and side lobes, beamwidths, radiation intensity, beam efficiency, directivity, gain and resolution, antenna apertures, aperture efficiency, effective height; Antenna properties based on reciprocity theorem; Thin linear wire antennas: Retarded potentials; Radiation from small electric dipole, Quarter wave monopole and half wave dipole, current distributions, evaluation of field components; power radiated, radiation resistance, beamwidths, directivity, effective area and effective height; Natural current distributions, fields and patterns of thin linear center-fed antennas of different lengths; Illustrated problems.

| UNIT-II | LOOP ANTENNAS AND ANTENNA ARRAYS | Classes: 09 |
|---|---|---|

Loop Antennas: Introduction, small loop; Comparison of Far fields of small loop and short dipole; Radiation resistances and directivities of small and large loops. Antenna Arrays: Point sources, definition, patterns; Arrays of 2 isotropic sources, different cases; Principle of pattern multiplication; Uniform linear arrays - Broadside arrays; End-fire arrays; EFA with increased directivity; Derivation of their characteristics and comparison; BSAs with non-uniform amplitude distributions; General considerations and Binomial arrays; Folded Dipoles and their characteristics; Arrays with parasitic elements, Yagi-Uda array, Helical antennas-Helical geometry, Helix modes, Practical design considerations for monofilar Helical antenna in axial and normal modes;

| UNIT-III | VHF,UHF AND MICROWAVE ANTENNAS | Classes: 09 |
|---|---|---|

VHF, UHF and Microwave Antennas: Horn antennas- Types, Fermat's principle, optimum horns, design considerations of pyramidal horns; Illustrative problems; Lens antennas: Introduction, geometry of Non-metallic dielectric lenses zoning, tolerances, applications; Slot antenna, its pattern, Babinet's principle and complementary antennas, impedance of slot antennas.

Microstrip Antennas: Introduction, features, advantages and limitations; Rectangular patch antennas-geometry and parameters, characteristics of microstrip antennas, Impact of different parameters on characteristics.

| UNIT-IV | REFLECTOR ANTENNAS AND ANTENNA MEASUREMENTS | Classes: 10 |
|---|---|---|

Reflector Antennas: Introduction, flat sheet and corner reflectors; Paraboloidal reflectors: Geometry, pattern characteristics, feed methods, reflector types- Related features; Illustrative problems. Antenna measurements: Introduction, concepts, reciprocity near and far fields; Coordinate system, sources of errors patterns to be measured; Pattern measurement arrangement directivity measurement; Gain measurements: Comparison method, absolute and 3-antenna methods.

| UNIT-V | RADIO WAVE PROPAGATION | Classes: 09 |
|---|---|---|

Wave Propagation - I: Introduction, definitions, categorizations , general classifications, different Modes of Wave Propagation; Ground wave propagation: Introduction, plane earth reflections, space and surface waves, wave tilt, curved earth reflections; Space wave propagation: Introduction, field strength variation with distance and height, effect of earth's curvature, absorption, super refraction, M-Curves, duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations; Wave propagation – II: Sky wave propagation: Introduction, structure of ionosphere, refraction and reflection of sky waves by ionosphere; Ray path, critical frequency, MUF, LUF, OF, virtual height and skip distance; Relation between MUF and skip distance; Multi-hop propagation.

**Text Books:**


1. John D. Kraus, Ronald J. Marhefka, Ahmad S. Khan, "Antennas and Wave Propagation", TMH, $4^{th}$ Edition, 2010.
2. C.A. Balanis, "Antenna Theory", John Wiley and Sons, $2^{nd}$ Edition, 2001.


**Reference Books:**


1. E.C. Jordan, K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, $2^{nd}$ Edition, 2000.
2. E.V.D. Glazier, H.R.L. Lamont, "Transmission and Propagation", Her Majesty's Stationery Office, 1958.
3. F.E. Terman, "Electronic and Radio Engineering", McGraw-Hill, $4^{th}$ Edition, 1955.
4. K.D. Prasad, Satya Prakashan, "Antennas and Wave Propagation", Tech India Publications, $1^{st}$ Edition, 2001.


**Web References:**

1. http:// web.stanford.edu/class
2. http://www.electronicagroup.com
3. http://www.cpri.in/about-us/departmentsunits/library-and-information-centre/digital-library-links.html
4. http://nptel.ac.in/courses/antennas

**E-Text Books:**

1. http://www.ebookgalaxy.in/2016/01/antennas-and-wave-propagation-by-g-s-n.html#.WBGI7NJ97IU
2. https://www.jntubook.com/antennas-wave-propagation-textbook
3. http://117.55.241.6/library/E-Books/Antennas_mcgraw-hill_2nd_ed_1988-john_d_kraus.pdf
4. http://www.archive.org

**Course Home Page:**

# BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

**V Semester:** **ECE**

<table>
<tr><th rowspan="2">Course Code</th><th rowspan="2">Category</th><th colspan="3">Hours / Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><th>L</th><th>T</th><th>P</th><th>C</th><th>CIA</th><th>SEE</th><th>Total</th></tr>
<tr><td>AHS015</td><td>Skill</td><td>2</td><td>1</td><td>-</td><td>2</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the market dynamics namely demand, elasticity of demand and pricing in different market structures.
II. Explain how the production function is carried out to achieve least cost combination of inputs and cost analysis.
III. Analyze how capital budgeting decisions are carried out.
IV. Develop the frame work for both manual and computerized accounting process.
V. Acquire the basics of how to analyze and interpret the financial statements through ratio analysis.

| UNIT-I | INTRODUCTION AND DEMAND ANALYSIS | Classes : 07 |
|---|---|---|

Definition, nature and scope of business economics. Demand analysis: Demand determinants, law of demand and its exceptions. Elasticity of demand: Definition, types, measurement and significance of elasticity of demand. Demand forecasting, factors governing demand forecasting.

| UNIT-II | PRODUCTION AND COST ANALYSIS | Classes : 10 |
|---|---|---|

Production function-Isoquants and Isocosts, MRTS, least cost combination of inputs, cobb-dougles production function, internal and external economies of scale, cost analysis: Cost concepts. Break even analysis (BEA)-determination of break-even point (simple problems)-managerial significance.

| UNIT-III | MARKETS AND NEW ECONOMIC ENVIRONMENT | Classes: 08 |
|---|---|---|

Types of competition and markets, features of perfect competition, monopoly and monopolistic competition, price-output determination in case of perfect competition and monopoly.

Business: Features and evaluation of different forms of business organization: Sole proprietorship, partnership, joint stock company, public enterprises and their types.

| UNIT-IV | CAPITAL BUDGETING | Classes: 10 |
|---|---|---|

Capital and its significance, types of capital, estimation of fixed and working capital requirements, methods and sources of raising capital- capital budgeting: features of capital budgeting proposals, methods of capital budgeting: payback period, accounting rate of return(ARR), net present value method and internal rate of return method (simple problems).

| UNIT-V | INTRODUCTION TO FINANCIAL ACCOUNTING AND FINANCIAL ANALYSIS | Classes : 10 |
|---|---|---|

Financial accounting objectives, functions, importance; Accounting concepts and accounting conventions -double-entry book keeping, journal, ledger, trial balance-final accounts (Trading account, Profit & Loss account and Balance Sheet with simple adjustments). Financial analysis: Analysis and interpretation of liquidity ratios, activity ratios, capital structure ratios and profitability ratios (simple problems), Du pont chart.

**Text Books:**

1. Aryasri, "Managerial Economics and Financial Analysis", TMH, 2012.
2. M.Kasi Reddy, Saraswathi, "Managerial Economics and Financial Analysis", PHI, 2012.
3. Varshney, Maheswari, "Managerial Economics", Sultan Chand, 2009.

**Reference Books:**

1. S.A.Siddiqual, A.S. Siddiqual, "Managerial Economics and Financial Analysis", New Age International Publishers, 2013.
2. S.N.Maheswari, S.K.Maheswari, "Financial Accounting", Vikas publications, 2012.
3. J.V.Prabhakar Rao & P.V.Rao, "Managerial Economics and Financial Analysis", Maruthi Publishers, 2011.
4. Vijay Kumar, Appa Rao, "Managerial Economics and Financial Analysis", Cengage 2011.

**Web References:**

1. https:// www.scribd.com/doc/37684926
2. https:// www.slideshare.net/glory1988/managerial-economics-and- financial analysis
3. http:// www.cs.utah.edu/~devnani/2-2.pdf
4. https:// thenthata.web4kurd.net/mypdf/managerial-economics-and- financial analysis
5. https:// bookshallcold.link/pdfread/managerial-economics-and-financial analysis
6. https:// www.gvpce.ac.in/syllabi/Managerial Economics and financial analysis

**E-Text Book:**

1. https:// books.google.co.in/books/about/Managerial economics and financial analysis
2. http://www. ebooktake.in/pdf/title/managerial-economics-and-financial analysis
3. http://all4ryou.blogspot.in/2012/06/mefa-managerial-economics and financial analysis
4 http://books.google.com/books/about/Managerial economics and financial analysis
5. http://www.scribd.com/doc/37684926

**Course Home Page:**

# RESEARCH AND CONTENT DEVELOPMENT

<table>
<tr><td colspan="10">V Semester: AE / CSE / IT / ECE / EEE / MECH</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>AHS106</td><td>Skill</td><td>-</td><td>-</td><td>2</td><td>1</td><td>30</td><td>70</td><td>100</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Gain a practical understanding of the various methodological tools used for social scientific research.
II. Learn the ethical, political, and pragmatic issues involved in the research process.
III. Improve their ability to develop technical writing.
IV. Identify the overall process of designing a research study from its inception to its report.

**Week - l, 2, 3 — LATEX FOR DOCUMENTATION**

Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check and Track Changes using LaTeX; Mathematical expressions, Subscripts and superscripts, brackets and parentheses, fractions and binomials, aligning equations, operators, spacing in math mode, integrals, sums and limits, display style in math mode, list of Greek letters and math symbols, mathematical fonts; Prepare class timetable and student marks list using LaTex;

**Week - 4 — RESEARCH FORMULATION AND DESIGN**

1. Topic/Title Selection for Research and Problem Statement
2. Title Selection and / or Methodology Formulation
3. Finalization of tentative Methodology

**Week - 5 — DATA COLLECTION**

Data Preparation: Data Generation (simulated data) or Collection of Real Data – Part: I

**Week - 6 — DATA COLLECTION AND SAMPLING DESIGN**

Data Preparation: Data Generation (simulated data) or Collection of Real Data – Part: II

**Week – 7 — IMPLEMENTATION**

Implementation of Methodology on the Data and discussion of results - Part: I

**Week – 8 — IMPLEMENTATION**

Implementation of Methodology on the Data and discussion of results - Part: II

**Week – 9 — IMPLEMENTATION OF METHODOLOGY**

1. Block diagram / flowchart of Methodology or Algorithm
2. Testing of Methodology / algorithm, discussion of Results

**Week – 10 — RESULTS**

Evaluation of Methodology / Algorithm, Discussion or Results and conclusion

**Week – 11 — PLAGIARISM ANALYSIS**

Documentation / Paper formatting of Review / Research Article – Part: I ( Plagiarism analysis)

| Week – 12 | DOCUMENTATION |
|---|---|
| Documentation / Paper formatting of Review / Research Article – Part: II (Paper ready for submission) | |

**Text Books:**

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, "An Introduction to Research Methodology", RBSA Publishers. U.K., 2002.
2. Kothari, C.R, "Research Methodology: Methods and Techniques". New Age International. 418p, 1990.
3. Stefan Kottwitz , " LATEX Beginner's Guide", Packt Publishing Limited, 2011.

**Reference Book:**

1. Meenakshi Raman, Sangeeta Sharma, "Technical Communication", Oxford Publishers, 1st Edition, 2004.
2. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Publications. 2 volumes.
3. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

**Web References:**

1. https://www.techwhirl.com/what-is-technical-writing/
2. https://www.mit.edu/me-ugoffice/communication/technical-writing
3. https://www.vocabulary.com/dictionary/technical

**E-Text Books:**

1. www.ebooksgo.org/
2. www.e-booksdirectory.com

# DIGITAL COMMUNICATIONS LABORATORY

| V Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC105 | Core | L | T | P | C | CIA | SEE | Total |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 36 | | | | Total Classes: 36 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Analyze various digital modulation techniques.
II. Verify the sampling theorem.
III. Understand the spectral characteristics of PAM and QAM
IV. Analyze various pulse modulation techniques.

## LIST OF EXPERIMENTS

| Week | Experiment |
|---|---|
| **Week-l** | **SAMPLING THEOREM – VERIFICATION** |
| Verification of sampling theorem for under, perfect, over sampling cases | |
| **Week-2** | **PULSE AMPLITUDE MODULATION AND DEMODULATION** |
| Generation of Pulse Amplitude modulation and demodulation using hardware and matlab | |
| **Week-3** | **PULSE WIDTH MODULATION AND DEMODULATION** |
| Generation of Pulse width modulation and demodulation using hardware and matlab | |
| **Week-4** | **PULSE POSITION MODULATION AND DEMODULATION.** |
| Generation of pulse position modulation and demodulation using hardware and matlab | |
| **Week-5** | **PULSE CODE MODULATION** |
| Generation of pulse code modulation and demodulation using hardware and understanding the concept analog to digital conversion | |
| **Week-6** | **DIFFERENTIAL PULSE CODE MODULATION** |
| Generation of differential pulse code modulation and demodulation using hardware | |
| **Week-7** | **DELTA MODULATION.** |
| Generation of delta modulation and demodulation using hardware .Understanding difference between PCM and DM | |
| **Week-8** | **FREQUENCY SHIFT KEYING** |
| Generation of Frequency shift keying modulation and demodulation using hardware | |

| | |
|---|---|
| **Week-9** | **PHASE SHIFT KEYING.** |
| Generation of Phase shift keying modulation and demodulation using hardware | |
| **Week-l0** | **DIFFERENTIAL PHASE SHIFT KEYING** |
| Generation of Differential Phase shift keying modulation and demodulation using hardware | |
| **Week-l1** | **AMPLITUDE SHIFT KEY(ASK)** |
| Generation of Amplitude Shift Key modulation and demodulation using hardware | |
| **Week-l2** | **STUDY OF THE SPECTRAL CHARACTERISTICS OF PAM AND QAM** |
| Understand frequency domain description of PAM and QAM | |
| **Week-l3** | **QUADRATURE PHASE SHIFT KEYING** |
| Generation of QPSK modulation and demodulation using hardware | |
| **Week-l4** | **MATLAB for QPSK & DPSK .** |
| Understand frequency domain description of amplitude modulation and frequency modulation | |

**Reference Books:**


1. K. Sam Shanmugam, “Digital and Analog Communication Systems”, John Wiley & Sons, 2nd Edition, 2005.
2. B.P.Lathi, “Modern Analog and Digital Communication”, Oxford reprint, 3rd Edition, 2004.
3. Singh, Sapre, “Communication Systems Analog and Digital”, TMH, 2nd Edition, 2004


**Web References:**

1. https://ocw.mit.edu/courses/electrical.../6...digital-communications.../lecture-notes
2. https://everythingvtu.wordpress.com
3. http://www.iare.ac.in

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIRED FOR A BATCH OF 36 STUDENTS**

**HARDWARE:** Desktop Computer Systems 18 nos

**SOFTWARE:** MATLAB

## LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS

| S.No | Name of the Equipment | Range |
|---|---|---|
| 1 | Cathode Ray Oscilloscope | 0-25 MHz |
| 2 | RF Generator, | 0-300 MHz |
| 3 | Function Generator | 0-1 MHz |
| 4 | Function Generator | 0-2 MHz |
| 5 | Sampling Theorem | -- |
| 6 | Pulse Amplitude Modulation | -- |
| 7 | Pulse Width Modulation | -- |
| 8 | Pulse Position Modulation | -- |
| 9 | Pulse Code Modulation | -- |
| 10 | Pulse Shift Keying | -- |
| 11 | Frequency Shift Keying | -- |
| 12 | D-Phase Shift Keying | -- |
| 13 | D-Pulse Code Modulation | -- |
| 14 | Delta Modulation | -- |
| 15 | Amplitude Shift Keying | -- |
| 16 | Q-Phase Shift Keying | -- |
| 17 | Spectrum Analyzer | 0-500 MHz |

# INTEGRATED CIRCUITS APPLICATIONS LABORATORY

| V Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC106 | Core | L | T | P | C | CIA | SEE | Total |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 36 | | | | Total Classes: 36 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Implement different circuits and verify circuit concepts.
II. Study the concepts of multivibrators and filters.
III. Verify the operations of the 555 timers and PLLs and their applications.
IV. Design and verify combinational and sequential circuits

## LIST OF EXPERIMENTS

| | |
|---|---|
| **Week-l** | **INVERTING, NON-INVERTING AND DIFFERENTIAL AMPLIFIERS** |
| To construct and test the performance of an Inverting, Non-inverting amplifier and Differential amplifier using IC 741 | |
| **Week-2** | **INTEGRATOR AND DIFFERENTIATOR** |
| To construct and test the performance of an Integrator and Differentiator using IC 741 | |
| **Week-3** | **SECOND ORDER ACTIVE LOWPASS, HIGHPASS AND BANDPASS FILTERS** |
| To design and verify the operation of the Active low pass, High pass and Band pass filters using IC 741 | |
| **Week-4** | **ASTABLE MULTIVIBRATORS AND SCHMITT TRIGGER USING 555** |
| To design and construct an Astable multivibrators and Schmitt trigger using IC 555 | |
| **Week-5** | **MONOSTABLE MULTIVIBRATORS 555** |
| To design and construct Monostable multivibrators using IC 555 | |
| **Week-6** | **SCHMITT TRIGGER USING 555** |
| To design and construct schimitt trigger using NE555 Timer. | |
| **Week-7** | **PLL USING IC 565** |
| Verifying characteristics of PLL | |
| **Week-8** | **INSTRUMENTATION AMPLIFIER.** |
| To design and verify the operation of instrumentation amplifier using IC 741 | |
| **Week-9** | **MULTIPLEXER AND DEMULTIPLEXER** |
| Verify Functionality of multiplexer and demultiplexer | |

| | |
|---|---|
| **Week-l0** | **ENCODER AND DECODER** |
| Verify Functionality of encoder and decoder | |
| **Week-l1** | **REALISATION OF DIFFERENT FLIP-FLOPS USING LOGIC GATES** |
| Verify Functionality of flip-flop | |
| **Week-l2** | **4 BIT COUNTERS** |
| Verify Functionality of counters | |
| **Week-l3** | **REALISATION OF SHIFT REGISTERS** |
| Verify Functionality of shit register | |
| **Week-l4** | **DECADE COUNTER** |
| Verify Functionality of decade counter | |

**Reference Books:**


1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, 2nd Edition, 2003.
2. Ramakanth A. Gayakwad, "Op-Amps & linear ICs", PHI, 3rd Edition, 2003.
3. John F. Wakerly, "Digital Design Principles and Practices", Prentice Hall, 3rd Edition, 2005.


**Web References:**

1. http://www.ee.iitkgp.ac.in
2. http://www.citchennai.edu.in

**Course Home Page:**

**LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS**

| S. No | Name of the Equipment | Range |
|---|---|---|
| 1 | Regulated Power Supply | 0-30V DC |
| 2 | CRO | 0-20 MHz |
| 3 | Function generator | 20 MHZ |
| 4 | Digital IC Trainer Kit | -- |
| 5 | Resistors | 47Ω, 82 Ω, 100 Ω, 150 Ω, 220 Ω, 470 Ω, 560 Ω, 1k Ω, 2.2k Ω, 3.3k Ω.5k Ω,10k |
| 6 | Inductors | 0.01mH, 0.1mH,10mH, 50mH |
| 7 | Capacitors | 0.01µF, 0.1µF, 0.47µF, 470µF, |
| 8 | Decade counter | IC 7490 |
| 9 | Op-amp | 741 IC |
| 10 | TIMER IC | 555 IC |
| 11 | IC'S | IC 7432 ,IC 7404,IC 7411,IC 7408,IC 7402,IC 7400 IC 7410,IC 7474,NE 65 |

# DIGITAL SIGNAL PROCESSING

| VI Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC012 | Core | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Develop skills for analyzing discrete signals and systems and apply discrete Fourier transform for frequency domain analysis along with the implementation of FFT.

II. Provide concepts and skills for the design and realization of IIR and FIR filters, with given specifications, using different techniques.

III. Investigate the effect of finite word length in the design of digital filters.

IV. Tackle the design of multirate filters using DSP concepts and use for real time applications.

| UNIT-I | REVIEW OF DISCRETE TIME SIGNALS AND SYSTEMS | Classes: 10 |
|---|---|---|

Discrete time signal definition; Signal classification; Elementary signals; Transformation of elementary signals; Concept of digital frequency; Discrete time system definition; System classification; Linear time invariant (LTI) system; Properties of the LTI system; Time domain analysis of discrete time systems; Impulse response; The convolution sum; Methods of evaluating the convolution sum; Filtering using overlap-save and overlap-add method; Realization of digital filters: Concept of IIR and FIR filters; Realization structures for IIR and FIR filters using direct form-I and direct form-II, cascade, lattice and parallel.

| UNIT-II | DISCRETE FOURIER TRANSFORM AND EFFICIENT COMPUTATION | Classes: 08 |
|---|---|---|

Introduction to discrete time Fourier transform (DTFT); Discrete Fourier transform (DFT) definition; Properties of DFT; Linear and circular convolution using DFT; Fast-Fourier-transform (FFT): Direct computation of DFT; Need for efficient computation of the DFT (FFT algorithms); Radix-2 FFT algorithm for the computation of DFT and IDFT using decimation-in-time and decimation-in-frequency algorithms; General Radix-N FFT.

| UNIT-III | STRUCUTRE OF IIR FILTERS | Classes: 08 |
|---|---|---|

Analog filters: Butterworth filters; Chebyshev type-1 & type-2 filters; Analog transformation of prototype LPF to HPF/BPF/BSF.

Transformation of analog filters into equivalent digital filters using impulse invariant method and bilinear transform method; Matlab programs of IIR filters.

| UNIT-IV | SYMMETRIC AND ANTISYMMETRIC FIR FILTERS | Classes: 09 |
|---|---|---|

Design of linear phase FIR filters windowing and frequency sampling methods; Equiripple linear phase FIR filters; Parks-McClellan algorithm and remez algorithm; Least-mean-square error filter design; Design of FIR differentiators; Matlab programs of FIR filters; Comparison of FIR & IIR.

| UNIT-V | APPLICATIONS OF DSP | Classes: 10 |
|---|---|---|

Multirate signal processing; Decimation; Interpolation; Polyphase structures for decimation and interpolation filters; Structures for rational sampling rate conversion; Applications of multirate signal processing for design of phase shifters, interfacing of digital systems with different sampling rates, sub band coding of speech signals. Analysis of finite word length effects: Representation of numbers; ADC quantization noise, coefficient quantization error, product quantization error, truncation & rounding errors; Limit cycle due to product round-off error; Round-off noise power; Limit cycle oscillations due to overflow in digital filters; Principle of scaling; Dead band effects.

**Text Books:**


1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, Principles, Algorithms and Applications", Prentice Hall, 4th Edition, 2007.
2. Sanjit K Mitra, "Digital signal processing, A computer base approach", McGraw-Hill Higher Education, 4th Edition, 2011.
3. Emmanuel C, Ifeacher, Barrie. W. Jervis, "DSP-A Practical Approach", Pearson Education, 2nd Edition, 2002.
4. A.V. Oppenheim, R.W. Schaffer, "Discrete Time Signal Processing", PHI, 2nd Edition, 2006.


**Reference Books:**


1. Li tan, "Digital signal processing: fundamentals and applications" Elsevier Science &. Technology Books, 2nd Edition, 2008.
2. Robert J.schilling, Sandra. L.harris, "Fundamentals of Digital signal processing using Matlab", Thomson Engineering, 2nd Edition, 2005.
3. Salivahanan, Vallavaraj, Gnanapriya, "Digital signal processing", McGraw-Hill Higher Education, 2nd Edition, 2009.


**Web References:**

1. https://www.coursetalk.com/providers/coursera/courses/digital-signal-processing
2. https://www.edx.org/course/discrete-time-signal-processing-mitx-6-341x-1
3. https://www.mooc-list.com/course/digital-signal-processing-coursera

**E-Text Books:**

1. http://www.dspguide.com/pdfbook.htm
2. http://dspguru.com/dsp/books/favorites
3. http://onlinevideolecture.com/ebooks
4. http://www.freebookcentre.net/SpecialCat/Free-Signal-Processing-Books

**Course Home Page:**

# MICROPROCESSORS AND MICROCONTROLLERS

| VI Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC013 | Core | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Imbibe sound knowledge about architecture, instruction set and concepts of 8086 and 8051.
II. Demonstrate the ability to develop programmes for different applications using assembly language of 8086 and 8051.
III. Impart knowledge of different types of external peripherals like 8255,8259,8279,8251,8257.
IV. Be proficient in Memory and I/O interfacing with 8086 and 8051.

| UNIT-I | 8086 MICROPROCESSORS | Classes: 10 |
|---|---|---|

Register organization of 8086, Architecture, signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, special purpose activities, Minimum mode, maximum mode of 8086 system and timings, machine language instruction formats, addressing mode of 8086, instruction set off 8086,assembler directives and operators.

| UNIT-II | PROGRAMMING WITH 8086 MICROPROCESSOR | Classes: 08 |
|---|---|---|

Machine level programs, programming with an assembler, Assembly language programs, introduction to stack, stack structure of 8086/8088, interrupts and interrupt service routines.

Interrupt cycle of 8086, non-mask able interrupt and mask able interrupts, interrupt programming.

| UNIT-III | INTERFACING WITH 8086/88 | Classes: 08 |
|---|---|---|

Semiconductor memory interfacing, dynamic RAM interfacing, interfacing i/o ports, PIO 8255 modes of operation of 8255,interfacing to D/A and A/D converters, stepper motor interfacing, control of high power devices using 8255..

Programmable interrupt controller 8259A, the keyboard /display controller8279, programmable communication interface 8251 USART, DMA Controller 8257.

| UNIT-IV | 8051 MICROCONTROLLER | Classes: 09 |
|---|---|---|

8051 Microcontroller – Internal architecture and pin configuration, 8051 addressing modes, instruction set, Bit addressable features. I/O Port structures, assembly language programming using data transfer, arithmetic, logical and branch instructions.

| UNIT-V | SYSTEM DESIGN USING MICROCONTROLLER | Classes: 10 |
|---|---|---|

8051 Timers/Counters, Serial data communication and its programming, 8051 interrupts, Interrupt vector table, Interrupt programming. Real world interfacing of 8051 with external memory, expansion of I/O ports, LCD, ADC, DAC, stepper motor interfacing.

| Text Books: |
|---|
| 1. Ray A.K, Bhurchandi K.M, “Advanced Microprocessor and Peripherals”, TMH, 2nd Edition, 2012<br>2. Muhammad Ali Mazidi, J.G. Mazidi, R.D McKinlay,” The 8051 Microcontroller and Embedded systems using Assembly and C”, Pearson education, 2nd Edition, 2009.<br>3. Douglas V. Hall, “Microprocessors and Interfacing Programming and Hardware”, TMGH, 2nd Edition, 1994. |
| **Reference Books:** |
| 1. Kenneth J. Ayala, “The 8051 Microcontroller”, Thomson Learning, 3rd edition, 2005.<br>2. Manish K. Patel, “The 8051 Microcontroller Based Embedded Systems”, McGraw Hill, 1st Edition, 2014.<br>3. Ajay V Deshmukh, ”Microcontrollers”, TATA McGraw Hill publications, 2nd Edition, 2012. |
| **Web References:** |
| 1. http://www.nptel.ac.in/downloads/106108100/<br>2. http://www.the8051microcontroller.com/web-references<br>3. http://www.iare.ac.in |
| **E-Text Books:** |
| 1. https://books.google.co.in/books<br>2. http://www.www.jntubook.com<br>3. http://www.ebooklibrary.org/articles/mpmc |
| **Course Home Page:** |

# ELECTRONIC MEASUREMENT AND INSTRUMENTATION

**VI Semester:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AEC014 | Core | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 15** | **Practical Classes: Nil** | | | | **Total Classes: 60** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Acquire a sound understanding theory and performance characteristics of instruments and errors in measurement and apply to DC voltmeters, ammeters, ohmmeters.
II. Provide concepts and operation of different signal generators and wave form analyzers.
III. Compare and contrast different types of oscilloscopes.
IV. Select different types of D.C and A.C bridges for measurement of passive components and physical parameters.

| UNIT-I | INTRODUCTION TO MEASURING INSTRUMENTS | Classes: 08 |
|---|---|---|

Block schematics of measuring systems, performance characteristics, Static characteristics: Accuracy, resolution, precision, gauss error, types of errors, Dynamic characteristics : Repeatability, reproducibility, fidelity, lag; Analog measuring instruments: D' Arsonval movement, DC voltmeters and ammeter, AC voltmeters and current meters, ohmmeters, multimeters, meter protection, extension of range, digital voltmeters: Ramp type, staircase, dual slope integrating type, successive approximation type, specifications of instruments.

| UNIT-II | OSCILLOSCOPE | Classes: 09 |
|---|---|---|

Oscilloscopes: CRT, block schematic of CRO, time base circuits, delay lines, high frequency CRO considerations, applications, specifications, special purpose oscilloscopes: Dual trace, dual beam CROs, sampling oscilloscopes, storage oscilloscopes, digital storage CROs, Lissajous figures, frequency measurement, phase measurement, CRO probes.

| UNIT-III | SIGNAL GENERATOR AND SIGNAL ANALYZERS | Classes: 09 |
|---|---|---|

Signal Generators: AF and RF signal generators, sine and square wave generators, function generators: arbitrary waveform generator, sweep frequency generators, video signal generators, specifications.

Signal Analyzers: AF, HF wave analyzers, heterodyne wave analyzers, harmonic distortion, spectrum analyzers, power analyzers

| UNIT-IV | AC AND DC BRIDGES | Classes: 10 |
|---|---|---|

Measurements using DC and AC bridges: Wheat stone bridge, Kelvin bridge, AC bridges, Maxwell, Hay, Schering, Wien, Anderson bridges, wagner & ground connection.

| UNIT-V | TRANSDUCERS | Classes: 09 |
|---|---|---|

Transducers: Classification, strain gauges, force and displacement, tranducers, resistance thermometers, hotwire anemometers, LVDT, themocouples, synchros; Piezoelectric transducers, variable capacitance transducers; Magneto strictive transducers, measurement of physical parameters: Flow measurement, displacement meters, liquid level measurement, measurement of humidity and moisture, velocity, force, pressure, high pressure, vacuum level, temperature measurements.

**Text Books:**

1. K. Lal Kishore, “Electronic Measurements and Instrumentation”, Pearson Education, 2nd Edition, 2010.
2. H.S.Kalsi, “Electronic Instrumentation” , TMH, 2nd Edition, 2004.
3. A.K.Sawhney, “Electrical and electronics measurements and instrumentation”, 19th Edition, 2011.

**Reference Books:**

1. David A. Bell, “Electronic Instrumentation and Measurements”, Oxford University Press, 1st Edition, 2007.
2. A.D. Helbincs, W.D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, PHI, 56th Edition, 2003.
3. B.M. Oliver, J.M. Cage, “Electronic Measurements and Instrumentation”, TMH, Reprint, 2009.
4. T.R. Padmanabham, “Industrial Instrumentation”, Springer, 1st Edition, 2009.

**Web References:**

1. https://www.scribd.com/
2. https://www.worldcat.org/
3. https://www.infibeam.com/
4. https://www.abebooks.co.uk

**E-Text Books:**

1. https://www.vssut.ac.in/lecture_notes/lecture1423813026.pdf
2. fmcet.in/ECE/EC2351_uw.pdf
3. https://books.askvenkat.com/tag/measurement-and-instrumentation-lecture-notes-pdf
4. https://www.jntubook.com/electronics-measurements-instrumentation-textbook-free-d

# IDEATION AND PRODUCT DEVELOPMENT

<table>
<tr><td colspan="10">VI Semester: Common for all branches</td></tr>
<tr><td rowspan="1">Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">AEC201</td><td rowspan="2">Skill</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>1</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes:</td><td>Tutorial Classes:</td><td colspan="4">Practical Classes: 28</td><td colspan="3">Total Classes: 28</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students:**

- **I.** To develop next generation Entrepreneurs and Creative Leaders to resolve live challenges.
- **II.** To understand about the future needs of industries.
- **III.** To transform innovative ideas into successful businesses.
- **IV.** To use a range of creative thinking tools to develop Out of the Box Ideas.
- **V.** To develop Breakthrough Innovators and Dynamic Thinkers.

**Syllabus**

- Successful team formation and management
- Introduction to user-centred design
- Ideation and use of personas and POVs
- Need finding
- Embedded Microcontrollers for consumer products
- Human factors in engineering design
- Critical Experience and Critical Function Prototyping
- Dark Horse and 'Funky' prototyping
- Rapid prototyping and manufacturing
- Design for manufacture
- User testing
- Use of video/electronic media for communication
- Start-ups and entrepreneurship
- Intellectual Property

**Text Books:**


1. Product Design: Techniques in Reverse engineering & New Product development. K Otto & K Wood. Prentice Hall, 2001. ISBN 0-13-0212271-7 TCD Shelf Mark. HL-236-568.
2. Invention by design: how engineers get from thought to thing, Petroski H. Cambridge, Mass., London, Harvard University Press, 1996. ISBN 0674463676. TCD Shelf Mark. HL-201-280.
3. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Tim Brown, Harper Business, 2009, ISBN 978-0061766084.
4. Creative Confidence: Unleashing the Creative Potential Within Us All, Tom & David Kelley, Crown Business, 2013, ISBN 978-0385349369.

# DIGITAL SIGNAL PROCESSING LABORATORY

| VI Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC107 | Core | L | T | P | C | CIA | SEE | Total |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 45 | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Implementation of convolution in MATLAB.
II. Implementation of digital signal processing algorithms in MATLAB and C.
III. Understand the real-time operation of digital filters.
IV. Analyze the Multirate signal processing algorithms.

## LIST OF EXPERIMENTS

| WEEK - l | CONVOLUTION |
|---|---|
| a) Generation of linear convolution without using built in function and the function conv in MATLAB<br>b) Generation of circular convolution without using built in function in MATLAB | |
| **WEEK-2** | **DISCRETE FOURIER TRANSFORM** |
| Compute the Discrete Fourier Transform and IDFT with and without fft and ifft in MATLAB | |
| **WEEK-3** | **APPLICATION OF DFT** |
| Implementation of Linear convolution using DFT (Overlap-add and Overlap-Save methods) | |
| **WEEK -4** | **DIT - FAST FOURIER TRANSFROM** |
| Implementation of Decimation-in-time radix-2 FFT algorithm | |
| **WEEK -5** | **DIF - FAST FOURIER TRANSFROM** |
| Implementation of Decimation-in-frequency radix-2 FFT algorithm | |
| **WEEK -6** | **IIR - BUTTERWORTH FILTER** |
| Implementation of IIR digital filter using Butterworth method and bilinear transformation | |
| **WEEK -7** | **IIR - CHEBYSHEV FILTER** |
| Implementation of IIR digital filter using Chebyshev (Type I and II) method | |
| **WEEK -8** | **FIR FILTER - WINDOW TECHNIQUES** |
| Implementation of FIR digital filter using window (Rectangular, Hamming, Hanning, Bartlett) methods | |

| | |
|---|---|
| **WEEK-9** | **FIR FILTER – SAMPLING TECHNIQUE** |
| Implementation of FIR digital filter using frequency sampling method | |
| **WEEK-l0** | **FIR FILTER – OPTIMUM EQUIRIPPLE** |
| Implementation of optimum equiripple FIR digital filter using window methods | |
| **WEEK-l1** | **DUAL TONE MULTI FREQUENCY** |
| DTMF Tone Generation and Detection Using Goertzel Algorithm | |
| **WEEK-l2** | **SAMPLING RATE CONVERTERS** |
| Implementation of sampling rate conversion by decimation, interpolation and a rational factor using MATLAB | |
| **WEEK-l3** | **DFT AND SINEWAVE USING TMS320C6713 KIT** |
| a) Implementation of DFT<br>b) Sine wave generation using lookup table with values generated from MATLAB | |
| **WEEK-l4** | **FILTERS USING TMS320C6713 KIT** |
| IIR and FIR Filter Implementation using DSP Kits | |

**Reference Books:**


1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, Principles, Algorithms and Applications", Prentice Hall, 4th Edition, 2007.
2. B. Preetham Kumar, "Digital Signal Processing Laboratory", CRC Press, 2nd Edition, 2010.
3. B.Venkata Ramani, M.Bhaskar, " Digital Signal Processors- Architecture, Programming and applications", TMH, 2nd Edition, 2002.


**Web References:**

1. http://eceweb1.rutgers.edu/~orfanidi/ece348/
2. http://www.eecs.umich.edu/courses/eecs452/refs.html
3. http://www.dsp.sun.ac.za/lab-reference-guide/
4. http://www.iare.ac.in

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIRED FOR A BATCH OF 36 STUDENTS**

**HARDWARE:** 36 numbers of Desktop Computer Systems with 2 GB RAM

**SOFTWARES:** a) MATLAB b) C6713 DSK Code Composer Studio

**LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS**

| S.No | Name of the Equipment | Range |
|---|---|---|
| 1 | TMS320C6713 DSP Starter Kit (DSK) | 225 MHz device delivering up to 1800 million instructions per second (MIPs) |
| 2 | USB Cable | -- |
| 3 | Universal Power Supply | +5V |
| 4 | AC Power Cord(s) | -- |

# MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

**VI Semester:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC108 | Core | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 45 | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Develop assembly level programs and providing the basics of the microprocessors.
II. Understanding the interfacing of external devices to the processor and controller for various applications.
III. Learn assemble language programming using 8051 microcontroller.
IV. Develop ability in programming using microprocessor and microcontroller.

## LIST OF EXPERIMENTS

### WEEK - l DESIGN A PROGRAM USING WIN862

Design and develop an Assembly language program using 8086 microprocessor and to show the following aspects.

a) Programming
b) Execution
c) Debugging

To Demonstrate the win 862 software and Trainer kit for 8086 Microprocessor

### WEEK-2 16 BITARITHMETIC AND LOGICAL OPERATIONS

Write an ALP program to perform 16 Bit arithmetic and logical operations using WIN862 software

### WEEK-3 MULTIBYTE ADDITION AND SUBRACTION

a) Write an ALP program to perform multi byte addition and subtraction
b) Write an ALP program to perform 3*3 matrix multiplication and addition

### WEEK -4 PROGRAMS TO SORT NUMBERS

a) Write an ALP program to perform ascending order using 8086
b) Write an ALP program to perform descending order using 8086

### WEEK -5 PROGRAMS FOR STRING MANIPULATIONS OPERATIONS

a) Write an ALP program to insert or delete a byte in the given string
b) Write an ALP program to search a number/character in a given string
c) Write an ALP program to move a block of data from one memory location to the other &Write an ALP program for reverse of a given string

### WEEK -6 CODE CONVERSIONS

a) Write an ALP program to convert packed BCD to Unpacked BCD
b) Write an ALP program to convert packed BCD to ASCII
c) Write an ALP program to convert hexadecimal to ASCII

| | |
|---|---|
| **WEEK -7** | **INTERFACING STEPPER MOTOR** |
| a) Write an ALP program to rotate stepper motor in clockwise direction<br>b) Write an ALP program to rotate stepper motor in anti clockwise direction | |
| **WEEK -8** | **INTERFACING ADC & DAC DEVICES** |
| a) Write an ALP program to convert analog to digital using 8086<br>b) Write an ALP program to convert digital to analog using 8086 | |
| **WEEK-9** | **INTERFACING KEYBOARD TO 8086** |
| Write an ALP program to interface keyboard to 8086 | |
| **WEEK-l0** | **SERIAL AND PARALLEL COMMUNICATION** |
| a) Parallel communication between two microprocessors using 8255<br>b) Serial communication between two microprocessor kits using 8251 | |
| **WEEK-l1** | **INTERFACING TRAFFIC LIGHT CONTROLLER AND TONE GENERATOR** |
| a) Write a program to interface traffic light controller<br>b) Write an ALP program to interface tone generator | |
| **WEEK-l2** | **ARITHMETIC AND LOGICAL OPERATIONS USING 8051** |
| Write an ALP program to perform 16 Bit arithmetic and logical operations using 8051 microcontroller | |
| **WEEK-l3** | **TIMER/COUNTER** |
| Write an ALP Program and verify Timer/Counter using 8051 | |
| **WEEK-l4** | **INTERFACING KEYBOARD TO 8051** |
| Write an ALP program to interface keyboard to 8051 | |
| **Reference Books:** | |
| 1. Ray A.K, Bhurchandi K.M, "Advanced Microprocessor and Peripherals", 2/e TMH, 2012<br>2. Muhammad Ali Mazidi, J.G. Mazidi and R.D McKinlay, "The 8051 Microcontroller and Embedded systems using Assembly and C", 2nd Edition, Pearson education, 2009. | |
| **Web References:** | |
| 1. http://www.nptel.ac.in/downloads/106108100/<br>2. http://www.the8051microcontroller.com/web-references<br>3. http://www.iare.ac.in | |
| **Course Home Page:** | |
| **HARDWARE AND SOFTWARE REQUIRED FOR A BATCH OF 36 STUDENTS**<br><br>**HARDWARE:** Desktop Computer Systems 36 nos<br><br>**SOFTWARES:** win 862 | |

## LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS

| S. No | Name of the Equipment | Range |
|---|---|---|
| 1 | Regulated Power Supply | 0-5V & 12V DC |
| 2 | DCRO | 0-20 MHz |
| 3 | 8086 Trainer Kits with keyboard | 8MHz/ 5V |
| 4 | 8051 Trainer kits with keyboard | 12 MHz/5V |
| 5 | Serial Interface cable | -- |
| 6 | Stepper Motors | -- |
| 7 | A/D Device | -- |
| 8 | A/D and Dual D/A Devices | -- |
| 9 | Dual D/A Devices | -- |
| 10 | PPI 8255 | -- |
| 11 | USART 8251 | -- |
| 12 | Keyboard/ Seven segment controller | -- |
| 13 | Traffic Light Controller | -- |
| 14 | RTC/ Tone generator | -- |
| 15 | Elevator | -- |
| 16 | SRAM and DRAM | -- |
| 17 | DMA Controller | -- |
| 18 | LCD Display | -- |
| 19 | Timer/Counter, UART and Interrupt | -- |
| 20 | Keyboard | -- |

# INSTRUMENTATION LABORATORY

| **VI Semester:** ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC109 | **Core** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: 45** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Recall the basic applications and theory of the LabVIEW graphical programming environment.
II. Determine the basic programming concepts in LabVIEW.
III. Understand different data acquisition system concepts.
IV. Develop real time applications using LabVIEW.
V. Design, implement, and distribute stand-alone applications using LabVIEW.
VI. Apply single and multiple-loop design patterns for application functionality.

## LIST OF EXPERIMENTS

| **WEEK - l** | **OPEN AND RUN A VIRTUAL INSTRUMENT** |
|---|---|
| Open the front panel and block diagram in Lab VIEW software | |
| **WEEK-2** | **BASIC ARITHMETIC OPERATIONS &BOOLEAN OPERATIONS** |
| Designing a program to perform Addition, Subtraction , Multiplication and Division operations, and Developing a program to perform AND, OR, NOT, NAND, NOR,XOR and XNOR operations using Lab VIEW | |
| **WEEK-3** | **SUM OF ‘n’ NUMBERS USING ‘FOR’ LOOP & FACTORIAL OF A GIVE NUMBER USING FOR LOOP** |
| Designing a program to find the sum of ‘n’ numbers using FOR loop and Designing a program to perform the factorial of a given number using FOR loop. | |
| **WEEK-4** | **SUM OF ‘n’ NATURAL NUMBERS USING WHILE LOOP & FACTORIAL OF A GIVE NUMBER USING WHILE LOOP** |
| Designing a program to find the sum of ‘n’ natural numbers using WHILE loop and Designing a program to perform the factorial of a given number using WHILE loop. | |
| **WEEK-5** | **CONVERT °C TO °F, CREATE A SUBVI** |
| Designing the program to convert °C to °F and Create a SubVI | |
| **WEEK-6** | **ARRAY MAXIMUM AND MINIMUM** |
| Designing a program to find the maximum and minimum variable from an array. | |
| **WEEK-7** | **ANALYZING AND LOGGING DATA BY USING WAVE FORM GRAPHS** |
| Designing a program to analyze and logging the data. | |

| | |
|---|---|
| **WEEK -8** | **BUNDLE AND UNBUNDLE CLUSTER** |
| Designing a program to bundle and unbundle a cluster. | |
| **WEEK-9** | **APPLICATION USING FORMULA NODE & DISCRETE COSINE TRANSFORM** |
| Designing a program to create a sine wave using formula node and to perform discrete cosine transform on the given signal. | |
| **WEEK-l0** | **FLAT AND STACKED SEQUENCE** |
| Designing a program to perform functions using flat and stacked sequence. | |
| **WEEK-l1** | **DATA ACQUISITION THROUGH VIRTUAL INSTRUMENTATION** |
| Acquire the data from the sensors by using MY DAQ and MY RIO | |
| **WEEK-l2** | **DEVELOPING VOLTMETER USING DAQ CARDS** |
| Designing a program to Develop voltmeter by using DAQ CARDS . | |
| **WEEK-l3** | **DEVELOPING SIGNAL GENERATOR USING DAQ CARDS** |
| Designing a program to develop signal generator by using DAQ cards | |
| **WEEK-l4** | **REAL TIME TEMPERATURE CONTROL USING VIRTUAL INSTRUMENTATION.** |
| Designing a program for real time temperature control by using virtual instrumentation | |

**Reference Books:**


1. Jim Kring, Jeffrey Travis , "LabVIEW for Everyone: Graphical Programming Made Easy and Fun" Prentice Hall, 3rd Edition, 2006.
2. Richard Jennings Gary W.Johnson, "Labview Graphical Programming", McGraw-Hill Education, 4th Edition, 2011.
3. Rick Bitter, Taqi Mohiuddin,, Matt Nawrocki, "LabView: Advanced Programming Techniques", CRC Press, 2nd Edition, 2006.
4. Sanjay Gupta, "Virtual Instrumentation using LABVIEW", McGraw-Hill Education, 2nd edition, 2010.


**Web References:**


1. http://www.ni.com/pdf/manuals/373427j.pdf
2. http://home.hit.no/~hansha/documents/labview/Introduction%20to%20LabVIEW.htm
3. http://k12lab-support-pages.s3.amazonaws.com/lvbasichome1.html
4. https://www.pearsonhighered.com/samplechapter/0130153621.pdf


**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIRED FOR A BATCH OF 36 STUDENTS**

**HARDWARE:** Desktop Computer Systems 36 nos

**SOFTWARES:** NI LabVIEW ( 2015 LV- 64bitWin Eng)

## LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS

| S. No | Name of the Equipment | Range |
|---|---|---|
| 1 | NI myDAQ with required accessories and mini systems | Analog input...... ±10 V, ±2 V, DC-coupled<br>Audio input..... ±2 V, AC-coupled |
| 2 | NI myRIO | Analog Input…………±5V |
| 3 | Qube inverted pendulum addon for myRIO | -- |
| 4 | Connectors and cables | -- |
| 5 | NI USRB 2901 bundle with required accessories and cables | -- |

# MICROWAVE ENGINEERING

| VII Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC015 | Core | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Perceive the concepts of waveguides and analyze the field components in different types of waveguides.
II. Categorize different types of microwave components based on their applications.
III. Imbibe knowledge to use microwave oscillators & amplifiers in microwave communication and compare their characteristics.
IV. Demonstrate the ability to measure different microwave parameters using microwave bench setup.

| UNIT-I | WAVEGUIDES | Classes: 08 |
|---|---|---|

Introduction, microwave spectrum and bands, applications of microwaves, types of waveguides, rectangular waveguides, field equations in rectangular waveguide, field components of TM and TE waves for rectangular waveguide, modes of TM and TE waves in rectangular waveguide, impossibility of TEM waves, cut off frequency of rectangular waveguide; Wave impedance in rectangular waveguide: Wave impedance for a TM and TE wave in rectangular waveguide, Dominant mode and degenerate modes, mode characteristics of phase velocity, group velocity, wavelength and impedance relations; Illustrative problems; Cavity resonators: Types of cavity resonators; Rectangular cavity resonator: Dominant modes and resonant frequencies, illustrative problems.

| UNIT-II | WAVEGUIDE COMPONENTS AND APPLICATIONS | Classes: 09 |
|---|---|---|

Coupling mechanisms: Probe, loop, coupling to a cavity resonator, waveguide discontinuities, waveguide irises, tuning screws and posts, matched loads; Waveguide attenuators; Waveguide phase shifters; waveguide multiport junctions: E plane Tee, H plane Tee, Magic Tee, applications of Magic Tee, hybrid ring; Ferrites: Faraday rotation principle, gyrator, isolator, circulator.

| UNIT-III | MICROWAVE LINEAR BEAM AND CROSS FIELD TUBES (O TYPE AND M TYPE): | Classes: 09 |
|---|---|---|

Microwave linear beam tubes (O type): Limitations of conventional tubes at microwave frequencies; Klystron: Velocity modulation process, bunching process, output power and beam loading; Multicavity Klystron amplifiers: Beam current density, output current and output power of two cavity Klystron; Reflex Klystron: Velocity modulation, power output and efficiency.

Helix Traveling Wave tube: Slow wave structures, amplification process, conventional current;
Microwave cross field tubes (M type): Introduction, cross-field effects; Magnetrons: Different types, 8-cavity cylindrical travelling wave Magnetron, Hull cut-off and Hartree conditions, modes of resonance and PI-mode operation.

| UNIT-IV | MICROWAVE SOLID-STATE DEVICES | Classes: 09 |
|---|---|---|

Microwave solid-state devices: Microwave tunnel diode; Transferred electron devices: Gunn-effect diodes, RWH theory, modes of operations; Avalanche transit time devices: IMPATT diode, TRAPATT diode, BARITT diode, Pin diodes, varactor diodes, crystal detectors.

| UNIT-V | MICROWAVE MEASUREMENTS | Classes: 10 |
|---|---|---|
| Description of microwave bench: Different blocks and their features, precautions; Microwave power measurement: Bolometers; Measurement of attenuation; Frequency standing wave measurements: measurement of low and high VSWR; Cavity Q; Impedance measurements. | | |

**Text Books:**

1. Samuel Y. Liao, “Microwave Devices and Circuits”, Pearson, 3rd Edition, 2003.
2. Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, “Microwave Principles” ,CBS Publishers and Distributors, New Delhi, 1st Edition, 2004.
3. F.E. Terman, “Electronic and Radio Engineering”, Tata McGraw-Hill Publications, 4th Edition, 1955.

**Reference Books:**

1. R.E. Collin, “Foundations for Microwave Engineering” IEEE Press, John Wiley, 2nd Edition, 2002.
2. Peter A. Rizzi, “Microwave Engineering Passive Circuits” PHI, 3rd Edition, 1999.
3. M.L. Sisodia, G.S.Raghuvanshi, “Microwave Circuits and Passive Devices” Wiley Eastern Ltd., New Age International Publishers Ltd, 1st Edition, 1995.

**Web References:**

1. http://nptel.ac.in/courses/117101119/1
2. http://www-group.slac.stanford.edu/kly/Lecture_Series/slac_klystron_lecture_series.htm
3. https://books.google.co.in/books?id=ZU19Uemy83YC&printsec=frontcover&dq=microwave+ engineering & hl=en & redir_esc=y#v=onepage & q&f = false

**E-Text Books:**

1. https://ecedmans.files.wordpress.com/2014/10/microwave-devices-and-circuits-samuel-liao.pdf
2. http://www.faadooengineers.com/threads/11621-Microwave-engineering-ebook-pdf-Free-Download
3. http://www2.electron.frba.utn.edu.ar/~jcecconi/Bibliografia/Ocultos/Libros/Microwave_Engineering_David_M_Pozar_4ed_Wiley_2012.pdf.

**Course Home Page:**

# EMBEDDED SYSTEMS

| VII Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC016 | Core | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Imbibe knowledge about the basic functions, structure, concepts and applications of Embedded Systems.
II. Understand Real time operating system concepts.
III. Analyze different tools for development of embedded software.
IV. Be acquainted the architecture of advanced processors.

| UNIT-I | EMBEDDED COMPUTING | Classes: 08 |
|---|---|---|

Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, complex systems and microprocessor, classification, major application areas, the embedded system design process, characteristics and quality attributes of embedded systems, formalisms for system design, design examples

| UNIT-II | INTRODUCTION TO EMBEDDED C AND APPLICATIONS | Classes: 09 |
|---|---|---|

C looping structures, register allocation, function calls, pointer aliasing, structure arrangement, bit fields, unaligned data and endianness, inline functions and inline assembly, portability issues; Embedded systems programming in C, binding and running embedded C program in Keil IDE, dissecting the program, building the hardware; Basic techniques for reading and writing from I/O port pins, switch bounce; Applications: Switch bounce, LED interfacing, interfacing with keyboards, displays, D/A and A/D conversions, multiple interrupts, serial data communication using embedded C interfacing

| UNIT-III | RTOS FUNDAMENTALS AND PROGRAMMING | Classes: 09 |
|---|---|---|

Operating system basics, types of operating systems, tasks and task states, process and threads, multiprocessing and multitasking, how to choose an RTOS ,task scheduling, semaphores and queues, hard real-time scheduling considerations, saving memory and power.

Task communication: Shared memory, message passing, remote procedure call and sockets; Task synchronization: Task communication synchronization issues, task synchronization techniques, device drivers.

| UNIT-IV | EMBEDDED SOFTWARE DEVELOPMENT TOOLS | Classes: 09 |
|---|---|---|

Host and target machines, linker/locators for embedded software, getting embedded software into the target system; Debugging techniques: Testing on host machine, using laboratory tools, an example system.

| UNIT-V | INTRODUCTION TO ADVANCED PROCESSORS | Classes: 10 |
|---|---|---|

Introduction to advanced architectures: ARM and SHARC, processor and memory organization and instruction level parallelism; Networked embedded systems: Bus protocols, I2C bus and CAN bus; Internet-EnAnalyzed systems, design example-Elevator controller.

**Text Books:**

1. Shibu K.V, “Introduction to Embedded Systems”, Tata McGraw Hill Education Private Limited, 2nd Edition, 2009.
2. Raj Kamal, “Embedded Systems: Architecture, Programming and Design”, Tata McGraw-Hill Education, 2nd Edition, 2011.
3. Andrew Sloss, Dominic Symes,Wright, “ARM System Developer's Guide Designing and Optimizing System Software”, 1st Edition, 2004.

**Reference Books:**

1. Wayne Wolf, “ Computers as Components, Principles of Embedded Computing Systems Design”, Elsevier, 2nd Edition, 2009.
2. Dr. K. V. K. K. Prasad, “ Embedded / Real-Time Systems: Concepts, Design & Programming”, dreamtech publishers, 1st Edition, 2003.
3. Frank Vahid, Tony Givargis, “Embedded System Design”, John Wiley & Sons, 3rd Edition, 2006.
4. Lyla B Das, “Embedded Systems” , Pearson Education, 1st Edition, 2012.
5. David E. Simon, “An Embedded Software Primer”, Addison-Wesley, 1st Edition, 1999.
6. Michael J. Pont, “Embedded C”, Pearson Education, 2nd Edition, 2008.

**Web References:**

1. https://www.smartzworld.com/notes/embedded-systems-es/
2. http://notes.specworld.in/embedded-systems-es/
3. http://education.uandistar.net/jntu-study-materials
4. http://www.nptelvideos.in/2012/11/embedded-systems.html

**E-Text Books:**

1. https://www.scribd.com/doc/233633895/Intro-to-Embedded-Systems-by-Shibu-Kv
2. http://www.ee.eng.cmu.ac.th/~demo/think/_DXJSq9r3TvL.pdf
3. https://www.scribd.com/doc/55232437/Embedded-Systems-Raj-Kamal
4. https://docs.google.com/file/d/0B6Cytl4eS_ahUS1LTkVXb1hxa00/edit
5. http://www.ecpe.nu.ac.th/ponpisut/22323006-Embedded-c-Tutorial-8051.pdf

**Course Home Page:**

# VLSI DESIGN

| **VII Semester:** ECE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC017 | **Core** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 15** | **Practical Classes: Nil** | | | | **Total Classes: 60** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Have skills to use concepts of MOS devices for the fabrication of integrated chips (IC's).
II. Familiarize CMOS layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
III. Demonstrate the ability to design static CMOS combinational and sequential logic at the transistor level, including mask layout.
IV. Focus in selecting appropriate building blocks of data path for given system.

| **UNIT-I** | **MOSFETS** | **Classes: 08** |
|---|---|---|

Fundamentals of MOSFETs; Weak & strong inversion conditions; Threshold voltage concept in MOSFETs; Current - voltage characteristics of a MOSFET; MOSFET parasitics; Trends & projections in VLSI design & technology; Scaling in MOS devices; Effects in scaling of MOS devices; BiCMOS technologies; CMOS nanotechnology.

| **UNIT-II** | **VLSI DESIGN STYLES** | **Classes: 09** |
|---|---|---|

NMOS, PMOS and CMOS fabrication Flow; Noise Margin; Inverter Threshold Voltage; NMOS inverter design and characteristics; CMOS inverter design and properties; Delay and power dissipation; Parallel & series equivalent circuits; Pass transistor; Various pull ups; Bi-CMOS inverters

| **UNIT-III** | **VLSI PHYSICAL DESIGN** | **Classes: 09** |
|---|---|---|

Stick Diagrams; Physical design rules: 2 µm and lambda CMOS design rules for wires, contacts and transistors; Layout design; Euler's rule for physical design.

VLSI Interconnects; Reliability issues in CMOS VLSI; Latching; Electromigration.

| **UNIT-IV** | **LOGIC DESIGN AND IMPLEMENTATION STRATEGIES** | **Classes: 09** |
|---|---|---|

Gate Level Design: Complex gates; Switch logic; Transmission gates; Static and dynamic CMOS design; Time delays; Driving large capacitive loads; Wiring capacitances; Fan-in and Fan-out; Choice of layers implementation strategies full custom and semi custom design; Standard cell design and cell libraries; Programmable logic devices; CPLDs; FPGA building block architectures; FPGA interconnect routing procedures; Speed and area tradeoff.

| **UNIT-V** | **SUB SYSTEM DESIGN** | **Classes: 10** |
|---|---|---|

Data Path Sub Systems: Sub system design; Shifters; Adders; ALUs; Multipliers; Parity generators; Comparators; Zero/one detectors; Counters Array Subsystems: SRAM; DRAM; ROM; Serial access Memories; Static and dynamic latches and registers; Timing issues; Clock strategies; Low power memory Circuits; Synchronous and asynchronous circuit design.

**Text Books:**


1. A. Pucknell, Kamran Eshraghian, “BASIC VLSI Design,” Third Edition, Prentice Hall of India, 2007. ISBN: 978-81-203-0986-9
2. R. Jacob Baker, Harry W.LI., David E.Boyee, “CMOS Circuit Design, Layout and Simulation,” Wiley-IEEE Press, USA, 2005. ISBN: 978-0-470-88132-3
3. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, “Digital Integrated Circuits: A Design Perspective,” Second Edition, Phi Learning, 2009. ISBN: 9788120322578


**Reference Books:**


1. N. Weste, K. Eshraghian, “Principles of CMOS VLSI Design”, Second Edition, Addision Wesley, 1993. ISBN: 978-81-317-1942-8
2. M.J. Smith, “Application Specific Integrated Circuits”, Addisson Wesley, First edition, 1997. ISBN-13: 978-0321602756
3. John P. Uyemura, “CMOS Logic Circuit Design,” Springer, USA, 2007. ISBN: 0-7923-8452-0


**Web References:**


1. http://www.nptel.ac.in/downloads/117101058/
2. https://www.tutorialspoint.com/vlsi_design/vlsi_design_digital_system.htm


**E-Text Books:**


1. http://www.csit-sun.pub.ro/courses/vlsi/Modern_VLSI_Design.pdf
2. http://ic.sjtu.edu.cn/ic/wp-content/uploads/sites/10/2013/04/CMOS-VLSI-design.pdf


**Course Home Page:**

# MICROWAVE ENGINEERING LABORATORY

**VII Semester:** **ECE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AEC110 | Core | L | T | P | C | CIA | SEE | Total |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Total Tutorials: Nil** | **Total Practical Classes: 36** | | | | **Total Classes: 36** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Measure the parameters using microwave components.
II. Analyze the generation and propagation of microwaves in waveguides.
III. Evaluate scattering parameters of different microwave junctions.
IV. Determine characteristic parameters of waveguides.

## LIST OF EXPERIMENTS

| | |
|---|---|
| **Week-1** | **STUDY OF MICROWAVE COMPLONENTS** |
| To study the different wave guide components in the microwave bench setup. | |
| **Week-2** | **MEASUREMENT OF FREQUENCY AND GUIDE WAVE LENGTH** |
| To measure the frequency of a microwave source and demonstrate relationship among guide dimensions, free space wavelength and guide wave length. | |
| **Week-3** | **MODE CHARACTERISTICS OF REFLEX KLYSTRON** |
| To study the characteristics of Reflex Klystron oscillator, finding the mode numbers and efficiencies of different modes. | |
| **Week-4** | **GUNN DIODE CHARACTERISTICS** |
| To study the characteristics of Gunn diode oscillator. | |
| **Week-5** | **ATTENUATION MEASUREMENT** |
| To measure attenuation and insertion loss of a fixed and variable attenuator. | |
| **Week-6** | **DIRECTIONAL COUPLER CHARACTERISTICS** |
| To measure coupling factor, insertion loss, isolation and directivity of a Directional coupler. | |
| **Week-7** | **MEASUREMENT OF IMPEDANCE OF GIVEN LOAD** |
| To measure the unknown impedance of given load using bench set up. | |
| **Week-8** | **SCATTERING PARAMETERS OF H-PLANE TEE AND E-PLANE TEE** |
| To find the scattering parameters of a three port H-Plane Tee And E-PlaneTEE. | |

| | |
|---|---|
| **Week-9** | **MEASUREMENT OF VSWR** |
| To measure the low and high VSWR's of matched terminals. | |
| **Week-10** | **MEASURMENT OF SCATTERING PARAMETERS OF MAGIC TEE** |
| To find the scattering parameters of a four port Magic Tee. | |
| **Week-11** | **CIRCULATOR CHARACTERISTICS** |
| To measure the isolation and insertion loss of a three port circulator. | |
| **Week-12** | **GAIN AND RADIATION PATTERN OF HORN ANTENNA** |
| Develop a Hello World application using Google App Engine. | |
| **Week-13** | **MEASUREMENT OF PHASE SHIFT** |
| To measure the Phase shift between two components in the microwave bench set up. | |
| **Week-14** | **ISOLATOR CHARACTERISTICS** |
| To measure the isolation and insertion loss of an isolator. | |

**Reference Books**


1. Samuel Y. Liao, "Microwave Devices and Circuits", Pearson, 3rd Edition, 2003.
2. Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, "Microwave Principles" ,CBS Publishers and Distributors, New Delhi, 1st Edition, 2004.
3. F.E. Terman, "Electronic and Radio Engineering", Tata McGraw-Hill Publications, 4th Edition, 1955.


**Web References:**

1. http://www.ee.iitkgp.ac.in
2. http://www.citchennai.edu.in

**Course Home Page:**

## LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS

| S. No | Name of the Equipment | Range/Model |
|---|---|---|
| 1 | Klystron Based Microwave Bench Setup | -- |
| 2 | Gunn diode Based Microwave Bench Setup | -- |
| 3 | VSWR Meter | -- |
| 4 | FUNCTION GENERATOR | 0-1 MHz |
| 5 | Slotted Line | -- |
| 6 | Magic Tee | -- |
| 7 | Circulator | -- |
| 8 | Directional Coupler | -- |
| 9 | Variable Attenuator | -- |
| 10 | Matched Terminator | -- |
| 11 | Cathode Ray Oscilloscope | (0-30) MHz |
| 12 | Dc Regulated Power Supply | (0-30) V |

## EMBEDDED SYSTEM LABORATORY

| VII Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC111 | Core | L | T | P | C | CIA | SEE | Total |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Total Tutorials: Nil | Total Practical Classes: 36 | | | | Total Classes: 36 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Demonstarte Keil IDE tool for development of Embedded system
II. Program the interfacing of various devices with 8051 using Embedded C
III. Develop program for implementation of interrupts and serial communications

### LIST OF EXPERIMENTS

**Week-1 DEVELOP PROGRAM USING KEIL IDE TOOL**

Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects.

a. Programming
b. Execution
c. Debugging

To Demonstrate the Tool Chain for Keil IDE (Embedded Systems Development Tool Chain) with the example of LED Blinking Program.

**Week-2 INTERFACING LED WITH DIFFERENT PORT PINS**

a)Program to toggle all the bits of port P1 continuously with 250 ms delay
b)Program to toggle only the bit P1.5 continuously with some delay

**Week-3 INTERFACING BUZZER AND SWITCH**

Program to interface a switch and a buzzer to two different pins of a port such that the buzzer should sound as long as the switch is pressed.

**Week-4 INTERFACING LCD DISPLAY**

Program to interface LCD data pins to port P1 and display a message on it using P89V51RD2

**Week-5 INTERFACE HEXA KEYPAD**

Program to 4*4 interface keypad. Whenever a key is pressed, it should be displayed on LCD

**Week-6 INTERFACE SEVEN SEGMENT DISPLAY**

Program to interface seven segment display using 89V51RD2

**Week-7 SERIAL COMMUNICATION INTEFACING**

Program for serial communication between Microcontroller to PC communication the data should be transfer from microcontroller to PC terminal window using 89V51RD2

| | |
|---|---|
| **Week-8** | **SERIAL COMMUNICATION INTEFACING** |
| Program for serial communication between PC to Microcontroller communication the data should be transfer from PC to Microcontroller terminal window using 89V51RD2 | |
| **Week-9** | **INTERFACING WITH TEMPERATURE SENSOR** |
| Program to develop necessary interfacing circuit to read data from I) Temperature sensor and process using P89V51RD2, the data has to display terminal window | |
| **Week-10** | **INTERFACING STEPPER MOTOR** |
| Program to interface Stepper Motor to rotate the motor in clockwise and anticlockwise directions | |
| **Week-11** | **INTERFACING MULTPLE DEVICES** |
| Program to verify run 2 to 3 tasks simultaneously on P89V51RD2 SDK. Use LCD interface, LED interface, Serial communication. | |
| **Week-12** | **INTERFACE ADC DEVICE** |
| Program to interface ADC device with P89V51RD2 and display value on LCD | |
| **Week-13** | **INTERFACE DAC DEVICE** |
| Program to interface DAC device with P89V51RD2 and observer the analog output in CRO | |
| **Week-14** | **INTERFACE RELAY** |
| Program to interface Relay with P89V51RD2 using transistor | |
| **Week-15** | **INTERRUPT** |
| Program to toggle LEDS using simple INTERRUPT | |

**Reference Books**


1. Lyla B Das, "Embedded Systems", 1st Edition, Pearson Education, 2012.
2. Michael J. Pont, "Embedded C", Pearson Education, 2nd Edition, 2008
3. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Education 2nd Edition, Tata McGraw Hill, 2011.


**Web References:**

1. https://www.intorobotics.com/8051-microcontroller
2. https://electrosome.com/led-blinking-8051-microcontroller-keil-c-tutorial-at89c51/
3. http://www.8051projects.net/wiki/Keil_Embedded_C_Tutorial

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR 36 STUDENTS**

**HARDWARE:** Desktop Computer Systems 36 nos

**SOFTWARE:** Keil Micro Vision, PSoC Designer 5.0

## LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS

| S. No | Name of the Equipment | Range |
|---|---|---|
| 1 | Power Supply | 0-5V DC |
| 2 | P89V51RD2 Development kits | -- |
| 3 | P89C51RD2 Development kits | -- |
| 4 | Serial communication cables | -- |

# VLSI DESIGN LABORATORY

| VII Semester: ECE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC112 | Core | L | T | P | C | CIA | SEE | Total |
| | | - | - | 3 | 2 | 30 | 70 | 100 |
| Contact Classes: Nil | Total Tutorials: Nil | Total Practical Classes: 36 | | | | Total Classes: 36 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the basic concepts about MOS device and inverter characteristics
II. Understand the fabrication steps of IC design and design flow of VLSI circuits
III. Design the stick diagram and layout of a circuit
IV. Design the different MOSFET amplifier circuits

## LIST OF EXPERIMENTS

**Week-1 MOSFET**

To plot the (i) output characteristics
(ii) Transfer characteristics of an n-channel and p-channel MOSFET.

**Week-2 CMOS INVERTER**

To design and plot the static (VTC) and dynamic characteristics of a digital CMOS inverter.

**Week-3 RING OSCILLATOR**

To design and plot the output characteristics of a 3-inverter ring oscillator.

**Week-4 LOGIC GATES**

To design and plot the dynamic characteristics of 2-input NAND, NOR, XOR and XNOR logic gates using CMOS technology.

**Week-5 4X1 MULTIPLEXER**

To design and plot the characteristics of a 4x1 digital multiplexer using pass transistor logic.

**Week-6 LATCHES**

To design and plot the characteristics of a positive and negative latch based on multiplexers.

**Week-7 REGISTERS**

To design and plot the characteristics of a master-slave positive and negative edge triggered registers based on multiplexers.

**Week-8 DIFFERENTIAL AMPLIFIER**

Design and simulation of a simple 5 transistor differential amplifier. Measure gain, ICMR, and CMRR.

| | |
|---|---|
| **Week-9** | **NMOS INVERTER AND CMOS INVERTER** |
| To design layout of NMOS and CMOS inverter. | |
| **Week-10** | **LAYOUT OF 2-INPUT NAND, NOR GATES** |
| To design the layout of 2-input NAND, NOR gates. | |
| **Week-11** | **COMMON SOURCE AMPLIFIER** |
| Analysis of Frequency response of Common source amplifiers. | |
| **Week-12** | **COMMON DRAIN AMPLIFIER** |
| Analysis of Frequency response of Common drain amplifiers. | |
| **Week-13** | **SINGLE STAGE CASCODE AMPLIFIER** |
| Design and Simulation of Single Stage Cascode Amplifier. | |
| **Week-14** | **BASIC CURRENT MIRROR, CASCODE CURRENT MIRROR AMPLIFIER** |
| Design and Simulation of Basic Current Mirror, Cascode Current Mirror Amplifier. | |

**Reference Books**

1. Razavi, Design of Analog CMOS Integrated Circuits, Tata McGraw Hill Publications, 2002.
2. Allen Holberg, CMOS Analog Circuit Design, Oxford Publications, 2002.
3. Baker, Li, Boyce, CMOS Mixed Circuit Design, Wiley Publications, 2002.

**Web References:**

1. http://iitg.vlab.co.in/?sub=59&brch=165

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR 36 STUDENTS**

**HARDWARE:** Desktop Computer Systems 36 nos

**SOFTWARE:** Cadence tools

# COMPUTER NETWORKS

| VIII Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AIT003 | Foundation | L | T | P | C | CIA | SEE | Total |
| | | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Recognize modern network architectures from a design and performance perspective.
II. Understand the basics and challenges of network communication.
III. Provide an opportunity to do network programming using TCP/IP.
IV. Interpret the operation of the protocols that are used inside the Internet.

| UNIT-I | INTRODUCTION TO PHYSICAL LAYER | Classes: 10 |
|---|---|---|

Introduction: Networks, network types, internet history, standards and administration; Network models: Protocol layering, TCP/IP protocol suite, the OSI model; Introduction to physical layer: Data and signals, transmission impairment, data rate limits, performance; Transmission media: Introduction, guided media, unguided media; Switching: Introduction, circuit switched networks, packet switching.

| UNIT-II | INTRODUCTION TO DATA LINK LAYER | Classes: 09 |
|---|---|---|

Introduction: Link layer addressing, error detection and correction: Cyclic codes, checksum, forward error correction: Data link control: DLC services, data link layer protocols, HDLC, point to point protocol, media access control: Random access, controlled access, channelization, connecting devices and virtual LAN: Connecting devices, virtual LAN.

| UNIT-III | THE NETWORK LAYER | Classes: 10 |
|---|---|---|

Network layer design issues, routing algorithms, congestion control algorithms, quality of service, and internetworking.

The network layer in the internet: IPv4 addresses, IPv6, internet control protocols, OSPF (Open Shortest Path First), BGP (Border Gateway Protocol), IP, (Internet Protocol), ICMP (internet control message protocol.

| UNIT-IV | THE TRANSPORT LAYER | Classes: 10 |
|---|---|---|

The transport service, elements of transport protocols, congestion control; The internet transport protocols: UDP (User Datagram Protocol), TCP (Transport Control Protocol), performance problems in computer networks, network performance measurement.

| UNIT-V | INTRODUCTION TO APPLICATION LAYER | Classes: 10 |
|---|---|---|

Introduction, client server programming, WWW (World Wide Web) and HTTP (Hyper Text Transfer Protocol), FTP (File Transfer Protocol), E-Mail, TELNET, SECURE SHELL, DNS(Domain Naming System), SNMP (Simple Network Management Protocol).

**Text Books:**

1. Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw-Hill, 5th Edition, 2012.
2. Andrew S. Tanenbaum, David.j.Wetherall, “Computer Networks”, Prentice-Hall, 5th Edition, 2010.

**Reference Books:**

1. Douglas E. Comer “Internetworking with TCP/IP “, Prentice-Hall, 5th Edition, 2011.
2. Peterson, Davie, Elsevier “Computer Networks”, 5th Edition,2011
3. Comer, “Computer Networks and Internets with Internet Applications”, 4th Edition, 2004.
4. Chawan- Hwa Wu, Irwin, “Introduction to Computer Networks and Cyber Security”, CRC publications, 2014.

**Web References:**

1. http://computer.howstuffworks.com/computer-networking-channel.htm
2. http://www.ietf.org
3. http://www.rfc-editor.org/
4. https://technet.microsoft.com/en-us/network/default.aspx

**E-Text Books:**

1. http://www.freebookcentre.net/networking-books-download/Lecture-Notes-on-Computer-Networks.html
2. http://www.freebookcentre.net/networking-books-download/Introduction-to-Computer-Networks.html

**MOOC Course**

1. https://www.mooc-list.com/course/networking-introduction-computer-networking-stanford-university
2. https://lagunita.stanford.edu/courses/Engineering/Networking/Winter2014/about.

**Course Home Page:**

# OPTICAL COMMUNICATION

| VIII Semester: ECE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC018 | **Core** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
II. Interpret various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
III. Understand fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
IV. Analyze fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

| UNIT-I | OVERVIEW OF OPTICAL FIBRE COMMUNICATION | Classes: 10 |
|---|---|---|

Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod; rays and modes; different types of optical fibers, modal analysis of a step index fiber, linearly polarized modes, single mode fibers and graded - index fiber.

| UNIT-II | SIGNAL DEGRADATION AND OPTICAL SOURCES | Classes: 09 |
|---|---|---|

Attenuation- Absorption, scattering losses, bending losses, core and cladding losses; signal distortion in optical waveguides; Material Dispersion, Waveguide Dispersion; Optical sources; Semiconductor device fabrication, LED and LASER diode; Principles of operation, concepts of line width, phase noise, switching and modulation characteristics.

| UNIT-III | OPTICAL DETECTORS | Classes: 08 |
|---|---|---|

Optical detectors: pin detector, avalanche photodiode - Principles of operation, concepts of responsively, sensitivity and quantum efficiency, noise in detection.

Multichannel Transmission Technique-Multichannel Frequency Modulation, Subcarrier multiplexing. WDM Concepts and Components

| UNIT-IV | OPTICAL AMPLIFIERS | Classes: 08 |
|---|---|---|

Basic concepts, semiconductor amplifier, erbium-doped fiber amplifier, Raman amplifier, Brillouin amplifier - principles of operation, amplifier noise, signal to noise ratio, gain, gain bandwidth, gain and noise dependencies, intermodulation effects, saturation induced crosstalk, wavelength range of operation

| UNIT-V | OPTICAL NETWORKS AND DISPERSION COMPENSATION | Classes: 10 |
|---|---|---|

Optical networks: SONET/SDH, ATM, IP, wavelength routed networks, soliton communication system, fiber soliton, soliton based communication system design, high capacity and WDM soliton.

**Text Books:**

1. Keiser. G, “Optical fiber communications”, Tata McGraw-Hill, 4th Edition, New Delhi, 2008.
2. Agrawal. G.P, “Fiber-Optic Communication Systems” John Wiley & Sons, 3rd Edition, 2002.

**Reference Books:**

1. John Gowar, “Optical Communication Systems”, Prentice Hall, 2nd Edition, 1993.
2. Franz, Jain, “Optical communication, Systems and Components”, Narosa Publications, 1st Edition New Delhi, 2000.
3. Karminvov, T. Li “Optical Fibre Telecommunications”, Vol A & B, Academic Press, 2002.

**Web References:**

1. http://nptel.ac.in
2. http://nptel.ac.in/courses
3. https://onlinecourses.nptel.ac.in

**E-Text Books:**

1. https://eceagmr.files.wordpress.com
2. http://www.slac.stanford.edu
3. https://www.utdallas.edu

**Course Home Page:**

# SENSORS AND ACTUATORS

| I Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC501 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Develop a basic understanding of different sensor types.
II. Know the different types of mechanical and electrical sensors.
III. Know the principles of various sensors and their characteristics.
IV. Know the fundamental principles which can be applied to develop the present and future sensor systems.
V. Know the characterization (static and dynamic) of sensors.

| UNIT-I | SENSOR PRINCIPLES AND CHARACTERISTICS | Classes: 10 |
|---|---|---|

Basic sensor technology, sensor characteristics, static and dynamic, principles of sensing, capacitance, magnetic and electromagnetic induction, resistance, piezoelectric effect, pyro electric effect, Hall effect, Seebeck and Peltier effect, heat transfer, light, analysis of experimental data, causes and types of experimental errors, statistical analysis of experimental data, method of least squares, correlation coefficient, multivariable regression, graphical analysis and curve fitting; Stress, strain, Hook's law, Poisson's ratio, tensile strength, yield strength, bending stress and yielding ,vibration definitions and terminology

| UNIT-II | ACTIVE AND PASSIVE SENSORS-I | Classes: 09 |
|---|---|---|

Potentiometric and capacitive sensors, inductive and magnetic sensors, LVDT, RVDT, eddy current, transverse inductive, magneto-resistive, Hall effect, ultrasonic sensors, thickness and level sensors, ablation, thin film, liquid level sensor, linear velocity sensors, doppler shift, light interference method, seismic devices, angular velocity sensors ,dc and ac tachometer, counter types, hall effect, wiegand effect, absolute angular rate sensors, gyroscopes ,magnetic speed and direction sensor, accelerometer dynamics, capacitive, piezoresistive, piezoelectric accelerometers, thermal accelerometer, heated plate, heated gas accelerometers, force balance accelerometer.

| UNIT-III | ACTIVE AND PASSIVE SENSORS-II | Classes: 08 |
|---|---|---|

Strain gages, tactile sensor, piezoelectric force sensor, torque sensor, thrust measurement, Bellows, membranes, thin plates, piezo resistive, capacitive sensors ,vacuum sensors ,thermal conductivity gages, pirani gage, thermistor gage, thermocouple gage, convection gage ,ionization gage, gas drag gage.

Flow sensors, pressure gradient technique, turbine and vane flow meter, thermal mass flow sensors, ultrasonic sensors, electromagnetic flow sensors, micro flow sensors, Breeze sensors, coriolis mass flow sensors, drag force flow sensors, laser doppler anemometer.

| UNIT-IV | ACOUSTIC AND TEMPERATURE SENSORS | Classes: 08 |
|---|---|---|
| Resistive Microphones, condenser microphones, fiber optic microphone, piezoelectric microphones, electret microphones, solid state acoustic detectors, surface acoustic wave sensor, bulk acoustic wavsensor, acousticresonance, thermoresistive, thermoelectric, semiconductorPNJunction, optical, acoustic, piezoelectric temperature sensors. | | |
| **UNIT-V** | **ACTUATORS** | **Classes: 10** |
| Pneumatic and hydraulic actuation systems, actuation systems, pneumatic and hydraulic systems, directional control valves, pressure control valves, cylinders, servo and proportional control valves, process control valves, rotary actuators, mechanical actuation systems, types of motion, kinematic chains, cams, gears, ratchet and pawl, belt and chain drives, bearings, mechanical aspects of motor selection, electrical actuation systems, electrical systems, mechanical switches, solid state switches, solenoids, D.C. Motors, A.C. motors , Stepper motors. | | |

**Text Books:**


1. Jacob Fraden, " Hand Book of Modern Sensors: physics, Designs and Applications", springer ,3rd Edition , 2003.
2. Jon. S. Wilson, "Sensor Technology Hand Book", Elsevier, 1st Edition , 2004.
3. D. Patranabis, "Sensors and Transducers" ,PHI Learning Private Limited, 2nd Edition, 2003.


**Reference Books:**


1. W. Bolton, "Mechatronics", Pearson Education Limited, 4th Edition, 2008.
2. D. Patranabis," Sensors and Actuators", PHI, 2nd Edition 2013.
3. John G Webster, "Measurement, Instrumentation and sensors Handbook", CRC press, 2nd Edition, 2014.


**Web References:**

1. http://www.elsevier.com
2. http://www.sciencedirect.com
3. http://www.electrical4u.com
4. http://www.edn.com

**E-Text Books:**

1. http://www.e-booksdirectory.com
2. http://www.ebooks.com
3. https://en.wikibooks.org
4. http://jntu-ebooks.blogspot.in

**Course Home Page:**

# AUTOMOTIVE AND OPTICAL SENSORS

| I Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC502 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the functioning of an automobile.
II. Classify the automotive sensors of different types, their principles and applications.
III. Understand the sensors for automotive vehicle convenience and security systems.
IV. Understand the principles underlying the theory, principles and the wide application of fiber optic sensing.
V. Understand the different types of optical sensors and different optoelectronic sources, detectors and various applications.

| UNIT-I | INTRODUCTION TO AUTOMOTIVE ENGINEERING | Classes: 10 |
|---|---|---|

Power-train, combustion engines, transmission, differential gear, braking systems, introduction to modern automotive systems and need for electronics in automobiles, application areas of electronics in the automobiles, possibilities and challenges in the automotive industry, Enabling technologies and Industry trends.

| UNIT-II | ACTIVE AND PASSIVE SENSORS | Classes: 09 |
|---|---|---|

Λ sensors, exhaust temperature sensor, Nox sensor, PM sensor, fuel quality sensor, level sensor, torque sensor, speed sensor, mass flow sensor, manifold pressure sensor, Wheel speed sensors/direction sensors, steering position sensor (multi turn), acceleration sensor (inertia measurement), brake pneumatic pressure sensor, ABS sensor, electronic stability sensor, Gas sensors (CO2), temperature/humidity sensor, air bag sensor, key less entering sensor, radar sensors.

| UNIT-III | ACTIVE AND PASSIVE SENSORS | Classes: 08 |
|---|---|---|

Tire pressure monitoring systems, two wheeler and four wheeler security systems, parking guide systems, anti lock braking system, future safety technologies; Vehicle diagnostics and health monitoring, safety and reliability, traction control, vehicle dynamics control, accelerators and tilt sensors for sensing skidding and anti collision - anti collision techniques using ultrasonic doppler sensors.

Principal sensor functions, distributed front air bag sensing systems, single-point sensing systems, side-impact sensing, and future occupant protection systems, electromechanical seat, seat belt height, steering wheel and mirror adjustments, central locking systems, tire pressure control systems, electromechanical window drives.

| UNIT-IV | OPTICAL RADIATION ,OPTICAL DETECTORS AND SOURCES | Classes: 08 |
|---|---|---|

Electromagnetic spectrum, snell's law and total internal reflection, diffraction principles, generation of free carriers in semiconductors by absorption of electromagnetic radiations, phototransistors and photo-darlington pairs, photoconductive sensors, photomultiplier tubes, photo diodes, APD, wavelength sensors, CCD sensors, CMOS active pixel sensor technology, solid state light sources, LED, diode lasers,

| | | |
|---|---|---|
| semiconductor laser optical cavity resonator, distributed feedback lasers (DFB),vertical cavity surface emitting Lasers (VCSELs), Radiometry and photometry, Black-body radiation, | | |
| **UNIT-V** | **OPTICAL FIBRES AND FIBRE OPTIC SENSORS** | **Classes: 10** |
| Multimode step index fibers, multimode graded index fibers, pulse spreading/dispersion in single mode optical fibers, material dispersion, waveguide dispersion, chromatic dispersion, attenuation in optical fiber-absorption, scattering, polarization modes in single mode fibers, h parameter and beat length, polarization maintaining fibers, intensity modulated, evanescent field fiber optic sensors, reflection coefficient fiber-optic sensors, moving grating fiber-optic sensors, micro bend fiber-optic sensors, fiber bragg grating sensors, FBG fabrication methods, fiber-optics temperature and refractive index sensors, fiber-optic curvature sensors, integrated optical sensors, PMT, optical sensors used in Satellites. | | |

**Text Books:**


1. BOSCH Automotive Electrics, Automotive Electronics: Systems &Components, 4th Edition, 2014.
2. Safa O. Kasap, "Optoelectronics and Photonics", Prentice Hall, 1st Edition, 2001.
3. J.Watson, "Optoelectronics", Van Nostrand Reinhold publishers, 1st Edition, 1989.
4. Grattan, L.S., Meggitt, B.T, "Optical fiber Sensor technology", Springer, 1st Edition, 1999.


**Reference Books:**


1. Ronald K.Jurgen, "Sensors and Transducers, SAE, 2nd Edition, 2003.
2. Ernest O.Doebelin, "Measurement Systems -Application and Design ", McGraw-Hill, 4th Edition 2000
3. Tai-Ran Hsu, "MEMS & Microsystem, Design and Manufacture", McGraw Hill, 1st Edition, 2002
4. K Booth, S.Hill, "Essence of optoelectronics", Prentice hall, 1st Edition,1998
5. Udd, Eric, "Fiber Optic Sensors : An introduction for engineers and scientists", Wiley, 1st Edition, 1991
6. Agarwal, Govind P, "Fiber Optic Communication Systems", Wiley , 2nd Edition,1997


**Web References:**


1. http://www.continentalautomotive.com/www/automotive_de_en/themes/passenger_cars/chassis_safety/adas/rdp_en.html
2. http://www.continentalautomotive.com/www/automotive_de_en/themes/commercial_vehicles/camera_systems_en/proviu_detect_en.html
3. http://www.continentalautomotive.com/www/automotive_de_en/themes/two_wheelers/electronic_brake_systems/mib_en.html


**E-Text Books:**


1. http://www.springer.com/in/book/9783658017835
2. https://books.google.co.in/books/about/Optoelectronics_and_Photonics.html?id=MaEeAQAAIAAJ&redir_esc=y


**Course Home Page:**

# DEVICE MODELING

| I Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC503 | **Elective** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Use simulation tools to model a circuit.
II. Analyze circuits using Spice simulation.
III. Apply mathematical techniques for device simulations.
IV. Design different amplifiers using BJTs, JFETs and MOPSFETs using Simulation.

| UNIT-I | INTRODUCTION TO DEVICE MODELLING | Classes: 10 |
|---|---|---|

Introduction: Device Modeling; Use of device models in circuit analysis; Circuit simulation; Fundamentals of SPICE simulation; Circuit simulation using SPICE; Basic SPICE simulation models; Basic SPICE simulation model parameters; Advanced SPICE simulation model parameters; Passive component models.

| UNIT-II | MATHEMATICAL TECHNIQUES FOR DEVICE SIMULATIONS | Classes: 09 |
|---|---|---|

Poisson equation; Continuity equation; Drift-diffusion equation; Schrodinger equation; Hydrodynamic equations; Trap rate, Finite difference solutions to these equations in 1D and 2D space, grid generation.

| UNIT-III | DIODE AND BJT DEVICE MODELLING | Classes: 08 |
|---|---|---|

Diode models: Spice Diode I-V characteristic with Temperature Effects; Load Line solution; Spice diode model: Ideal , ideal with voltage drop , ideal with voltage drop and series resistance , dc diode model, small signal diode model, HF diode model; Diode Circuits : Rectifier, clipping , Spice simulation.

Bipolar models: DC BJT model, small signal BJT model, High frequency BJT model; Measurement of BJT Model parameters; Common-emitter amplifier, Emitter-follower.

| UNIT-IV | JFET DEVICE MODELLING | Classes: 08 |
|---|---|---|

JFET models: Spice AC, DC, transient, and bias point simulations; Bias with Current Source; Ohmic and SAT regions ; JFET Small-Signal Analysis: Small-signal model, common-source amplifier, source-follower, input and output impedance using SPICE.

| UNIT-V | MOSFET DEVICE MODELLING | Classes: 10 |
|---|---|---|

MOSFET model: Dc MOSFET model, small signal MOSFET model, high frequency MOSFET model; Measurement of MOSFET model; Modeling noise sources in noise sources; Simple MOSFET models for MOSDFET applications; MOSFET small-signal analysis: Small-signal model, common-source amplifier, Source-follower, input and output impedance.

**Text Books:**


1. M.E. Herniter "Schematic Capture with Cadence PSpice", Prentice Hall, 2nd Edition, 2003.
2. Chua, L.O. and Lin, P.M., "Computer-Aided Analysis of Electronic Circuits: Algorithms and Computational Techniques", Prentice-Hall, 1st Edition 1975.
3. P. Antogneth, G. Massobrio, "Semiconductor Device Modeling with SPICE", McGraw-Hill, 2nd Edition, 1993.


**Reference Books:**


1. B.G.Streetman, S.Banerjee , "Solid State Electronic Devices", Prentice Hall India.
2. S. Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 7th Edition, 2015.
3. Andrei Vladimirescu, "The Spice Book ", John Wiley & Sons, 1994 .
4. Selberherr, S , "Analysis and Simulation of Semiconductor Devices" , Springer, 1984.
5. Fjeldly, Yetterdal, Shur, "Introduction to Device Modeling and Circuit Simulation", Wiley-Interscience., 1997.


**Web References:**

1. http://class.ece.iastate.edu/ee508/GAS_book/chap3.pdf
2. http://nptel.ac.in/courses/117106033/
3. http://www.iare.ac.in
4. http:// www.jntumaterials.co.in
5. http://www-inst.eecs.berkeley.edu/~ee130/sp03/lecture.html

**E-Text Books:**

1. http://www.bookzz.org/
2. http://www.www.jntubook.com
3. http://www.4shared.com/web/preview/pdf/CeQiu2Llba
4. http://www.gbv.de/dms/ilmenau/toc/128819782.pdf

**Course Home Page:**

# BIO MEDICAL INSTRUMENTATION

| I Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC504 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Explain the physiology of the heart, lung, blood circulation and circulation respiration. Biomedical applications of different transducers used.
II. Develop the various sensing and measurement devices of electrical origin. To provide awareness of electrical safety of medical equipments.
III. Analyze the latest ideas on devices of non-electrical devices.
IV. Analyze modern methods of imaging techniques.
V. Understand latest knowledge of medical assistance / techniques and therapeutic equipments.

| UNIT-I | PHYSIOLOGY AND TRANSDUCERS | Classes: 10 |
|---|---|---|

Cell and its structure: Resting and action potential nervous system, functional organization of the nervous system, structure of nervous system, neurons synapse transmitters and neural communication, cardiovascular system respiratory system, basic components of a biomedical system, transducers selection criteria piezoelectric, ultrasonic transducers, temperature measurements, fiber optic temperature sensors.

| UNIT-II | ELECTRO – PHYSIOLOGICAL MEASUREMENTS | Classes: 09 |
|---|---|---|

Electrodes: Limb electrodes, floating electrodes, pregelled disposable electrodes, micro, needle and surface electrodes. Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers, isolation amplifier, ECG, EEG, EMG, ERG, lead systems and recording methods, typical waveforms. Electrical safety in medical environment: shock hazards, leakage current, instruments for checking safety parameters of biomedical equipments.

| UNIT-III | NON-ELECTRICAL PARAMETER MEASUREMENTS | Classes: 08 |
|---|---|---|

Measurement of blood pressure, Cardiac output, Heart rate, Heart sound, Pulmonary function measurements, spirometer, photo plethysmography, body plethysmography.

Blood Gas analyzers: pH of blood –measurement of blood pCO2, pO2, finger-tipoxymeter - ESR, GSR measurements.

| UNIT-IV | MEDICAL IMAGING | Classes: 08 |
|---|---|---|

Radio graphic and fluoroscopic techniques, computer tomography, magnetic resonance imaging, ultrasonography, endoscopy, gamma camera, thermography, different types of biotelemetry systems and patient monitoring, introduction to biometric systems.

| UNIT-V | ASSISTING AND THERAPEUTIC EQUIPMENTS | Classes: 10 |
|---|---|---|

Pacemakers, defibrillators, ventilators, nerve and muscle stimulators, diathermy, heart, lung machine, audio meters, dialysers, lithotripsy.

**Text Books:**

1. R.S.Khandpur, "Hand Book of Bio-Medical instrumentation", McGraw-Hill Publishing Co Ltd, 1st Edition, 2003
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, "Bio-Medical Instrumentation and Measurements", 2nd Edition, Pearson Education, 2002.
3. K.N.Scott, A.K.Mathur, "Text Book of Biomedical Instrumentation", CBS Publisher, 1st Edition, 2007.

**Reference Books:**

1. M.Arumugam, "Bio-Medical Instrumentation", Anuradha Agencies, 1st Edition, 2003.
2. L.A. Geddes, L.E.Baker, "Principles of Applied Bio-Medical Instrumentation", John Wiley & Sons, 2nd Edition, 1975.
3. J.Webster, "Medical Instrumentation", John Wiley & Sons, 4th Edition, 1995.
4. C.Rajarao, S.K.Guha, "Principles of Medical Electronics and Bio-medical Instrumentation", Universities press (India) Ltd, Orient Longman ltd, 1st Edition, 2000.

**Web References:**

1. www.aami-bit.org/
2. https://accessengineeringlibrary.com/
3. www.biomed.mtu.edu

**E-Text Books:**

1. www.free-engineering-books.com
2. 117.55.241.6/library/E-Books
3. biomedikal.in/2009/12/lecture-notes-on-biomedical-instrumentation
4. www.biomed.mtu.edu

**Course Home Page:**

# SILICON ON INSULATOR AND ADVANCED MOSFET BASED STRUCTURES

**I Group:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AEC505 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | Total Classes: 45 | | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Learn various aspects of a MOSFET and scaling theory.
II. Understand the technology and modeling aspects of SOI MOSFET.
III. Learn about multiple gate MOSFETS and their requirement.
IV. Understand and study the nano-scale MOSFET.
V. Study quantum-mechanics phenomenon in a nano-sized MOSFET.

**UNIT-I REVIEW OF MOS DEVICE** **Classes: 10**

Band diagrams, drain current and subthreshold characteristics, drain conductance, transconductance, substrate bias, mobility, low field mobility, high field mobility, mobility various models, scaling of MOSFET, short channel and narrow channel MOSFET, high-k gate dielectrics, ultra shallow junctions, source and drain resistance.

**UNIT-II SOI MOSFET** **Classes: 09**

The SOI MOSFET: Construction, operation, Symbol, comparison of capacitances with bulk MOSFET, PD and FD SOI devices, short channel effects.

**UNIT-III SOI MOSFET CHARACTERISTICS** **Classes: 08**

Current-voltage characteristics: Lim & Fossum model and C-V model, transconductance.

Impact ionization and high field effects: Kink effect and Hot carrier degradation, Floating body and parasitic BJT effects, self heating.

**UNIT-IV MULTI GATE SOI MOSFET** **Classes: 08**

Multiple gate SOI MOSFETs: double gate, FINFET, triple gate, triple-plus gate, GAA, device characteristics, short channel effects, threshold effect, volume inversion, mobility, FINFET.

**UNIT-V NANO-MOSFET** **Classes: 10**

Physical view of nano scale MOSFET, Nator’s theory of the ballistic MOSFET, role of quantum capacitance, scattering theory, MOSFET physics in terms of scattering, transmission coefficient under low and high drain biases, silicon nano wires, evaluation of the I-V characteristics, I-V characteristics of non-degenerate and degenerate carrier statistics.

**Text Books:**


1. Jean-Pierre Colinge, “Physics of Semiconductor Devices”, Kluwer Academic Publishers, eBook. ISBN: 0-306- 47622-3, Print ISBN: 1-4020-7018-7.
2. Y. Taur and T.H. Ning, “Fundamentals of Modern VLSI Devices”, Cambridge University Press, 1998. ISBN: 0-521-55959-6.

**Reference Books:**

1. Jean-Pierre Colinge, “FinFETs and Other Multi-Gate Transistors,” Springer, 2008. ISBN 978-0-387-71751-7 e-ISBN 978-0-387-71752-4.
2. Amara, Olivier Rozeau, “Planar Double-Gate Transistor, From Technology to Circuit”, Springer, 2009. ISBN978-1-4020-9327-2, e-ISBN978-1-4020-9341-8.
3. Jean- Pierrie Colinge, “Silicon-on-insulator Technology: Materials to VLSI,” Kluwer Academic Publishers Group, 2004.

**Web References:**

1. http://nptel.ac.in/courses/117108047/
2. https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=8&cad=rja&uact=8&ved=0ahUKEwiowdCHyNLQAhUJqY8KHTGDD8AQFgg_MAc&url=http%3A%2F%2Finst.eecs.berkeley.edu%2F~ee130%2Fsp07%2Flectures%2Flecture43.ppt&usg=AFQjCNHhgoBdqUk1-WYp2kDHdKgOIRdquQ&bvm=bv.139782543,d.c2I

**E-Text Books:**

1. http://ece.iisc.ernet.in/~navakant/nano/2007/Lecture23.pdf
2. http://textofvideo.nptel.iitm.ac.in/106105034/lec2.pdf

**Course Home Page:**

# POWER SEMICONDUCTOR DEVICES

| I Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC506 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand and model the avalanche break down mechanism in power diodes.
II. Analyze the applications of power BJT as a switch and explore typical switching applications.
III. Understanding operation of Thyristors.
IV. Interpret power MOSFET theory and its applications.
V. Simulate power semiconductor devices and understand their I-V and switching characteristics.

| UNIT-I | P-N JUNCTION THEORY | Classes: 10 |
|---|---|---|

Avalanche Breakdown voltage of plane and planar p-n junctions, Breakdown voltage improvement Techniques. High injection level effects in p-n junctions. Forward voltage drop in high voltage PIN diodes and its dependence on carrier lifetime.

| UNIT-II | POWER BJT | Classes: 09 |
|---|---|---|

Bipolar Power Transistor structures and characteristics, Current-gain, Switching operation, second break down and safe operating area, overlay transistor.

| UNIT-III | THYRISTORS | Classes: 08 |
|---|---|---|

Thyristor operation principles, reverse and forward blocking voltage, forward conduction characteristics.

Cathode shorted and anode shorted thyristor, di/dt and dv/dt ratings of thyristors, triacs and GTO.

| UNIT-IV | POWER MOSFET | Classes: 08 |
|---|---|---|

Power MOSFET structure, I-V characteristics, on resistance, Minimum size chip design for specific drain breakdown voltage, Switching characteristics, safe operating area, insulated gate transistor (IGT): Structure, operation principle, I-V characteristics and turn off transients, latch up and its prevention.

| UNIT-V | POWER IC | Classes: 10 |
|---|---|---|

Power Integrated Circuit Problems and isolation techniques in HVIC's. Smart PIC's and HVIC's.

**Text Books:**


1. Baliga, B. Jayant, "Power Semiconductor Devices", PWS Publishing Co., Boston, 1st Edition,1996
2. Benda, Vitezslav, John Gowar, Duncan A. Grant, Chichester , "Power semiconductor devices: theory and applications", New York Wiley, 1st Edition, 1999.

| Reference Books: |
|---|
| 1. Bose, Bimal K, Modern Power Electronics, Evolution, Technology, and Application, IEEE Press, 1st Edition,1992.<br>2. Ramshaw, Raymond S., "Power Electronics Semiconductor Switches", London: Chapman & Hall (Kluwer), 2nd Edition, 2002.<br>3. Rashid, Muhammad H., Upper Saddle River, "Power Electronics, Circuits, Devices and Applications", NJ: Pearson Education, 3rd Edition, 2003. |
| **Web References:** |
| 1. http://nptel.ac.in/courses/117103063/2<br>2. http://nptel.ac.in/courses/108105066/3 |
| **E-Text Books:** |
| 1. http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Power%20Electronics/PDF/L-3(DK)(PE)%20((EE)NPTEL).pdf<br>2. http://nptel.ac.in/courses/117102012/ |
| **Course Home Page:** |

# DIGITAL SIGNAL PROCESSORS AND ARCHITECTURE

**II Group:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC507 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Impart the knowledge of basic DSP concepts and number systems to be used, different types of A/D, D/A conversion errors.
II. Learn the architectural differences between DSP and General purpose processor.
III. Learn about interfacing of serial & parallel communication devices to the processor.
IV. Implement the DSP & FFT algorithms.

| UNIT-I | INTRODUCTION TO DIGITAL SIGNAL PROCESSING | Classes: 10 |
|---|---|---|

Introduction: Digital signal-processing system, discrete Fourier Transform (DFT) and fast Fourier transform (FFT), differences between DSP and other micro processor architectures; Number formats: Fixed point, floating point and block floating point formats, IEEE-754 floating point, dynamic range and precision, relation between data word size and instruction word size; Sources of error in DSP implementations: A/D conversion errors, DSP computational errors, D/A conversion errors, Q-notation.

| UNIT-II | ARCHITECTURE OF PROGRAMMABLE DSPs | Classes: 09 |
|---|---|---|

Multiplier and multiplier accumulator, modified bus structures and memory access in PDSPs, multiple access memory, multiport memory, SIMD, VLIW architectures, pipelining, special addressing modes in PDSPs, on-chip peripherals.

| UNIT-III | OVERVIEW OF TMS320C54XX PROCESSOR | Classes: 08 |
|---|---|---|

Architecture of TMS320C54XX DSPs, addressing modes, memory space of TMS320C54XX processors.

Program control, instruction set and programming, on-chip peripherals, interrupts of TMS320C54XX processors, pipeline operation.

| UNIT-IV | INTERFACING MEMORY AND I/O PERIPHERALS TO PDSPs | Classes: 08 |
|---|---|---|

Memory space organization, external bus interfacing signals, memory interface, parallel I/O interface, programmed I/O, interrupts and I/O, direct memory access (DMA).

| UNIT-V | IMPLEMENTATIONS OF BASIC DSP ALGORITHS | Classes: 10 |
|---|---|---|

The Q-notation, convolution, correlation, FIR filters, IIR filters, interpolation filters, decimation filters, an FFT algorithm for DFT filters computation of the signal spectrum.

**Text Books:**


1. Avtar Singh and S. Srinivasan, "Digital Signal Processing" Thomson Publications, 1st Edition, 2004.
2. Lapsley et al., "DSP Processor Fundamentals, Architectures & Features", S. Chand & Co, 1st Edition, 2000.
3. B. Ventakaramani, M. Bhaskar, "Digital Signal Processors Architecture Programming and Applications", Tata McGraw-Hill, 1st Edition, 2006.

**Reference Books:**


1. Jonatham Stein, “Digital Signal Processing”, John Wiley, 1st Edition, 2000.
2. Sen M. Kuo&WoonSergGan, “Digital Signal Processors Architectures, Implementation and Application”, Pearson Practice Hall, 1st Edition, 2013.
3. K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, “A Practical Approach to Digital Signal Processing”, New Age International, 1st Edition, 2006.
4. Ifeachor E. C., Jervis B. W, “Digital Signal Processing: A practical approach”, Pearson Education, PHI/, 2nd Edition, 2002.
5. Peter Pirsch ,“Architectures for Digital Signal Processing”, John Weily, 1st Edition, 2007.


**Web References:**

1. http://www.nptel.ac.in/

**E-Text Books:**

1. http://www.dspguide.com/
2. http://www.allsyllabus.com/
3. http://www.faadooengineers.com/

**Course Home Page:**

# DIGITAL IMAGE PROCESSING

<table>
<tr><td colspan="10">II Group: ECE</td></tr>
<tr><th rowspan="2">Course Code</th><th rowspan="2">Category</th><th colspan="3">Hours / Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><th>L</th><th>T</th><th>P</th><th>C</th><th>CIA</th><th>SEE</th><th>Total</th></tr>
<tr><td>AEC508</td><td>Elective</td><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the image fundamentals and mathematical transforms necessary for image processing.
II. Describe the image enhancement techniques.
III. Evaluate the image restoration procedures.
IV. Analyze the image compression procedures.
V. Design the image segmentation and representation techniques.

| UNIT-I | INTRODUCTION | Classes: 10 |
|---|---|---|

Digital image fundamentals and image transforms digital image fundamentals, sampling and quantization, relationship between pixels; Image transforms: 2-D FFT, properties, Walsh transform, Hadamard transform, discrete cosine transform, Haar transform, Slant transform, Hoteling transform.

| UNIT-II | IMAGE ENHANCEMENT | Classes: 09 |
|---|---|---|

Introduction, image enhancement in spatial domain, enhancement through point processing, types of point processing, histogram manipulation, linear and non-linear gray level transformation, local or neighbourhood operation, median filter processing; Spatial domain high pass filtering, filtering in frequency domain, obtaining frequency domain filters from spatial filters, generating filters directly in the frequency domain, low pass (smoothing) and high pass (sharpening) filters in frequency domain.

| UNIT-III | IMAGE RESTORATION | Classes: 08 |
|---|---|---|

Image restoration degradation model, algebraic approach to restoration, inverse filtering.

Least mean square filters, constrained least square restoration, interactive restoration.

| UNIT-IV | IMAGE SEGMENTATION | Classes: 08 |
|---|---|---|

Image segmentation detection of discontinuities, edge linking and boundary detection, threshold, region oriented segmentation morphological image processing dilation and erosion, structuring element decomposition, the Strel function, erosion; Combining dilation and erosion: Opening and closing the hit and miss transformation.

| UNIT-V | IMAGE COMPRESSION | Classes: 10 |
|---|---|---|

Image compression: Redundancies and their removal methods, fidelity criteria, image compression models, source encoder and decoder, error free compression, lossy compression, JPEG 2000 standard.

**Text Books:**


1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson, 3rd Edition , 2008.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, “Digital Image Processing”, TMH, 3rd Edition, 2010.

| Reference Books: |
| --- |
| 1. Rafael, C. Gonzalez, Richard E woods, Stens L Eddings, "Digital Image Processing using MAT LAB", Tata McGraw Hill, 2nd Edition, 2010.<br>2. A.K. Jain, "Fundamentals of Digital Image Processing", PHI, 1st Edition, 1989.<br>3. Somka, Hlavac, Boyle, "Digital Image Processing and Computer Vision", Cengage Learning, 1st Edition, 2008.<br>4. Adrain Low, "Introductory Computer vision Imaging Techniques and Solutions", Tata McGraw-Hill, 2nd Edition, 2008.<br>5. John C. Russ, J. Christian Russ, "Introduction to Image Processing & Analysis", CRC Press, 1st Edition, 2010. |
| **Web References:** |
| 1. https://imagingbook.com/<br>2. https://en.wikipedia.org/wiki/Digital_image_processing<br>3. http://www.tutorialspoint.com/dip/<br>4. http://www.imageprocessingplace.com/<br>5. http://web.stanford.edu/class/ee368/<br>6. https://sisu.ut.ee/dev/imageprocessing/book/1<br>7. https://in.mathworks.com/discovery/digital-image-processing.html?requestedDomain=www.mathworks.com |
| **E-Text Books:** |
| 1. http://www.sci.utah.edu/~gerig/CS6640-F2010/dip3e_chapter_02.pdf<br>2. http://www.faadooengineers.com/threads/350-Digital-Image-Processing<br>3. http://newwayofengineering.blogspot.in/2013/08/anil-k-jain-fundamentals-of-digital.html<br>4. http://bookboon.com/en/digital-image-processing-part-one-ebook |
| **Course Home Page:** |

# PATTERN RECOGNITION

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **II Group:** ECE | | | | | | | | |
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC509 | **Elective** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Implement pattern recognition and machine learning theories.
II. Design and implement certain important pattern recognition techniques.
III. Apply the pattern recognition theories to applications of interest.
IV. Implement the entropy minimization, clustering transformation and feature ordering.

| | | |
|---|---|---|
| **UNIT-I** | **INTRODUCTION** | **Classes: 10** |

Basic concepts, Applications, Fundamental problems in pattern recognition system design, design concepts and methodologies, examples of automatic pattern recognition systems, simple pattern recognition model; Decision and distance functions: Linear and generalized decision functions, pattern space and weight space, geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

| | | |
|---|---|---|
| **UNIT-II** | **PROBABILITY** | **Classes: 09** |

Probability of events: Random variables, joint distributions and densities, movements of random variables, estimation of parameter from samples; Statistical decision making: Introduction, Baye's theorem, multiple features, conditionally independent features, decision boundaries, unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations, Baye's classifier for normal patterns.

| | | |
|---|---|---|
| **UNIT-III** | **NON PARAMETRIC DECISION MAKING** | **Classes: 08** |

Introduction, histogram, kernel and window estimation, nearest neighbour classification techniques; Adaptive decision boundaries, adaptive discriminate functions, minimum squared error discriminant functions, choosing a decision making techniques;

Clustering and partitioning, Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

| | | |
|---|---|---|
| **UNIT-IV** | **PATTERN PREPROCESSING AND FEATURE SELECTION** | **Classes: 08** |

Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

| | | |
|---|---|---|
| **UNIT-V** | **SYNTACTIC PATTERN RECOGNITION** | **Classes: 10** |

Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scan, Finger prints, etc.

| Text Books: |
|---|
| 1. Earl Gose, “Pattern recognition and Image Analysis”, Princeton Hall PTR, 1st Edition, 1996.<br>2. Tou. Rafael. Gonzalez. “Pattern Recognition Principle”, Pearson Education , 1st Edition, 1996. |
| **Reference Books:** |
| 1. Richard duda, Hart, David Strok, “Pattern Classification”, John Wiley, 2nd Edition, 2012. |
| **Web References:** |
| 1. http://nptel.ac.in/courses/111105041/1<br>2. http://nptel.ac.in/courses/117105101/ |
| **E-Text Books:** |
| 1. http://nptel.ac.in/courses/117108048/module1/Lecture1.pdf<br>2. http://textofvideo.nptel.iitm.ac.in/117105101/lec1.pdf |
| **Course Home Page:** |

# ADVANCED DIGITAL SIGNAL PROCESSING

**II Group:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC510 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Auto correlation and power spectrum estimation techniques.
II. Linear prediction Wiener filters, LMS adaptive filters, and applications.
III. Determine coefficients for perfect reproduction filter banks.
IV. Apply the above tools to real world problems including spectral analysis, filter design

| UNIT-I | POWER SPECTRAL ESTIMATIONS | Classes: 10 |
|---|---|---|

Estimation of spectra from finite duration observation of signals, the Periodogram; Use DFT in power Spectral Estimation; Non-Parametric Methods: Bartlett, Welch, Blackman and Tukey methods; Performance characteristics of nonparametric power spectrum estimators; Computational requirements of nonparametric power spectrum estimates.

| UNIT-II | PARAMETRIC METHODS OF POWER SPECTRAL ESTIMATION | Classes: 09 |
|---|---|---|

Parametric methods for power spectrum estimation; Relationship between Auto-correlation and model parameters; AR (Auto-Regressive) process and linear prediction, Yule-Walker, Burg and unconstructrained least squares methods; Sequential estimation; Moving average(MA) and ARMA models; Minimum variance method, Piscaranko's harmonic decomposition methods; MUSIC method.

| UNIT-III | LINEAR PREDICTION AND OPTIMUM LINEAR FILTERS | Classes: 08 |
|---|---|---|

Innovations representation of a stationary random process; Forward and backward linear prediction.

Solution of the normal equations; Properties of linear prediction-Error Filter; AR lattice and ARMA lattice-ladder Filters.

| UNIT-IV | DSP ALGORITHMS | Classes: 08 |
|---|---|---|

Fast DFT algorithms based on index mapping; Sliding discrete fourier transform; DFT computation over a narrow frequency band; Split Radix FFT; Linear filtering approach to computation of DFT using chirp Z-transform.

| UNIT-V | APPLICATIONS OF DIGITAL SIGNAL PROCESSING | Classes: 10 |
|---|---|---|

Digital cellular mobile telephony; Adaptive telephone echo cancellation; High quality A/D conversion for digital audio; Efficient D/A conversion in compact wifi systems; Acquisition of high quality data; Multirate narrow band digital filtering; High resolution narrowband spectral analysis.

**Text Books:**


1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, Principles, Algorithms and Applications", Prentice Hall, 4th Edition, 2007.
2. Sanjit K Mitra, "Digital signal processing, A computer base approach", McGraw-Hill Higher Education, 4th Edition, 2011.

3. Emmanuel C, Ifeacher, Barrie. W. Jervis, “DSP-A Practical Approach”, Pearson Education, 2nd Edition, 2002.
4. A.V. Oppenheim, R.W. Schaffer, “Discrete Time Signal Processing”, PHI, 2nd Edition, 2006.

**Reference Books:**

1. Li tan Elsevier, “Digital signal processing: fundamentals and applications” Elsevier Science &. Technology Books, 2nd Edition, 2008.
2. Robert J.schilling, Sandra.L.harris, “Fundamentals of Digital signal processing using Matlab”, Thomson Engineering, 2nd Edition, 2005.
3. Salivahanan, Vallavaraj, Gnanapriya, “Digital signal processing”, McGraw-Hill Higher Education, 2nd Edition, 2009.

**Web References:**

1. https://en.wikipedia.org/wiki/Digital_signal_processing
2. http://www.algorithmix.com/
3. http://www.ti.com/lsds/ti/processors/dsp/overview.page
4. http://www.iare.ac.in

**E-Text Books:**

1. https://www.friendlyduck.com/LP_TA/index.cfm
2. http://www.springer.com/in/book/9783642155901
3. http://chubby.hol.es/dsp-nagoor-kani.pdf
4. http://web.itu.edu.tr/hulyayalcin/Signal_Processing_Books/Slicer_Digital_Signal_Processing_Using_MATLAB_3rd_Edition.pdf

**Course Home Page:**

# ADAPTIVE SIGNAL PROCESSING

| **II Group:** ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC511 | Elective | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the Adaptive Systems.
II. Understand the principles of Wiener filter theory and mean square error.
III. Learn the Adaptive Algorithms.
IV. Understand the concepts of Kalman filters.
V. Analyze the applications of adaptive filters and use in simulation.

| UNIT-I | INTRODUCTION TO ADAPTIVE SYSTEMS | Classes: 10 |
|---|---|---|

Adaptive Systems: Definition and characteristics, example of an adaptive System, areas of application, adaptive linear combiner, the performance function, gradient and minimum mean square error.

| UNIT-II | WIENER FILTER AND LINEAR PREDICTION | Classes: 09 |
|---|---|---|

Linear optimum filtering, Principle of orthogonality, minimum mean square error, winer-hopf equation, error performance surface; Linear prediction: Forward linear prediction, backward linear prediction, properties of prediction error filters.

| UNIT-III | ADAPTIVE ALGORITHMS | Classes: 08 |
|---|---|---|

Method of steepest descent: Basic idea of steepest, descent algorithm, steepest, descent algorithm, applied to weiner filter, stability of steepest, descent algorithm, limitations of steepest, descent algorithm.

Least-mean square adaptive filter: Overview, LMS adaptation algorithm, application, comparison of LMS with steepest; Descent algorithm; Normalized least; Mean square adaptive filter: Normalized LMS filter as the solution to constrained optimization problem, stability of the NLMS.

| UNIT-IV | TRANSFORM-DOMAIN AND ADAPTIVE FILTERS | Classes: 08 |
|---|---|---|

Block adaptive filters, RLS adaptive filters; Statement of linear least; Square estimation problem, matrix inversion lemma, exponentially weighted RLS algorithm. Kalman Filter: Recursive minimum mean; Square estimation for scalar random variable, Kalman filtering problem, initial conditions, summary of Kalman Filter.

| UNIT-V | APPLICATIONS OF ADAPTIVE SIGNAL PROCESSING | Classes: 10 |
|---|---|---|

Adaptive modeling & system identification, inverse adaptive modeling, deconvolution, equalization, adaptive interference cancelling, adaptive noise cancelling, adaptive echo cancellation in telephone channels, introduction to adaptive arrays and adaptive beam forming.

**Text Books:**

1. Simon Haykins, "Adaptive Filter Theory", PHI, 4th Edition, 2002.
2. Bernard Widrow and Samuel D. Stearns, "Adaptive Signal Processing", Person Education, 2nd Edition, 2009.
3. John R. Treichler, C. Richard Johnson, Michael G. Larimore, "Theory and Design of Adaptive Filters", Prentice-Hall of India, 1st Edition, 2002.

**Reference Books:**

1. S. Thomas Alexander, "Adaptive Signal Processing - Theory and Application", Springer-Verilog, 1st edition, 1986.
2. D.G.Manolokis, Vinay.K.Ingle and Stephen M.Kogan, "Statistical and Adaptive Signal Processing," Artech House, 1st Edition, 2005.
3. Cowan C F N and Grant P M, "Adaptive Filters," Prentice Hall of India, 1st Edition, 1985.
4. Sayed F," Fundamentals of Adaptive Filters ," Wiley Interscience, , 1st Edition , 2002.

**Web References:**

1. http://www.nptel.ac.in/

**E-Text Books:**

1. http://cnx.rice.edu/content/col10280/1.1/

**Course Home Page:**

# REMOTE SENSING AND RADAR SIGNAL PROCESSING

**II Group:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AEC512 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the concepts of electromagnetic radiation.
II. Understand satellites and remote sensing.
III. Interpret the detection of radar signals in noise.

| UNIT-I | FUNDAMENTALS | Classes: 10 |
|---|---|---|

Definition, scope, types, chronological development, energy sources, electro magnetic radiation; Energy interactions: Energy interaction in the atmosphere, atmospheric windows, energy interaction with earth surface features, spectral reflectance patterns for different regions of EMR; Factors affecting remote sensing spectral signatures platforms: Types of platforms, ideal and real remote sensing system, advantages and limitations of satellite remote sensing.

| UNIT-II | SATELLITES AND SENSORS | Classes: 09 |
|---|---|---|

Satellite programs of the world, geostationary satellites and its orbits: Sensor characteristics and their applications; Remote sensing satellites: Coarse, medium and high resolution satellites, LANDSAT, SPOT, IRS, IKONOS, quick bird, world view and other recent satellites, scanning and orbiting mechanisms, resolutions, spatial, spectral, temporal, radiometric, image interpretation elements.

| UNIT-III | THERMAL REMOTE SENSING | Classes: 08 |
|---|---|---|

Thermal Remote Sensing: Radiant flux, heat transfer, thermal infrared radiation, thermal properties of materials, emissivity of materials, thermal inertia of earth surface features.

Thermal IR detection and imaging, characteristics of TIR images, factors controlling IR survey, applications.

| UNIT-IV | DETECTION OF RADAR SIGNALS IN NOISE | Classes: 08 |
|---|---|---|

Detection of radar signals in noise: Detection criteria, Neyman-Pearson observer, likelihood ratio receiver, inverse probability receiver, sequential observer, envelope detector, logarithmic detector, I/Q detector, automatic detection , CFAR receiver, cell averaging CFAR receiver, CFAR loss, CFAR uses in radar, radar signal management, schematics, component parts, resources and constraints.

| UNIT-V | WAVEFORM SELECTION [3, 2] | Classes: 10 |
|---|---|---|

Waveform Selection [3, 2]: Radar ambiguity function and ambiguity diagram, principles and properties, specific cases, ideal case, single pulse of sine wave, periodic pulse train, single linear FM pulse, noise like waveforms, waveform design requirements, optimum waveforms for detection in clutter, family of radar waveforms.

**Text Books:**


1. Lillisand T.M, R.W.Kiefer, "Remote Sensing and Image Interpretation", John Wiley & Sons, 4th Edition, 2004.
2. John R.Jensen ,"Remote sensing for Environment " Pearson Edition, 2004.
3. Anji Reddy, M., "Remote Sensing and Geographical Information Systems", BS Publications, 2nd Edition, 2002.
4. George Joseph, "Fundamentals of Remote sensing," University press Pvt Ltd, Hyderabad, 2nd Edition, 2005.
5. M.I. Skolnik, "Radar Handbook", McGraw Hill, 2nd Edition, 1991.
6. Fred E. Nathanson, "Radar Design Principles: Signal Processing and The Environment", PHI learning, 2nd Edition, 1999.
7. M.I. Skolnik, "Introduction to Radar Systems", TMH, 3rd Edition, 2001.


**Reference Books:**


1. Hayesm L., "Introduction to Remote Sensing", Taylor and Francis Publication, 1st Edition, 1995.
2. Gibso, P., Clare H.Power, "Introductory Remote Sensing Principles and concepts", Routledge, 1st Edition, 2000.
3. Henderson, F. M., Anthony J. Lewis, "Manual of Remote Sensing", 1st Edition, 1998.
4. Peyton Z. Peebles, "Radar Principles", John Wiley, 2004.
5. R. Nitzberg, "Radar Signal Processing and Adaptive Systems ", Artech House, 1999.
6. F.E. Nathanson, "Radar Design Principles", McGraw-Hill, 1st Edition, 1969.


**Web References:**

1. http://nptel.ac.in/courses/105108077/10
2. http://nptel.ac.in/syllabus/syllabus.php?subjectId=105107065

**E-Text Books:**

1. http://nptel.ac.in/courses/105108077/module2/lecture10.pdf
2. http://textofvideo.nptel.iitm.ac.in/105107121/lec8.pdf

**Course Home Page:**

## FIELD PROGRAMMABLE GATE ARRAY& COMPLEX PROGRAMMABLE LOGIC DEVICES

**III Group: ECE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AEC513 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Learn fundamentals of PLDs and CPLDS.
II. Understand how FPGA and CPLD architecture and internal structures effect your design.
III. Analyze the process of top-down design and how it is used to organize a design and speed up the development time.
IV. Apply the use of ASM in One-hot design and understand the system level design.

| UNIT-I | PROGRAMMABLE LOGIC AND COMPLEX PROGRAMMABLE LOGIC DEVICES | Classes: 10 |
|---|---|---|

ROM, PLA, PAL PLD, PGA, Features, programming and applications using complex programmable logic devices altera series – Max 5000/7000 series and Altera FLEX logic-10000 series CPLD, AMD's-CPLD (Mach 1to 5), Cypres FLASH 370 Device technology, Lattice PLST's architectures – 3000 series– Speed performance and in system programmability.

| UNIT-II | FIELD PROGRAMMABLE GATE ARRAYS AND CPLD/FPGA ARCHITECTURES | Classes: 09 |
|---|---|---|

Logic blocks, routing architecture, design flow technology mapping for FPGAs, Xilinx XC4000 & ALTERA's FLEX 8000/10000 FPGAs: AT & T – ORCA's (Optimized Reconfigurable Cell Array); ACTEL's – ACT-1, 2, 3 and their speed performance.

| UNIT-III | FINITE STATE MACHINES | Classes: 08 |
|---|---|---|

Top Down Design: State Transition Table, state assignments for FPGAs. Problem of initial state assignment for one hot encoding. Derivations of state machine charges. Realization of state machine charts with a PAL.

Alternative realization for state machine chart using microprogramming. Linked state machines; One – hot state machine, petrinets for state machines, basic concepts, properties, extended petrinets for parallel controllers, finite state machine, case study, meta stability, synchronization.

| UNIT-IV | FSM ARCHITECTURES | Classes: 08 |
|---|---|---|

Architectures centered around non-registered PLDs; State machine designs centered around shift registers; One – hot design method; Use of ASMs in one – hot design; Application of one – hot method.

| UNIT-V | SYSTEM LEVEL DESIGN | Classes: 10 |
|---|---|---|

Controller, data path and functional partitions, parallel adder cell, parallel adder sequential circuits, counters, multiplexers, parallel controllers.

**Text Books:**


1. Stephen. Trimberger , “Field Programmable Gate Array Technology “, Kluwer Academic Publications, $1^{st}$ Edition, 1994
2. John V.Oldfield, Richard C Dore, “Field Programmable Gate Arrays”, Wiley Publications, $1^{st}$ Edition, 1995.


**Reference Books:**


1. P.K.Chan, S. Mourad, “Digital Design Using Field Programmable Gate Array”, Prentice Hall, $1^{st}$ Edition, 1994.
2. Parag.K.Lala, “Digital System Design using Programmable Logic Devices “, BS Publications, $1^{st}$ Edition,2003.
3. S. Brown, R.J.Francis, J.Rose , Z.G.Vranesic, “Field programmable gate array,” BS Publications, $1^{st}$ Edition,2007.
4. Ian Grout, “Digital Systems Design with FPGA’s and CPLDs”, Elsevier, $1^{st}$ Edition, 2009.
5. J. Old Field, R.Dorf, “Field Programmable Gate Arrays”, John Wiley & Sons, New York, $1^{st}$ Edition, 1995.
6. S.Trimberger, Edr. “Field Programmable Gate Array Technology”, Kluwer Academic Publications, $1^{st}$ Edition, 1994.
7. Bob Zeidman, “Designing with FPGAs & CPLDs”, CMP Books, $1^{st}$ Edition, 2002.


**Web References:**

1. http://www.igniteengineers.com
2. http://www.eecg.toronto.edu
3. http://www.ece.uic.edu
4. http://www.iare.ac.in

**E-Text Books:**

1. https://books.google.co.in
2. http://www.www.jntubook.com
3. http://www.allaboutcircuits.com
4. http://www.archive.org

**Course Home Page:**

# VLSI SIGNAL PROCEESING

| III Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC514 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Identify techniques for altering the existing DSP structures to suit VLSI implementations.
II. Analyze efficient design of DSP architectures suitable for VLSI.
III. Understand the various VLSI architectures for digital signal processing.
IV. Analyze the techniques of critical path and algorithmic strength reduction in filter structures.
V. Evaluate the performance parameters, viz. area, speed and power.

| UNIT-I | INTRODUCTION TO DSP SYSTEMS | Classes: 10 |
|---|---|---|

Introduction to DSP systems, typical DSP algorithms, data flow and dependence graphs, critical path, loop bound, iteration bound, longest path matrix algorithm, pipelining and parallel processing of FIR filters, pipelining and parallel processing for low power.

| UNIT-II | RETIMING, ALGORITHMIC STRENGTH REDUCTION | Classes: 09 |
|---|---|---|

Retiming, definitions and properties, unfolding, an algorithm for unfolding, properties of unfolding, sample period reduction and parallel processing application, algorithmic strength reduction in filters and transforms, 2-parallel FIR filter, 2-parallel fast FIR filter, DCT architecture, rank-order filters, odd-even merge-sort architecture, parallel rank-order filters.

| UNIT-III | AN FAST CONVOLUTION, IIR FILTERS | Classes: 08 |
|---|---|---|

Fast convolution, Cook-Toom algorithm, modified Cook-Toom algorithm, Pipelined and parallel recursive filters, look-ahead pipelining in first-order IIR filters.

Look-ahead pipelining with power-of-2 decomposition, clustered look-ahead pipelining, parallel processing of IIR filters, combined pipelining and parallel processing of IIR filters.

| UNIT-IV | BIT-LEVEL ARITHMETIC ARCHITECTURES | Classes: 08 |
|---|---|---|

Bit-level arithmetic architectures, parallel multipliers with sign extension, parallel carry-ripple and carry-save multipliers, design of Lyon's bit-serial multipliers using Horner's rule, bit-serial FIR filter, CSD representation, CSD multiplication using Horner's rule for precision improvement, distributed arithmetic fundamentals and FIR filters.

| UNIT-V | NUMERICAL STRENGTH REDUCTION | Classes: 10 |
|---|---|---|

Numerical strength reduction, sub expression elimination, multiplication, iterative ,multiple constant matching, synchronous pipelining and clocking styles, clock skew in edge-triggered single phase clocking, two-phase clocking, wave pipelining; Asynchronous pipelining bundled data versus dual rail protocol.

**Text Books:**

1. Keshab K. Parhi, "VLSI Digital Signal Processing Systems, Design and implementation", Wiley, Interscience, 1st Edition, 2007.
2. U. Meyer – Baese, "Digital Signal Processing with Field Programmable Gate Arrays", Springer, 2nd Edition, 2004.

**Reference Books:**

1. Mohammed Isamail ,Terri Fiez, "Analog VLSI Signal and Information Processing", McGraw-Hill, 1st Edition,1994.
2. S.Y. Kung, H.J. White House, T. Kailath, "VLSI and Modern Signal Processing", Prentice Hall, 1st Edition,1985.
3. Jose E. France, Yannis Tsividis, "Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing", Prentice Hall, 1st Edition, 1994.
4. C. L. Wadhwa, "Electrical Circuit Analysis Including Passive Network Synthesis", New Age International, 2nd Edition, 2009.

**Web References:**

1. http://www.umiacs.umd.edu/
2. http://www.win.tue.nl/
3. http://www.ocw.nthu.edu.tw

**E-Text Books:**

1. http://www.bookzz.org
2. http://www.www.jntubook.com

**Course Home Page:**

# DESIGN FOR TESTABILITY

| **III Group:** ECE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC515 | **Elective** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Analyze digital circuits at logic and register level and design using simulation
II. Understand fault detection and redundancy
III. Interpret testing for single stuck faults.

| **UNIT-I** | **INTRODUCTION TO TEST AND DESIGN FOR TESTABILITY** | **Classes: 10** |
|---|---|---|

Modeling: Modeling digital circuits at logic level, register level and structural models. Levels of modeling. Logic Simulation: Types of simulation, Delay models, e lement evaluation, hazard detection, gate level event driven simulation.

| **UNIT-II** | **FAULT MODELING** | **Classes: 09** |
|---|---|---|

Logic fault models, fault detection and redundancy, fault equivalence and fault location, single stuck and multiple stuck, fault models; Fault simulation applications, general techniques for combinational circuits.

| **UNIT-III** | **TESTING FOR SINGLE STUCK FAULTS** | **Classes: 08** |
|---|---|---|

Testing for single stuck faults ,automated test pattern generation for single stuck faults in combinational and sequential circuits, Functional testing with specific fault models.

Vector simulation, ATPG vectors, formats, compaction and compression, selecting ATPG tool.

| **UNIT-IV** | **DESIGN FOR TESTABILITY** | **Classes: 08** |
|---|---|---|

Testability trade-offs, techniques; Scan architectures and testing, controllability and absorbability, generic boundary scan, full integrated scan, storage cells for scan design; Board level and system level DFT approaches; Boundary scans standards; Compression techniques, different techniques, syndrome test and signature analysis.

| **UNIT-V** | **BUILT-IN SELF-TEST** | **Classes: 10** |
|---|---|---|

BIST Concepts and test pattern generation; Specific BIST architectures: CSBL, BEST, RTS, LOCST, STUMPS, CBIST, CEBS, RTD, SST, CATS, CSTP, BILBO; Brief ideas on some advanced BIST concepts and design for self-test at board level; Memory BIST (MBIST): Memory test architectures and techniques, introduction to memory test, Types of memories and integration, Embedded memory testing model; Memory test requirements for MBIST; Brief ideas on embedded core testing.

| |
|---|
| |
| **Text Books:** |
| 1. Miron Abramovici, Melvin A. Breur, Arthur D.Friedman, "Digital Systems Testing and Testable Design", Jaico Publishing House, 2001.<br>2. Alfred Crouch, "Design for Test for Digital ICs & Embedded Core Systems", Prentice Hall, 1999. |
| **Reference Books:** |
| 1 . Robert J.Feugate, Jr., Steven M.Mentyn, Introduction to VLSI Testing, Prentice Hall, Englehood Cliffs, 1998. |
| **Web References:** |
| 1. https://ece.uwaterloo.ca/~cgebotys/NEW/ece427/DFTnotes.html<br>2. http://www.enablingmnt.co.uk/services/training/essentials-of-design-for-testability-for-digital-systems/ |
| **E-Text Books:** |
| 1. http://link.springer.com/chapter/10.1007%2F1-84628-173-3_8<br>2. https://sites.google.com/site/3ws4ed5r6g7yh/.../Digital-Systems-Testing--.pdf |
| **Course Home Page:** |

# DIGITAL IC APPLICATIONS USING VHDL

<table>
<tr><td colspan="9">III Group: ECE</td></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours / Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">AEC516</td><td rowspan="2">Elective</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Familiarization of Digital Logic families
II. Design of combinational and sequential circuits using digital ICs.
III. Strategy of digital circuits using VHDL Programming.

| UNIT-I | CMOS LOGIC AND BIPOLAR LOGIC AND INTERFACING | Classes: 10 |
|---|---|---|

Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOSdynamic electrical behavior, CMOS logic families; Bipolar logic, transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, emitter coupled logic, comparison of logic families, familiarity with standard 74XX and CMOS 40XX series-ICs - specifications.

| UNIT-II | THE VHDL HDL AND ITS ELEMENTS | Classes: 09 |
|---|---|---|

Design flow, program structure, types and constants, functions and procedures, libraries and packages; The VHDL design elements: Structural design elements, data flow design elements, behavioral design elements, time dimension and simulation synthesis.

| UNIT-III | COMBINATIONAL LOGIC DESIGN USING VHDL | Classes: 08 |
|---|---|---|

Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, EX-OR gates and parity circuits, comparators, adders and subtractors, ALUs, combinational multipliers. VHDL modes for the above ICs.

Design examples (using VHDL) - Barrel shifter, comparators, floating-point encoder, dual parity encoder.

| UNIT-IV | SEQUENTIAL LOGIC DESIGN | Classes: 08 |
|---|---|---|

Latches and flip-flops, PLDs, counters, shift register, and their VHDL models, synchronous design methodology, impediments to synchronous design.

| UNIT-V | MEMORIES | Classes: 10 |
|---|---|---|

ROMs: Internal structure, 2D-decoding commercial types, timing and applications; Static RAM: Internal structure, SRAM timing, standard SRAMS, synchronous SRAMS; Dynamic RAM: Internal structure, timing, synchronous DRAMs; Familiarity with component data sheets : Cypress CY6116, CY7C1006, specifications.

**Text Books:**

1. John F.Wakerly, “Digital Design Principles & Practices”, PHI/ Pearson Education Asia, 3rd Edition, 2005.
2. J. Bhasker, “VHDL Primer”, Pearson Education / PHI, 3rd Edition. Pearson Higher Education.

**Reference Books:**

1. Charles H. Roth Jr., “Digital System Design Using VHDL”, PWS Publications, 1998.
2. Alan B. Marcovitz, “Introduction to Logic Design”, TMH, 2nd Edition, 2005.
3. Stephen Brown, ZvonkoVransesic, “Fundamentals of Digital Logic with Verilog Design”, TMH, 2003.
4. Cypress Semiconductors Data Book (Download from website).
5. K. Lalkishore, “Linear Integrated Circuit Applications”, Pearson Educations 2005.

**Web References:**

1. http://equipe.nce.ufrj.br/gabriel/vhdlfpga.html
2. http://esd.cs.ucr.edu/labs/tutorial/VHDL_Page.html

**E-Text Books:**

1. https://www.studynama.com/community/threads/210-Digital-IC-applications-pdf-lecture-notes-ebook-download
2. http://www.faadooengineers.com/threads/9384-Digital-IC-Application-full-notes-pdf-e-book

**Course Home Page:**

# LOW POWER VERY LARGE SCALE INTEGRATION

| III Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC517 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Identify sources of power in an IC.
II. Identify the power reduction techniques based on technology independent and technology dependent.
III. Power dissipation mechanism in various MOS logic style.
IV. Identify suitable techniques to reduce the power dissipation.
V. Design memory circuits with low power dissipation.

| UNIT-I | POWER DISSIPATION IN CMOS | Classes: 10 |
|---|---|---|

Low power Basics: Need for low power VLSI chips, sources of power dissipation on digital integrated circuits; Emerging low power approaches; Physics of power dissipation in CMOS devices; Device & technology impact on low power: Dynamic dissipation in CMOS, transistor sizing and gate oxide thickness, impact of technology scaling, technology & device innovation.

| UNIT-II | POWER OPTIMIZATION | Classes: 09 |
|---|---|---|

Power estimation Simulation Power analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems; Low Power Design Circuit level: Power consumption in circuits; Flip flops & latches design, high capacitance nodes, low power digital cells library.

| UNIT-III | DESIGN OF LOW POWER CMOS CIRCUITS | Classes: 08 |
|---|---|---|

Logic level: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic.

Low power Architecture & Systems: Power and performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components, low power memory design.

| UNIT-IV | POWER ESTIMATION | Classes: 08 |
|---|---|---|

Low power Clock Distribution: Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network; Power estimation techniques - logic power estimation; Simulation power analysis; Probabilistic power analysis.

| UNIT-V | SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER | Classes: 10 |
|---|---|---|

Algorithm & architectural level methodologies: Introduction, design flow, Algorithmic level analysis and optimization, architectural level estimation and synthesis; Synthesis for low power; Behavioral level transform; Software design for low power.

**Text Books:**

1. Kaushik Roy and S.C.Prasad, “Low power CMOS VLSI circuit design”, Wiley, 2000.
2. Dimitrios Soudris, Chirstian Pignet, Costas Goutis, “Designing CMOS Circuits for LOW Power”, Kluwer, 2002.
3. B.Kulo and J.H Lou, “Low Voltage CMOS VLSI Circuits”, Wiley, 3rd Edition, 1999.

**Reference Books:**

1. A.P. Chandrasekaran and R.W. Broadersen, “Low power digital CMOS design”, Kluwer, 1995.
2. Gary Yeap, “Practical low power digital VLSI design”, Kluwer, 1998.
3. Abdelatif Belaouar, Mohamed.I.Elmasry, “Low power digital VLSI design”, Kluwer, 1995.

**Web References:**

1. http://bwrcs.eecs.berkeley.edu/
2. http://leda.elfak.ni.ac.rs/
3. http://textofvideo.nptel.iitm.ac.in/
4. http://www.nlc-bnc.ca/

**E-Text Books:**

1. https://books.google.com/books?isbn=1461560659
2. https://books.google.com/books?isbn=8132219376
3. https://books.google.com/books?isbn=1522501916

**Course Home Page:**

# SYSTEM VERILOG

<table>
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<tr><td rowspan="1">Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">AEC518</td><td rowspan="2">Elective</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Apply System Verilog to do synthesis and analysis; layout, circuit, logic, and architecture design.
II. Understand System Verilog's key concepts such as data types, RTL design, Interfaces, clocking, assertion-based verification, and classes.
III. Provides a number of code samples and examples to give students a better feel for the language.
IV. Verify a high performance IC or VLSI chip by imparting knowledge of all aspects of digital design, from architecture, application algorithm to fabrication.

| **UNIT-I** | **INTRODUCTION TO SYSTEM VERILOG** | **Classes: 10** |
|---|---|---|

Introduction to Verilog; Verilog Basics: Modules, data Types, operators, control statements, variable assignment, always blocks, task and function, test benches; Introduction to system verilog; literal values: Integer and logic literals, real literals, time literals, string literals, array literals, structure literals; Data types: Integer data types, arrays, associate arrays, queues, array methods; $cast: Dynamic type casting.

| **UNIT-II** | **OPERRATORS AND EXPRESSIONS** | **Classes: 09** |
|---|---|---|

Operators and Expressions: Assignment operators, operations on logic and bit types, wild equality and wild inequality, operator precedence associativity, concatenation, streaming operators, set membership; Procedural statements and control flow: Selection statements, loop statements, jump statements, final blocks, named blocks, disable block, event control, sequence, level-sensitive sequence controls; Process: always_combo, always_latch, always_ff, continuous assignments, fork-join.

| **UNIT-III** | **PROCESS CONTROL AND RANDOM CONSTRAINTS** | **Classes: 08** |
|---|---|---|

Process Control: wait_for, disable fork; Tasks and Functions: Tasks, Functions; Argument Passing: Pass by value, pass by reference, pass by name, default argument values, optional argument list; Interprocess communication: Semaphore, mailboxes, events; System verilog classes:  Object, object members, object methods, constructors, static class members, constant class members, assignments, inheritance and subclasses, super, data hiding and encapsulation, virtual class, out-of-block declarations.

Random Constraints: Random variables randomize (); Constraints blocks: Set membership, distributions constraints, implication constraints, iterative constraints, variable ordering, randcase; Clocking Block: Input output skews, hierarchical names, cycle delay, default clocking; System Verilog Program Block: Program block example, program control tasks, program with Interface.

| **UNIT-IV** | **ASSERTIONS AND INTERFACES** | **Classes: 08** |
|---|---|---|

System Verilog Assertions: Immediate assertions, concurrent assertions, Boolean layer, sequences, Properties; Multi clock support: Multi clock sequence, Multi clock property; Assert, assume and cover, binding, expect, clock resolution; System verilog hierarchy: Packages, top level module, nested modules, extern module; System verilog interfaces: Interfaces, ports in interface, modports, tasks and function in interface, parameterized interfaces, virtual interface; Functional coverage: Functional coverage types, covergroup, covergroup inside a class, coverage points, cross coverage, coverage options, coverage methods, coverage system Tasks.

| **UNIT-V** | **OVM, UVM AND VMM** | **Classes: 10** |
|---|---|---|

System Tasks And Functions: Array system tasks, variable system tasks, Assertion system tasks, Random number system tasks, Coverage system tasks, Improved verilog system tasks, Unpacked array system tasks; Direct programming interface: Two layers of DPI, global name space, imported tasks and functions, exported tasks and functions, disable DPI tasks and functions; AOP: Adding members, extending already defined methods; OVM; UVM; VMM.

**Text Books:**


1. Chris Spear, "System Verilog for Verification: A Guide to Learning the Testbench Language Features", Springer-Verilog New York, Inc. Secaucus, NJ, USA, 3rd Edition, 2012.
2. Mintz, Mike, Ekendahl, Robert , "Hardware Verification with System Verilog: An Object-Oriented Framework ", Springer, 2nd Edition, 2007.
3. Stuart Sutherland, Simon Davidmann, Peter Flake, "System Verilog For Design 2nd Edition: A Guide To Using System Verilog for Hardware and Modelling", Springer, 2nd Edition, 2006.


**Reference Books:**


1. Bergeron, Janick, "Writing Testbenches using SystemVerilog", Springer, 2nd Edition, 2007.
2. Meyyappan Ramanathan, "A Practical Guide for System Verilog Assertions", Springer, 2nd Edition, 2009.
3. Faisal Haque, Jonathan Michelson, Khizar Khan, "The Art of Verification with System Verilog Assertions", Oxford University Press, 7th Edition, 2009.


**Web References:**

1. http://www.acic-world.com
2. http://www.testbench.in
3. http:// www.ee.ed.ac.uk
4. http://www.opencores.org

**E-Text Books:**

1. http://fullebook.us/?book=0387255389
2. http://ebookmedia.org/?book=0387333991
3. https://books.google.co.in/books/about/SystemVerilog_for_Verification.html
4. https://books.google.co.in/books?id=fnnx2iH_

**Course Home Page:**

# MULTI INPUT AND MULTI OUTPUT WIRELESS COMMUNICATION

**IV Group: ECE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AEC519 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand MIMO channel models and space-time coding.
II. Remember capacity and information rates of MIMO channels.
III. Classify the space-time codes.
IV. Understand Frequency selective channels.

| UNIT-I | FADING CHANNELS AND DIVERSITY TECHNIQUES | Classes: 10 |
|---|---|---|

Wireless channels, Error/outage probability over fading channels, diversity techniques, channel coding as a means of time diversity, multiple antennas in wireless communications.

| UNIT-II | CAPACITY AND INFORMATION RATES | Classes: 09 |
|---|---|---|

Capacity and information rates of noisy, AWGN and fading channels, capacity of MIMO channel, capacity of non-coherent MIMO channels, constrained signaling for MIMO communications.

| UNIT-III | SPACE-TIME BLOCK AND TRELLIS CODES | Classes: 08 |
|---|---|---|

Space-time block codes: The Alamouti scheme, orthogonal and quasi-orthogonal space-time block codes, linear dispersion codes, basic space-time code design principles.

Space-time trellis codes: Generic space-time trellis codes, representation of space-time trellis codes for PSK constellation, performance analysis for space-time trellis codes, comparison of space-time block and trellis codes.

| UNIT-IV | CONCATENATED CODES AND ITERATIVE DECODING | Classes: 08 |
|---|---|---|

Development of concatenated codes, concatenated codes for AWGN and MIMO channels, Turbo coded modulation for MIMO channels, concatenated space-time block coding.

| UNIT-V | SPACE-TIME CODING | Classes: 10 |
|---|---|---|

MIMO frequency-selective channels, capacity and information rates of MIMO FS fading channels, Space-time coding and Channel detection for MIMO FS channels, MIMO OFDM systems.

**Text Books:**


1. Tolga M. Duman, Ali Ghrayeb, "Coding for MIMO Communication systems", John Wiley & Sons, West Sussex, England, 2007.
2. A.B. Gershman, N.D. Sidiropoulus, "Space-time processing for MIMO communications", Wiley,

Hoboken, NJ, USA, 2005.
3. E.G. Larsson, P. Stoica, “Space-time block coding for Wireless communications”, Cambridge University Press, 2003.

**Reference Books:**

1. M. Janakiraman, “Space-time codes and MIMO systems”, Artech House, 2004.
2. H. Jafarkhani, “Space-time coding: Theory & Practice”, Cambridge University Press, 2005.
3. George Tsoulos, “MIMO System Technology for Wireless Communications”, CRC Press, 2006.

**Web References:**

1. http://www.comlab.hut.fi/opetus/333/2004_2005_slides/Diversity.pdf
2. http://publik.tuwien.ac.at/files/pub-et_11276.pdf
3. http://wireless.ece.ufl.edu/eel6550/lit/ryanchap.pdf
4. https://www.dtc.umn.edu/s/resources/STFJournal.pdf

**E-Text Books:**

1. http://glearning.tju.edu.cn/pluginfile.php/52934/mod_resource/content/0/references/ebooks/_2005_Wiley_Space_Time_Processing_for_MIMO_Communications.pd
2. http://assets.cambridge.org/97805218/24569/sample/9780521824569ws.pdf
3. http://read.pudn.com/downloads166/ebook/765643/Space-Time%20Codes%20and%20MIMO%20Systems.pdf

**Course Home Page:**

# CELLULAR AND MOBILE COMMUNICATION

**IV Group:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AEC520 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | Total Classes: 45 | | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Analyze and design wireless and mobile cellular systems.
II. Understand impairments due to multipath fading channel and be able simulate standard stochastic channel models for various environments.
III. Evaluate the fundamental techniques to overcome the different fading effects.
IV. Interpret current and proposed cellular technologies.
V. Able to work in advanced research wireless and mobile cellular programs.

| UNIT-I | CELLULAR MOBILE RADIO SYSTEMS | Classes: 10 |
|---|---|---|

Introduction to cellular mobile System, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, hexagonal shaped cells, analog and digital Cellular systems, General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

| UNIT-II | INTERFERENCE AND CELL COVERAGE FOR SIGNAL AND TRAFFIC | Classes: 09 |
|---|---|---|

Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-cochannel interference-different types, Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

| UNIT-III | CELL SITE AND MOBILE ANTENNAS | Classes: 08 |
|---|---|---|

Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas, Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells,

non fixed channel assignment, Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

| UNIT-IV | WIRELESS SYSTEMS AND STANDARDS | Classes: 08 |
|---|---|---|

Second generation and Third generation Wireless Networks and Standards, WLL, Bluetooth, GSM, IS-95, DECT, GSM architecture, GSM channels, multiplex access scheme, TDMA, CDMA.

| UNIT-V | INTELLIGENT NETWORK FOR WIRELESS COMMUNICATIONS | Classes: 10 |
|---|---|---|
| Intelligent cell concept, advanced intelligent network, SS7 network and ISDN for AIN, AIN for mobile communication, asynchronous transfer mode technology, future public land mobile telecommunication system, wireless information superhighway. | | |

**Text Books:**

1. W.C.Y. Lee, "Mobile Cellular Telecommunications", Tata McGraw-Hill, 2nd Edition, 2006.
2. Gordon L. Stuber, "Principles of Mobile Communications", Springer International, 2nd Edition, 2007.
3. Yi-Bing Lin and Imrich chlantae, "Wireless and Mobile Network Architecture", John Wiley, 1st Edition, 2006.

**Reference Books:**

1. Theodore. S. Rapport, "Wireless Communications", 3rd Edition, Pearson Education, 2003.
2. Lee, "Wireless and Mobile Communications", McGraw Hill, 3rd Edition, 2006.
3. Jon W. Mark and Weihua Zhqung, "Wireless Communication and Networking", PHI, 1st Edition, 2005.
4. R. Blake, "Wireless Communication Technology", Thompson Asia Pvt. Ltd., 1st Edition 2004.

**Web References:**

1. https://accessengineeringlibrary.com
2. http:// www.radio-electronics.com
3. https://www.jntubook.com
4. http://www.iare.ac.in

**E-Text Books:**

1. http://www.iitg.ernet.in/scifac/qip/public_html/cd_cell/EC632.pdf
2. https://books.google.co.in/books/about/Cellular_and_Mobile_Communications
3. https://technicalpublications.org/.../books/ Cellular_and_Mobile_Communications

**Course Home Page:**

# RADAR SYSTEMS

| IV Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC521 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Total Contact Hours: 45 | Total Tutorials: Nil | Practical Classes: Nil | | | | Total Hours: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the basic principle of radar.
II. Analyze and compare different types of radars.
III. Compare the performance of different types of tracking radars in noise environment.
IV. Classify different components of radar receiver and analyze their utilization.

| UNIT-I | FUNDAMENTALS OF RADAR | Hours: 09 |
|---|---|---|

Introduction; radar frequencies and applications; Maximum unambiguous range; Radar wave forms; Radar equation; Radar block diagram and operation; Basic pulsed radar system; Moving target indication; Prediction of range performance; Minimum detectable signal; Receiver noise and SNR; Radar cross section of targets; Cross section fluctuations, transmitter power, PRF and range ambiguities; system losses, related problems.

| UNIT-II | CW AND FREQUENCY MODULATED RADAR | Hours: 09 |
|---|---|---|

Doppler Effect, CW Radar: Block Diagram; Isolation between transmitter and receiver; Non-zero IF receiver, receiver bandwidth requirements, applications of CW radar, illustrative problems; FM-CW radar, range and Doppler measurement, block Diagram and characteristics (Approaching/ Receding Targets), FM-CW altimeter, multiple frequency CW radar

| UNIT-III | MOVING TARGET INDICATION AND PULSE DOPPLER RADAR | Hours: 09 |
|---|---|---|

Introduction to Doppler and moving target indication radar, principle and block diagram of moving target indication, power amplifier transmitter, delay line cancellers, filter characteristics, blind speeds, double cancellation, staggered pulse repetition frequencies, MTI radar parameters, moving target detector; limitations to MTI performance, non-coherent MTI.

Pulse doppler radar; radar Equation for pulsed radar; moving target indication versus pulse doppler radar.

| UNIT-IV | TRACKING RADAR AND RADAR DETECTION THEORY | Hours: 09 |
|---|---|---|

Introduction, single target tracking: range, Doppler and angle measurement, track while scan, angle tracking: sequential lobing, conical scan, monopulse; Tracking radar: Amplitude comparison monopulse (one- and two coordinates), phase comparison monopulse, tracking in range, acquisition and scanning patterns, comparison of trackers. matched filter receiver, response characteristics and derivation, correlation function and cross-correlation receiver, efficiency of non matched filters, matched filter with non-white noise.

| UNIT-V | RADAR RECEIVERS | Hours: 09 |
|---|---|---|

Noise figure and noise temperature; Displays: Types; Duplexers, branch type and balanced type, circulators as duplexers; Introduction to phased array antennas: Basic concepts, radiation pattern, beam steering and beam width changes, series versus parallel feeds, applications, advantages and limitations.

**Text Books:**

1. Merrill I Skolnik , “Introduction to Radar Systems”, TMH Special Indian Edition, 2nd Edition, 2007
2. V.S.Bagad, “Radar Systems”, Technical Publications, 1st Edition, 2009.

**Reference Books:**

1. Merrill Skolnik, “Introduction to RADAR Systems”, 3rd Edition, McGraw-Hill, 2001.
2. Byron Edde , “Radar: Principles, Technology, Applications”, Pearson Education, 2004.
3. Peebles, Jr. P.Z Wiley , “Radar Principles”, New York, 1998.

**Web References:**

1. http://www.igniteengineers.com
2. http://www.ocw.nthu.edu.tw
3. http://www.uotechnology.edu.iq
4. http://www.iare.ac.in

**E-Text Books:**

1. http://www.bookboon.com/en/concepts-in-electric-circuits-ebook
2. http://www.www.jntubook.com
3. http://www.allaboutcircuits.com
4. http://www.archive.org

**Course Home Page:**

# SATELLITE COMMUNICATION

**IV Group:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC522 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | Total Classes: 45 | | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the communication space craft and orbits.
II. Interpret the access systems in communication satellites.
III. Understand the VSAT system technologies.
IV. Interpret packet communications in satellite.

| UNIT-I | COMMUNICATIONS SPACECRAFT AND ORBITS | Classes: 10 |
|---|---|---|

Overview of present and future trends of satellite communications introduction to satellite systems: Low earth orbit (LEO); Medium earth orbit (MEO); Geo synchronous earth orbit (GEO); Geostationary earth orbit (GEO); Orbital mechanics: Orbital elements; Orbital elements; Locating the satellite with respect to the earth; Coverage angle; Slant range; Inclined orbits; Orbital perturbations due to earth's oblateness and moon and sun; Eclipse of GEO satellite; Sun transit outage.

| UNIT-II | SPACE SEGMENT | Classes: 09 |
|---|---|---|

Placement of a communication satellite in GEO satellite sub systems: Telemetry, tracking and command system, power system, satellite antenna equipment, communications subsystem and transponders, TWT amplifier operation, satellite frequency bands and allocations; Satellite link: Basic transmission theory, system noise temperature and G/T ratio, basic link analysis, design of satellite links for a specified C/N with and without frequency Re-use , link budget; Propagation effects: Introduction, atmospheric absorption, cloud attenuation, troposphere and ionospeheric scintillation and low angle fading; Effects of rain: Rain induced attenuation, rain induced cross polarization interference.

| UNIT-III | COMMUNICATION SATTELLITE ACCESS SYSYTEMS | Classes: 08 |
|---|---|---|

Multiple Access: Frequency division multiple access (FDMA), Time division multiple access (TDMA), frame structure, burst structure, satellite switched TDMA, on-board processing, demand assignment multiple access (DAMA), types of demand assignment, characteristics.

Code Division Multiple Access (CDMA) / Spread Sprectrum Multiple Access (SSMA); Direct sequence CDMA (DS-CDMA) or DS spread spectrum transmission and reception, adjacent channel interference, intermodulation, handover, satellite diversity.

| UNIT-IV | EARTH STATION AND VSAT SYSTEMS TECHNOLOGY | Classes: 08 |
|---|---|---|

Earth Station: Transmitters, receivers, antennas, tracking systems, terrestrial interface, power test methods, lower orbit considerations; VSAT (Very Small Aperture Terminal) Systems: Overview of VSAT systems, VSAT network architecture, access control, multiple access selection. NGSO constellation design: Orbits, coverage, frequency bands, delay and throughput, non geostationary orbit (NGSO) constellation design and problems.

| UNIT-V | SATELLITE PACKET COMMUNICATION | Classes: 10 |
|---|---|---|
| Message transmission by FDMA: M/G/1 queue, message transmission by TDMA, pure aloha, satellite packet switching, slotted aloha, packet reservation, tree algorithm; Error control for digital satellite links: Error control coding, block codes, convolution codes, implementation of error detection on satellite links. Over view of future satellite communication systems, introduction to satellite laser communication, data relay communication satellites, satellite mobile services, applications. | | |

**Text Books:**

1. Dennis roddy, "Satellite Communications", 4th Edition, 2004.
2. Pratt. Bostian, Allnutt, "Satellite Communications", Wiley India, 2nd Edition, 2006.
3. Gérard Maral, "Satellite Communication Systems", 1993.

**Reference Books:**

1. Rappaport T.S., "Wireless communications", 2nd Edition, Pearson Education, 2010.
2. Bruce Elbert, "Introduction to Ssatellite Communication", 1987.

**Web References:**

1. http://nptel.ac.in/courses/106105082/33
2. https://onlinecourses.nptel.ac.in/noc16_ec10/preview

**E-Text Books:**

1. http://www4.zippyshare.com/v/72052755/file.html
2. http://www.jntumaterials.co.in/2015/07/satellite-communications-by-dennis-roddy.html

**Course Home Page:**

# TELECOMMUNICATION SWITCHING THEORY AND APPLICATIONS

| IV Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC523 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Learn to consider tele-traffic demands, quality of service, scalability, performance and cost into consideration to develop requirements and architectures.
II. Underlying technologies and applications including wireless communications, including mobility, optical communications, wavelength routing, packet networks and the Internet.
III. Coordinated with CS 440, computer networks, where communications protocols and the TCP/IP protocols suite are addressed.

| UNIT-I | INTRODUCTION | Classes: 10 |
|---|---|---|

Introduction: Evolution of telecommunications, simple telephone communication, manual switching system, major telecommunication networks, strowger switching system, crossbar switching; Electronic Space Division Switching: Stored program control, centralized SPC, distributed SPC, enhanced services, two stage networks, three stage network n-stage networks.

| UNIT-II | TIME DIVISION SWITCHING | Classes: 09 |
|---|---|---|

Time Division Switching: Time multiplexed space switching, time multiplexed time switching, combination Switching, three stage combination switching, n-stage combination switching; Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modeling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, delay systems.

| UNIT-III | DATA NETWORKS | Classes: 08 |
|---|---|---|

Data networks: Block diagram, features, working of EPABX systems, data transmission in PSTNs, data rates in PSTNs, modems, switching techniques for data transmission, circuit switching, store and forward switching data communication architecture.

ISO-OSI reference model, link to link layers, physical layer, data link layer, network layer, end to end layers, transport layer, session layer, presentation layer, Satellite based data networks, LAN, metropolitan area network, fiber optic networks, and data network standards.

| UNIT-IV | TELEPHONE NETWORKS | Classes: 08 |
|---|---|---|

Telephone Networks: Subscriber loop systems, switching hierarchy and routing, transmission plan, transmission systems, numbering plan, charging plan, signaling techniques, in channel signaling, common channel signaling, cellular mobile telephony.

| UNIT-V | INTEGRATED SERVICES DIGITAL NETWORKS | Classes: 10 |
|---|---|---|

Integrated Services Digital Networks: Motivation for ISDN, new services, network and protocol architecture, transmission channels, user network interface, signaling, numbering and addressing, service characterization, interworking, ISDN standards, broadband ISDN ,voice data Integration.

**Text Books:**

1. Thiagarajan Vishwanathan, “Telecommunication Switching Systems and Networks”; PHI Publications, 1992.
2. J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education, 2nd Edition, 2007.
3. John C. Bellamy, “Digital Telephony”, Wiley Publications, 3rd Edition, 2000.

**Reference Books:**

1. Wayne Tomasi, “Electronic Communications Systems”, Pearson Education, 5th Edition, 2009.
2. William C.Y.Lec, “Mobile Cellular Telecommunication, Analog and Digital Systems”, McGraw-Hill Inc, 2nd Edition, 1995.
3. Kaveh Pahlavan, Allen H. Levesque" Wireless Information Networks", Wiley Series, John Wiley and Sons Inc, 1st Edition, 2005.

**Web References:**

1. http://www.ie.itcr.ac.cr/
2. http://www.neduet.edu.pk/
3. http://www.researchgate.net
4. http://www.mitpress.mit.edu

**E-Text Books:**

1. http://www.e-booksdirectory.com/listing.php?category=292
2. link.springer.com/book/10.1007%2F978-1-4899-2215
3. www.ie.itcr.ac.cr/acotoc/Maestria_en_Computacion/Sistemas_de
4. https://www.crcpress.com/...Communications-Theoretical...Applications

**Course Home Page:**

## WIRELESS COMMUNICATIONS AND NETWORKS

**IV Group:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC524 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Provide fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
II. Equip various kinds of wireless networks and its operations.
III. Understand the concept of frequency reuse, and be able to apply it in the design of mobile cellular system.
IV. Understand various modulation schemes and multiple access techniques that are used in wireless communications,

| UNIT-I | THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS | Classes: 10 |
|---|---|---|

Introduction, frequency reuse, channel assignment strategies, handoff strategies; Prioritizing handoffs, practical handoff considerations, interference and system capacity; Co channel interference and system capacity, channel planning for wireless systems, adjacent channel interference, power control for reducing interference, trunking and grade of service, improving coverage & capacity in cellular systems; Cell splitting, sectoring.

| UNIT-II | MOBILE RADIO PROPAGATION | Classes: 09 |
|---|---|---|

Large-Scale Path Loss: Introduction to radio wave propagation, free space propagation model, relating power to electric field, the three basic propagation mechanisms; Reflection: Reflection from dielectrics, brewster angle, reflection from prefect conductors, ground reflection (Two-Ray) mode; Diffraction-Fresnel zone geometry, knife-edge diffraction model, multiple knife-edge diffraction, scattering, outdoor propagation models; Longley-Ryce model, Okumura Model, Hata Model, PCS extension to hata Model, Walfisch and Bertoni model, wideband PCS microcell model, indoor propagation models-partition losses (Same Floor), partition losses between floors, log-distance path loss model, ericsson multiple breakpoint model, attenuation factor model, signal penetration into buildings, ray tracing and site specific modeling.

| UNIT-III | CELLULAR SYSTEM DESIGN FUNDAMENTALS | Classes: 08 |
|---|---|---|

Small-scale fading and multipath: Small scale multipath propagation; Factors influencing small scale fading, doppler shift, impulse response model of a multipath channel; Relationship between bandwidth and received power, small; Scale multipath measurements; Direct RF pulse system, spread spectrum sliding correlator channel sounding, frequency domain channels sounding, parameters of mobile multipath channels; Time dispersion parameters.

Coherence Bandwidth, Doppler spread and coherence time, types of small - Scale fading; Fading effects due to multipath time delay spread, flat fading, frequency selective fading, fading effects due to Doppler Spread-Fast fading, slow fading, statistical models for multipath fading channels; Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, simulation of Clarke and Gans Fading model, level crossing and fading statistics, two-ray Rayleigh fading model.

| UNIT-IV | EQUALIZATION AND DIVERSITY | Classes: 08 |
|---|---|---|

Introduction, fundamentals of equalization, training a generic adaptive equalizer, equalizers in a communication receiver, linear equalizers, non-linear equalization; Decision feedback equalization (DFE), maximum likelihood sequence estimation (MLSE) equalizer, algorithms for adaptive equalization; Zero forcing algorithm, least mean square algorithm, recursive least squares algorithm; Diversity techniques; Derivation of selection diversity improvement, derivation of maximal ratio combining improvement, practical space diversity consideration; Selection diversity, feedback or scanning diversity, maximal ratio combining, equal gain combining, polarization diversity, frequency diversity, time diversity, RAKE receiver.

| UNIT-V | WIRELESS NETWORKS | Classes: 10 |
|---|---|---|

Introduction to wireless networks, advantages and disadvantages of wireless local area networks, WLAN topologies, WLAN standard IEEE 802.11, IEEE 802.11 medium access control, comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, wireless PANs, hiper lan, WLL.

**Text Books:**


1. Theodore .S. Rapport, "Wireless Communications", Pearson Education, 2nd Edition, 2010.
2. Upen Dalal, "Wireless communication", oxford University press, 2010.
3. Kaveh Pahlvan, Prashant Krishnamurthy, "Principle of wireless networks, A United Approach", Pearson Education, 2004.
4. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005.


**Reference Books:**


1. P.Nicopolitidis, M.S. Obaidat, G.I. papadimitria , A.S. Pomportsis , " Wireless Networks", John Wiley & sons, 1st Edition, 2003.
2. Vijay K Garg, " Wireless Communications and Networks", Morgan Kaufmann Publishers an Imprint of Elsevier, USA 2009 (Indian Reprint).
3. X.Wang, H.V.Poor , " Wireless communication sytems" Pearson Education, 2004.
4. Jon W .Mark, Weihua Zhqung , "wireless communication and Networking," PHI, 2005.
5. Jochen Schiller, "Mobile Communication", Pearson Education, 2nd Edition, 2003.


**Web References:**

1. http://nptel.ac.in/courses/117102062/
2. http://nptel.ac.in/courses/117102062/37

**E-Text Books:**

1. https://books.google.com.au/books?id=UE2wEc9NfB8C&pg=PR7&source=gbs_selected_pages&cad=2#v=onepage&q&f=false

**Course Home Page:**

# VOICE OVER INTERNET PROTOCOL

<table>
<tr><td colspan="9">V Group: ECE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">AEC525</td><td rowspan="2">Elective</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Classify the different internet protocols.
II. Illustrate the standards of different protocols.
III. Analyze the different architectures for various protocols

| UNIT-I | OVERVIEW OF IP PROTOCAL SUITE | Classes: 10 |
|---|---|---|

The internet protocol, the transmission control protocol (TCP), the user datagram protocol (UDP), the real-time transport protocol (RTP), internet protocol multicast, internet protocol version 6v6, interworking IPv4 and IPv6, The VoIP Market, VoIP Challenges.

| UNIT-II | H.323 AND H.245 STANDARDS | Classes: 09 |
|---|---|---|

The H.323 architecture, call signaling, call scenarios, H.245 control signaling conference calls, the decomposed gateway.

| UNIT-III | THE SESSION INITIATION PROTOCOL (SIP) | Classes: 08 |
|---|---|---|

SIP architecture- Overview of session initiation protocol messaging syntax, examples of session initiation protocol message sequences, redirect servers, proxy servers.

The session description protocol; Usage of session description protocol with session initiation protocol.

| UNIT-IV | QUALITY OF SERVICE (QOS) | Classes: 08 |
|---|---|---|

Need for quality of service , end-to-end quality of service , overview of quality of service solutions; The resource reservation protocol (RSVP); Diffserv: The Diffserv architecture; Multi protocol label switching (MPLS): Switching architecture, switching traffic engineering; Label distribution protocols and constraint based routing.

| UNIT-V | VOIP AND SS7 | Classes: 10 |
|---|---|---|

The SS7 protocol suite- The message transfer part (MTP), ISDN user part (ISUP), signaling connection control part (SCCP), SS7 network architecture, signaling points( SPs), single transfer point (STP), service control point(SCP), message signal units (MSUs), SS7 addressing, ISUP, performance requirements for SS7, sigtran- sigtran architecture, SCTP- M3UA operation, M2UA operation, M2PA operation; Interworking SS7 and VoIP architectures; Interworking soft switch and SS7, interworking H.323 and SS7.

**Text Books:**


1. Daniel Collins, “Carrier Grade Voice Over IP”, Tata McGraw Hill, 2nd Edition, 2003.
2. Nicholas Wittenberg, “Understanding Voice Over IP Technology,” Cengage, 1st Edition, 2010.
3. Michael, F. Finnevan, “Voice Over WLANS – The Complete Guide ”, Elsevier, 2008.

**Reference Books:**

1. Forouzan,“ Data Communications and Networking”, Tata McGraw-Hill ,4th Edition, 2007.
2. Andrew S. Tanenbaum,“Computer Networks”, Prentice Hill, 4th Edition,2003.
3. William Stallings, “Data and Computer Communications”, Prentice Hall, 6th Edition, 2000.

**Web References:**

1. http://www.juniper.net/techpubs/software/screenos/screenos6.3.0/630_ce_VoIP.pdf
2. https://en.wikibooks.org/wiki/Voice_over_IP
3. https://docs.google.com/file/d/0B78A_rsP6RDSY0NXLWFva20zQzQ/edit?pli=1

**E-Text Books:**

1. http://www.technologeeks.com/Courses/VoIP.pdf
2. https://www.amazon.com/Carrier-Grade-Voice-Over-second/dp/0071406344
3. http://studymafia.org/voip-seminar-ppt-with-pdf-report/

**Course Home Page:**

# WIRELESS SENSOR NETWORKS AND ARCHITECTURE

**V Group:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC526 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the basic WSN technology and supporting protocols, with emphasis placed on standardization basic sensor systems and provide a survey of sensor technology.
II. Understand the medium access control protocols and address physical layer issues.
III. Learn key routing protocols for sensor networks and main design issues.
IV. Learn transport layer protocols for sensor networks, and design requirements.
V. Understand the Sensor management, sensor network middleware, operating systems.

| UNIT-I | OVERVIEW OFWIRELESS SENSOR NETWORKS | Classes: 10 |
|---|---|---|

Challenges for wireless sensor networks, characteristic requirements of wireless sensor networks, enabling technologies for wireless sensor networks, advantages of sensor networks, sensor network applications.

| UNIT-II | ARCHITECTURES | Classes: 09 |
|---|---|---|

Single-node architecture, hardware components, energy consumption of sensor nodes, operating systems and execution environments, network architecture, sensor network scenarios, optimization goals and figures of merit, gateway concepts.

| UNIT-III | NETWORKING SENSORS | Classes: 08 |
|---|---|---|

Physical layer and transceiver design considerations, MAC protocols for wireless sensor networks, low duty cycle protocols and wakeup concepts-S-MAC, the mediation device protocol, wakeup radio concepts, address and name management.

Assignment of MAC addresses, naming and addressing, routing protocols, energy-efficient routing, geographic routing.

| UNIT-IV | INFRASTRUCTURE ESTABLISHMENT | Classes: 08 |
|---|---|---|

Topology control, clustering, hierarchical networks by clustering time synchronization, localization and positioning, sensor tasking and control, joint routing and information aggregation.

| UNIT-V | SENSOR NETWORK PLATFORM AND TOOLS | Classes: 10 |
|---|---|---|

Sensor node hardware, Berkeley motes, programming challenges, node-level software platforms, node-level simulators, state-centric programming.

**Text Books:**


1. Holger Karl, Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks", John Wiley, 1st Edition, 2005.
2. A. Sudhakar, Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 1st Edition 2007.

3. Jun Zheng, Abbas Jamalipour, “Wireless Sensor Networks- A Networking Perspective”, John Wiley & Sons, 1st Edition, 2009.

**Reference Books:**


1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks Technology, Protocols, And Applications”, John Wiley, 1st Edition 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 1st Edition 2003.
3. Waltenegus Dargie , Christian Poellabauer, “Fundamentals of Wireless Sensor Networks”, John Wiley & Sons, 1st Edition, 2010.


**Web References:**

1. http://www.ida.liu.se/labs/rtslab/courses/wsn/notes.shtml
2. http://www.cs.umanitoba.ca/~comp7860/08R-Fall/lecturenotes.html
3. http://ceng.usc.edu/~bkrishna/research/talks/WSN_Tutorial_Krishnamachari_ICISIP05.pdf
4. http://www.ece.rochester.edu/courses/ECE586/lectures.htm

**E-Text Books:**

1. https://books.google.co.in/books?id=8c6k0EVr6rMC
2. https://books.google.co.in/books?id=qOPk-NWkgiMC
3. https://books.google.co.in/books?id=I3bJGo690SUC
4. https://books.google.co.in/books?id=3ad7AAAAQBAJ

**Course Home Page:**

# MOBILE ADHOC NETWORKS

| V Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | CIA | SEE | Total |
| AEC527 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Interpret mathematical model and network protocol design in wireless multi-hop networks
II. understand network protocols and their cross layer interactions
III. Understand active research areas in wireless multi-hop networks.
IV. Interpret IEEE 802.11 wireless LAN and their Bluetooth standards

| UNIT-I | INTRODUCTION TO ADHOC NETWORKS | Classes: 10 |
|---|---|---|

Introduction to ad-hoc networks, definition, characteristics features, applications, characteristics of wireless channel, Ad-hoc mobility models, indoor and outdoor models

| UNIT-II | MEDIUM ACCESS PROTOCOLS | Classes: 09 |
|---|---|---|

MAC Protocols: design issues, goals and classification, contention based protocols with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

| UNIT-III | NETWORK PROTOCOLS | Classes: 08 |
|---|---|---|

Routing Protocols: Design issues, goals and classification; Proactive vs reactive routing, unicast routing algorithms, multicast routing algorithms,

Hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.

| UNIT-IV | END-END DELIVARY AND SECURITY | Classes: 08 |
|---|---|---|

Transport layer: Issues in designing, transport layer classification, ad-hoc transport protocols; Security issues in ad-hoc networks: issues and challenges, network security attacks, secure routing protocols.

| UNIT-V | CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G | Classes: 10 |
|---|---|---|

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective; Integration of ad-hoc with mobile IP networks.

**Text Books:**


1. C.Siva Ram Murthy, B.S.Manoj, "Ad hoc Wireless Networks Architectures and Protocols", Pearson Education, 2nd edition, 2007.
2. Prasant Mohapatra, Srikanth Krishnamurthy,"Adhoc Networks Technologies and Protocols", Springer, 1st Edition, 2005.
3. Stefano Basagni, MarcoConti, "Mobile Ad Hoc Networking", John wiley & sons, 1st Edition, 2004.

**Reference Books:**

1. George Aggelou, "Mobile Adhoc Networks from wireless LAN's to 4G networks", Tata McGraw-Hill, 1st Edition, 2009.
2. Azzedine Boukerche, "Algorithms and Protocols for wireless and mobile ad-hoc networks", John Wiley & Sons, 1st Edition, 2009.
3. Ramin Hekmat, "Ad-hoc Networks: Fundamental Properties and Network Topologies" Springer, 2006.

**Web References:**

1. https://en.wikipedia.org/wiki/Mobile_ad_hoc_network
2. http://people.ee.duke.edu/~romit/group/paper-collection.html
3. https://arxiv.org/ftp/arxiv/papers/1503/1503.03233.pdf
4. http://www.iare.ac.in/sites/default/files/lecture_notes/asn%20notes.pdf

**E-Text Books:**

1. https://books.google.co.in/books?id=izNUbXbK7e4C
2. https://books.google.co.in/books?id=cegpBdUxk_EC
3. https://books.google.co.in/books?id=4sa--GE8OGEC
4. https://books.google.co.in/books?id=GnkcHEsxAigC

**Course Home Page:**

# COGNITIVE RADIO

**V Group:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC528 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Know the basics of the software defined radios.
II. Learn the design of the wireless networks based on the cognitive radios.
III. Understand the concepts of wireless networks and next generation networks.

| UNIT-I | INTRODUCTION TO SOFTWARE DEFINED RADIO | Classes: 10 |
|---|---|---|

Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications.

| UNIT-II | SDR ARCHITECTURE | Classes: 09 |
|---|---|---|

Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.

| UNIT-III | INTRODUCTION TO COGNITIVE RADIOS | Classes: 08 |
|---|---|---|

Marking radio self-aware, cognitive techniques, position awareness.

Environment awareness in cognitive radios, optimization of radio resources, artificial intelligence techniques.

| UNIT-IV | COGNITIVE RADIO ARCHITECTURE | Classes: 08 |
|---|---|---|

Cognitive Radio: Functions, components and design rules, cognition cycle: orient, plan, decide and act phases, inference hierarchy, architecture maps, building the cognitive radio architecture on software defined radio architecture.

| UNIT-V | NEXT GENERATION WIRELESS NETWORKS | Classes: 10 |
|---|---|---|

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

**Text Books:**


1. Joseph Mitola III, "Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd, 2000.
2. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", Artech House, 2009.
3. Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009.
4. Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, "Next generation / dynamic spectrum access / cognitive radio wireless networks: A Survey" Elsevier Computer Networks, May 2006.

**Reference Books:**


1. Simon Haykin, “Cognitive Radio: Brain –Empowered Wireless Communications”, IEEE Journal on selected areas in communications, Feb 2005.
2. Hasari Celebi, Huseyin Arslan, “Enabling Location and Environment Awareness in Cognitive Radios”, Elsevier Computer Communications, Jan 2008.
3. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, “Software Defined Radio”, John Wiley, 2003.
4. Huseyin Arslan, “Cognitive Radio, SDR and Adaptive System”, Springer, 2007.
5. Alexander M. Wyglinski, Maziarnekovee, Y. Thomas Hu, “Cognitive Radio Communication and Networks”, Elsevier, 2010


**Web References:**


1. wcsp.eng.usf.edu/cognitive_radio_links.htm
2. https://en.wikipedia.org/wiki/Cognitive_radio
3. https://www.researchgate.net/.../261021527_Cognitive_radio_networks_for_Internet.
4. www.informationvine.com/Cognitive+Radio.


**E-Text Books:**


1. omidi.iut.ac.ir/...CognitiveRadio/.../ebook/Fette%20B.A.(ed)%20Cognitive%20Radio.
2. www.supelec.fr/d2ri/flexibleradio/pub/leonardo09.pd.
3. www.qsl.net/.../Cognitive%20Radio%20Communications%20and%20Networks%20-%2.


**Course Home Page:**

# CIPHER SYSTEMS

**V Group:** **ECE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC529 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Create secure cryptographic schemes to protect their own secrets, and to breaking the codes of their adversaries.
II. Use these concepts to implement and/or break encryption schemes ranging in complexity from simple shift ciphers to military grade public key cipher systems.
III. implementation of the RSA public key encryption algorithm, a cipher system

| UNIT-I | NUMBER THEORY | Classes: 10 |
|---|---|---|

Prime numbers, Euclidian algorithm, divisibility, congruences, chinese remainder theorem, discrete algorithms.

| UNIT-II | INTRODUCTION TO CIPHER SYSTEMS | Classes: 09 |
|---|---|---|

Monograph and digraph, linear and shift transformations, affine transformation, Enciphering matrices Vigenere and Beufort systems, Diffusion and confusion.

| UNIT-III | NEW DATA ENCRYPTION STANDARDS | Classes: 08 |
|---|---|---|

Block ciphers-Feistel, DES-SDES, DES, 2DES, 3DES, RC5; Blowfish algorithms, stream ciphers-RC4, Finite field theory.

AES, Rijndael algorithm, placement of encryption function, traffic confidentiality, Key distribution.

| UNIT-IV | PUBLIC KEY CRYPTOGRAPHY AND KEY MANAGEMENT | Classes: 08 |
|---|---|---|

Principles of public-key cryptosystems, Hellman and Merkel algorithm, RSA algorithm, elliptic curve arithmetic, elliptic curve cryptography, key management, Diffie-Hellman key exchange.

| UNIT-V | MESSAGE AUTHENTICATION AND HASH FUNCTIONS | Classes: 10 |
|---|---|---|

Authentication requirements, authentication functions, message authentication codes, hash functions, security of hash functions and MACs, secure hash algorithm, whirlpool, HMAC,CMAC, digital signatures and authentication protocols.

**Text Books:**


1. William Stallings, "Cryptography and Network Security principles and Practical", Prentice-Hall of India Pvt.Ltd, Pearson Education Asia, 3rd Edition, 2003.
2. B.A.Forouzan, D. Mukhopadhyay, "Cryptography and Network security, McGraw-Hill, 2nd Edition, 2008.
3. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, 2010.

**Reference Books:**


1. D. R. Stinson, “Cryptography – Theory and Practice”, CRC Press, Boca Raton 1995. ISBN 0-8493 8521-0.
2. F. L. Bauer, “Decrypted Secrets”, Springer, 2010. ISBN 978-3-642-06383-1</sup4<>.
3. David Kahn, “The Codebreakers”, MacMillan, New York, 1967. ISBN 0-02-560460-0. 2.


**Web References:**


1. www.cse.iitd.ac.in/~murali/crypt/books.html.
2. https://www.staff.uni-mainz.de/pommeren/Cryptology/References.html.
3. https://en.wikipedia.org/wiki/Books_on_cryptography.


**E-Text Books:**


1. https://www.inf.ufsc.br/~bosco/...1/.../Stallings_Cryptography_and_Network_Security.pdf.
2. https://www.portknocking.org/images/book-codesandciphers.pdf.
3. https://www.cl.cam.ac.uk/~rja14/Papers/SE-05.pdf.
4. https://mitpress.mit.edu/sites/default/.../9780262042406_Privacy_On_The_Line.pdf.


**Course Home Page:**

# NEURAL NETWORKS AND FUZZY LOGIC

**V Group:** **ECE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC530 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Meliorate the knowledge of fundamentals and types of neural networks.
II. Develop the different Algorithms for neural networks.
III. Meliorate the knowledge in Fuzzy logic principles.
IV. Correlate the principles with applications of neural networks and fuzzy logic.

| UNIT-I | INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS AND LEARNING LAWS | Classes: 10 |
|---|---|---|

Artificial neural networks and their biological motivation, terminology, models of neuron, topology, characteristics of artificial neural networks, types of activation functions, learning methods, error correction learning, Hebbian learning, perception, XOR problem, perceptron learning rule convergence theorem, adaline.

| UNIT-II | FEEDFORWARD AND RECURRENT NEURAL NETWORKS | Classes: 09 |
|---|---|---|

Multilayer perception, back propagation learning algorithm, universal function approximation, associative memory, auto association, hetero association, recall and cross talk, linear auto associator, bi-directional associative memory, hopfield neural network, travelling salesman problem.

| UNIT-III | UNSUPERVISED LEARNING AND SELF ORGANISING NETWORKS | Classes: 08 |
|---|---|---|

Competitive learning neural networks, max net, mexican hat, hamming net.

Kohonen self organizing feature map, counter propagation, learning vector quantization, adaptive resonance theory, applications of neural networks in image processing, signal processing, modeling and control.

| UNIT-IV | FUZZY SETS AND FUZZY RELATIONS | Classes: 08 |
|---|---|---|

Introduction, classical sets and fuzzy sets, classical relations and fuzzy relations, membership functions, fuzzy to crisp conversion, fuzzy arithmetic, numbers, vectors, extension principle.

| UNIT-V | FUZZY DECISION MAKING AND NEURO FUZZY | Classes: 10 |
|---|---|---|

Fuzzy rule based systems, Fuzzy nonlinear simulation ,Fuzzy decision making ,Fuzzy control systems, fuzzy optimization - one-dimensional optimization, mathematical formulation of adaptive neuro-fuzzy inference systems.

**Text Books:**


1. Laurene Fausett, “Fundamentals of Neural Networks-Architectures, algorithms and applications, Pearson Education Inc., 2004.
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, John Wiley and sons, 2004
3. S.Haykin, "Neural Networks, A Comprehensive Foundation", Pearson Education Inc., 2004.

**Reference Books:**


1. Jacek.M.Zuruda,"Introduction to Artificial Neural Systems", Jaico Publishing House ,2001.
2. J.S.R. Jang, C.T. Sun, E. Mizutani, “Neuro Fuzzy and Soft Computing - A computational Approach to Learning and Machine Intelligence”, Pearson Education Inc., 2002.
3. Freeman J.A. and Skapura B.M., “Neural Networks, Algorithms Applications and Programming Techniques”, Addison-Wesley, 1991.


**Web References:**


1. http://www.cs.stir.ac.uk/~lss/NNIntro/InvSlides.html
2. http://www.willamette.edu/~gorr/classes/cs449/intro.html
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-867-machine -learning
4. http://ocw.mit.edu/courses/sloan-school-of-management/15-062-datamining-spring-2003/lecture-notes/NeuralNet2002.pdf


**E-Text Books:**


1. http://www.e-booksdirectory.com
2. http://www.ebooks.com/subjects/computer-science-neural-networks-ebooks/
3. http://en.wikibooks.org/wiki/Artificial_Neural_Networks
4. http://jntu-ebooks.blogspot.in


**Course Home Page:**

# MICROCONTROLLER PROGRAMMING

| VI Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC531 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Know the basic functions, structure, concepts and applications of embedded systems.
II. Develop familiarity with 8051 Microcontrollers and their applications in an embedded environment.
III. Learn the method of designing and program an embedded systems for real time applications.
IV. Understand operating system concepts, types and choosing RTOS.
V. Solve well-defined problems on an embedded platform and also develop familiarity with tools used to develop in an embedded environment.

| UNIT-I | ARCHITECTURE OF 8051 MICROCONTROLLER | Classes: 10 |
|---|---|---|

Introduction to Microcontroller, difference between microprocessors and microcontrollers; Overview of 8051 microcontroller family, microcontroller families (PIC, AVR, ARM); Architecture of 8051 microcontroller: 8051 microcontroller hardware, pin diagram of 8051, input/output pins, ports and circuits; Internal RAM and ROM, SFR's, interfacing with external memory, timers and counters, interrupts; Serial data communication (UART).

| UNIT-II | INTRODUCTION TO PROGRAM DEVELOPMENT TOOL CHAIN USING KEIL µVISION: | Classes: 09 |
|---|---|---|

Integrated development Environment (IDE), editor-assembler, compiler, linker, simulator, and debugger. Assembly and 'C' program development and debugging process.8051 Assembly language programming: Addressing modes, data transfer Instructions, Logical instructions, Arithmetic instructions, Branching (Jump & Call) instructions, Bit addressable instructions and special instructions, Interrupts and interrupt handler sub routines (Interrupt Service Routines).

| UNIT-III | 8051 PROGRAMMING IN EMBEDDED C | Classes: 08 |
|---|---|---|

Introduction to embedded C: Date types in embedded C, arithmetic and logical operators, control statements and loops in embedded C, functions and arrays in embedded C.

Embedded C Programming: Programming of input/ output ports, programming of timer and counters, writing interrupt service routines in embedded C, programming of UART and PCA timer in embedded C.

| UNIT-IV | INTERFACING I/O DEVICES | Classes: 08 |
|---|---|---|

Introduction, Interfacing and C programming of 8051 with keyboard, interfacing and C programming of 8051 with 7-segment display, interfacing and C programming of 8051 with LCD display, interfacing and C programming of 8051 with ADC-DAC and sensors, SPI and I2C serial communication protocols and their programming.

| UNIT-V | APPLICATIONS AND ADVANCED ARCHITECTURES | Classes: 10 |
|---|---|---|

Applications and design of microcontroller based systems: Relay and opt isolators, stepper motor control, SCR firing circuit, DC motor interfacing and PWM; Advancements in 8051 architecture: Infineon - XC88X, SiLabs- C8051F12X(CIP 51 core).

**Text Books:**

1. Kenneth ayala,"8051 Architecture programming and application", Delmar Learning, 2nd Edition, 2011.
2. Rajkamal, "Microcontrollers Architecture, Programming, Interfacing and System Design", Pearson Education India, 2nd Edition, 2011
3. Lyla B das," Microprocessors and Microcontrollers", Pearson Education 2nd Edition, 2011.

**Reference Books:**

1. Mohammad ali Mazidi, Rolin micknlay, Janice Gillispie Mazidi, "Microcontroller and Embedded System using Assembly and C", Pearson/Prentice Hall, 2nd Edition, 2006.
2. Predko, Myke,"Programming and customizing the 8051 microcontroller", Tata McGraw-Hill, 2nd Edition, 2003.
3. Ajay V Deshmukh, "Microcontroller -Theory and applications", Tata McGraw-Hill Education, 1st Edition, 2006.

**Web References:**

1. http://buddhiprakash.weebly.com/uploads/4/5/3/2/45327319/8051microcontroller-ayala.pdf
2. http://studentyuva.blogspot.in/2009/09/8051-microcontroller-by-rajkamal.html
3. http://www.fullandfree.info/software/keil-51compiler/
4. http://www.win.fue.n/-aeb/comp/8051/set8051.html
5. http://meseec.ce.rit.edu/eecc250-winter99/250-2-9-2000.pdf

**E-Text Books:**

1. http://jsjyl.chd.edu.cn/The_8051_Microcontroller_and_Embedded_Systems_Using_Assembly_and_C.pdf
2. http://buddhiprakash.weebly.com/uploads/4/5/3/2/45327319/8051microcontroller-ayala.pdf
3. https://ti.tuwien.ac.at/ecs/teaching/courses/mclu/theory-material/Microcontroller.pdf

**Course Home Page:**

# ADVANCED RISC MACHINE ARCHITECTURE

| VI Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC532 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Knowledge of basic Microprocessor Architecture and Programming.
II. Ability to analyze, evaluate and improve the performance of computer systems.
III. Understanding parallelism, both of tasks and architectures.

| UNIT-I | INTRODUCTION | Classes: 10 |
|---|---|---|

Need of advance microprocessors, Difference between RISC and CISC, RISC Design philosophy, ARM Design Philosophy, History of ARM microprocessor, ARM processor family, Development of ARM architecture.

| UNIT-II | THE ARM ARCHITECTURE AND PROGRAMMERS MODEL | Classes: 09 |
|---|---|---|

The Acorn RISC Machine, ARM Core data flow model, Architectural inheritance, The ARM7TDMI programmer's model: General purpose registers, CPSR, SPSR, ARM memory map, data format, load and store architecture, Core extensions, Architecture revisions, ARM development tools.

| UNIT-III | ARM INSTRUCTION SET | Classes: 08 |
|---|---|---|

Data processing instructions**,** Arithmetic and logical instructions**,** rotate and barrel shifter**,** branch instructions, load and store instructions, software interrupt instructions, program status register instructions, conditional execution, multiple register load and store instructions, stack instructions.

Thumb instruction set, advantage of thumb instructions, assembler rules and directives, assembly language programs for shifting of data, factorial calculation, swapping register contents, moving values between integer and floating point registers.

| UNIT-IV | C PROGRAMMING FOR ARM | Classes: 08 |
|---|---|---|

Overview of C compiler and optimization, basic C data types, C looping structures, register allocations, function calls, pointer aliasing, structure arrangement, bit-fields, unaligned data and endianness, division, floating point, inline functions and inline assembly, Portability issues.

| UNIT-V | MEMORY MANAGEMENT UNIT | Classes: 10 |
|---|---|---|

Moving from memory protection unit (MPU) to memory management unit (MMU), working of virtual memory, multitasking, memory organization in virtual memory system, page tables, translation look aside buffer, caches and write buffer, fast context switch extension,

Advanced microprocessor bus architecture (AMBA) bus system, user peripherals, exception handling in ARM, ARM optimization techniques.

**Text Books:**

1. Muhammad Ali Mazidi, “ARM Assembly Language Programming & Architecture” Kindle Edition.
2. William Hohl, Christppher Hinds, “Arm Assembly Language, Fundamentals and Techniques, 2nd Edition”, CRC Press.
3. Arm System Developer’s Guide, Designing and Optimizing Software, Andrew N. Sloss, Dominic Symes, Chris Wwight, Elsevier.

**Reference Books:**

1. Steve Furber, “Arm System-on-chip Architecture”, 2nd Edition, Pearson publication.
2. Lyla Das, “Embedded Systems” Pearson publication, 2012.

**Web References:**

1. http://nptel.ac.in/syllabus/117106111/
2. https://developer.mbed.org
3. http://www.freescale.com/tools/software-and-tools/hardware-development-tools/freedom-development-boards:FREDEVPLA

**E-Text Books:**

1. http://electro.fisica.unlp.edu.ar/arq/downloads/Papers/ARM/Addison%20Wesley%20-%20ARM%20System-on-Chip%20Architecture,%202Ed.pdf

# EMBEDDED C

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VI Group:** ECE | | | | | | | | |
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC533 | **Elective** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand embedded C and use it for programming embedded system.
II. Apply techniques for data transfer between I/O ports and memory.
III. Apply object oriented programming for designing embedded system.
IV. Analyze and understand the usage of timers to generate time delays.

| UNIT-I | PROGRAMMING EMBEDDED SYSTEMS IN C | Classes: 10 |
|---|---|---|

Introduction, what is an embedded system, which processor should you use, which programming language should you use, which operating system should you use, how do you develop embedded software, conclusions; Introduction, what's in a name, the external interface of the standard 8051, reset requirements, clock frequency and performance, memory issues, I/O pins, timers, interrupts, serial interface, power consumption ,conclusions.

| UNIT-II | SWITCHES | Classes: 09 |
|---|---|---|

Introduction, basic techniques for reading from port pins; Example: Reading and writing bytes, example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), example: Counting goats, conclusions.

| UNIT-III | ADDING STRUCTURE TO THE CODE | Classes: 08 |
|---|---|---|

Introduction, object oriented programming with C, the project header (MAIN.H), the port header (PORT.H).

Example: Restructuring the 'Hello Embedded World' example, Example: Restructuring the goat-counting example, further examples and conclusions.

| UNIT-IV | MEETING REAL-TIME CONSTRAINTS | Classes: 08 |
|---|---|---|

Introduction, creating hardware delays using Timer 0 and Timer 1, example: Generating a precise 50 ms delay, example: Creating a portable hardware delay, Why not use Timer 2? The need for timeout mechanisms, creating loop timeouts and example: Testing loop timeouts, example: A more reliable switch interface, Creating hardware timeouts, example: Testing a hardware timeout, conclusions.

| UNIT-V | CASE STUDY: INTRUDER ALARM SYSTEM | Classes: 10 |
|---|---|---|

Introduction, The software architecture, key software components used in this example, running the program, the software, conclusions.

**Text Books:**

Michael J. Pont, "Embedded C", Pearson Education, 2nd Edition, 2008.

| |
|---|
| **Reference Books:** |
| Nigel Gardner, “The Microchip PIC in CCS C”, Ccs Inc, 2nd Revision Edition, 2002. |
| **Web References:** |
| 1. http://www.keil.com/forum/5973/<br>2. http://nptel.ac.in/courses/Webcourse,contents/IIT%20Kharagpur/Embedded%20systems/New_index1.html<br>3. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Delhi/Embedded%20Systems%20(Video).htm<br>4. http://freevideolectures.com/Course/2999/Embedded-Systems-I/5 |
| **E-Text Books:** |
| 1. http://teachers.teicm.gr/kalomiros/Mtptx/ebooks/eBook%20%20PIC%20Programming%20with%20C.pdf<br>2. http://www.ecpe.nu.ac.th/ponpisut/22323006-Embedded-c-Tutorial-8051.pdf<br>3. http://dsp-book.narod.ru/CPES.pdf<br>4. http://staff.ustc.edu.cn/~shizhu/WinCE/winCE6%20Fundamentals.pdf<br>5. http://read.pudn.com/downloads167/ebook/769402/Wrox.Professional.Microsoft.Windows.Embedded.CE.6.0.Nov.2008.eBook-DDU.pdf |
| **Course Home Page:** |

# REAL TIME OPERATING SYSTEM

| VI Group: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC534 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the principles behind the structure and operation of real-time operating systems.
II. Design the Real time operating system by using the concept of Timers, I/O subsystem and Memory Management.
III. Understand the concept of Communication and Synchronization among the Tasks.
IV. Design Real Time Operating System applications in different domains.

| UNIT-I | REAL TIME OPERATING SYSTEM PRINCIPLES | Classes: 10 |
|---|---|---|

History of operating systems, defining RTOS, classification of real-time systems; The scheduler, objects, services and key characteristics of RTOS; Tasks: Defining a task, task states and scheduling, typical task operations, typical task structure.

| UNIT-II | REAL TIME KERNEL OBJECTS | Classes: 09 |
|---|---|---|

Semaphores: Defining semaphores, typical semaphore operations, typical semaphore use; Message Queues: Defining message queues, message queue states, message queue content, message queue storage, typical message queue operations; Typical message queue use other kernel objects: Pipes, event registers, signals, condition variables.

| UNIT-III | RTOS DESIGN CONSIDERATIONS | Classes: 08 |
|---|---|---|

Timer and Timer Services: Real-time clocks and system clocks, programmable interval timers, timer interrupt service routines, model for implementing the soft-timer handling facility, timing wheels.

I/O sub system: Basic I/O concepts, the I/O sub system; Memory management: Dynamic memory allocation, fixed-size memory management, blocking vs. Non-blocking memory functions, hardware memory management units.

| UNIT-IV | TASKS COMMUNICATION AND SYNCHRONIZATION | Classes: 08 |
|---|---|---|

Synchronization and Communication: Synchronization, communication, resource synchronization methods, common practical design patterns; common design problems: Resource classification, deadlocks, priority inversion.

| UNIT-V | RTOS APPLICATION DOMAINS | Classes: 10 |
|---|---|---|

Comparison and study of RTOS: Vxworks and µCOS, Case studies: RTOS for image processing, embedded RTOS for voice over IP, RTOS for fault tolerant applications, RTOS for control systems.

**Text Books:**


1. Andrew Troelsen ,"Pro C# and the .NET 4 Platform", Springer (India) Private Limited, New Delhi, India, 5th Edition, 2010.

2. David Chappell, "Understanding .NET – A Tutorial and Analysis", Addison Wesley, 2nd Edition, 2002.
3. S. Thamarai Selvi, R. Murugesan "A Textbook on C# ", Pearson Education, 1st Edition, 2003.

**Reference Books:**

1. Raymond J.A.Bhur, Donald L.Bailey, "An Introduction to Real Time Systems", PHI, 1st Edition, 1999.
2. Wayne Wolf, "Computers as Components: Principles of Embedded Computing System Design," Kindle Publishers, 2nd Edition, 2005.
3. Tanenbaum, "Modern Operating Systems," Pearson Edition, 3rd Edition, 2007.

**Web References:**

1. http:// www.jntumaterials.co.in
2. http://www.inf.ed.ac.uk/teaching/courses/es/PDFs/RTOS.pdf
3. http://nptel.ac.in/courses/106108101/pdf/Lecture_Notes/Mod%208_LN.pdf
4. http://www.iare.ac.in

**E-Text Books:**

1. http://www.bookzz.org/
2. http://www.www.jntubook.com
3. http:// www.4shared.com/web/preview/pdf/BhrrT3m0
4. http://www.archive.org

**Course Home Page:**

# EMBEDDED NETWORKING

<table>
<tr><td colspan="11">VI Group: ECE</td></tr>
<tr><th rowspan="1">Course Code</th><th>Category</th><th colspan="3">Hours / Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">AEC535</td><td rowspan="2">Elective</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand embedded communication protocols to implement in embedded networking.
II. Design of CAN network based systems.
III. Understand the fundamental usage of UDP, TCP and FTP in design of embedded networks.

| UNIT-I | EMBEDDED COMMUNICATION PROTOCOLS | Classes: 10 |
|---|---|---|

Embedded Networking: Introduction, serial/parallel communication, serial communication protocols, RS232 standard, RS485, synchronous serial protocols, serial peripheral interface, inter integrated circuits $I^2C$– pc parallel port programming.

| UNIT-II | USB AND CAN BUS | Classes: 09 |
|---|---|---|

USB bus, introduction, speed identification on the bus, USB states, USB bus communication: Packets ,data flow types, enumeration, descriptors, PIC 18 microcontroller USB interface, C programs; CAN bus: Introduction, frames, bit stuffing, types of errors, nominal bit timing, PIC microcontroller CAN interface, simple application with CAN.

| UNIT-III | ETHERNET BASICS | Classes: 08 |
|---|---|---|

Elements of a network, inside Ethernet, building a network: Hardware options, cables, connections and network speed.

Design choices: Selecting components, Ethernet controllers, using the internet in local and communications, inside the Internet protocol.

| UNIT-IV | EMBEDDED ETHERNET | Classes: 08 |
|---|---|---|

Exchanging messages using UDP and TCP: Serving web pages with dynamic data, serving web pages that respond to user Input, email for embedded systems, using FTP, keeping devices and network secure.

| UNIT-V | WIRELESS EMBEDDED NETWORKING | Classes: 10 |
|---|---|---|

Wireless sensor networks: Introduction, applications, network topology, localization, time synchronization, energy efficient MAC protocols, SMAC, energy efficient and robust routing, data centric routing.

**Text Books:**


1. Frank Vahid, Tony Givargis, "Embedded Systems Design: A Unified Hardware/Software Introduction" John & Wiley Publications, 1st Edition, 2002.
2. Jan Axelson, "Parallel Port Complete: Programming, interfacing and using the PCs parallel printer port", Penram Publications, 1st Edition, 1996.

**Reference Books:**


1. Dogan Ibrahim, "Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series" Elsevier, 1st Edition, 2008.
2. Jan Axelson, "Embedded Ethernet and Internet Complete", Penram publications, 2nd Edition, 2003.
3. Bhaskar Krishnamachari, "Networking Wireless Sensors", Cambridge press, 1st Edition, 2005.


**Web References:**


1. http://nptel.ac.in/courses/108102045/26
2. http://freevideolectures.com/Course/2341/Embedded-Systems/27
3. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Delhi/Embedded%20Systems%20(Video).htm


**E-Text Books:**


1. www.nptel.ac.in/courses/108105057/Pdf/Lesson-26.pdf
2. www.nptel.ac.in/courses/108105057/Pdf/Lesson-3.pdf
3. emanager.srmuniv.ac.in/elibrary/temp/CAN_and_CANopen.pdf
4. https://www.crcpress.com/Embedded-and-Networking-Systems-Design-Software-and-Implementation/Khan-Iniewski/p/book/9781466590656


**Course Home Page:**

# ROBOTIC CONTROL SYSTEMS

| VI Group: ECE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC536 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Interpret robot terminologies and robotic sensors.
II. Understand direct and inverse kinematic relations.
III. Formulate the Jacobians and introduce path planning techniques.
IV. Analyze robot dynamics and understand various robot control techniques.

| UNIT-I | INTRODUCTION TO TERMINOLOGY | Classes: 10 |
|---|---|---|

Definition, classification, history, robots components, degrees of freedom, Robot joints coordinates, reference frames, workspace, robot languages, actuators; Sensors: Position, velocity and acceleration sensors, torque sensors, tactile and touch sensors proximity and range sensors, vision system, social issues.

| UNIT-II | KINEMATICS | Classes: 09 |
|---|---|---|

Mechanism, matrix representation, homogenous transformation, DH representation, inverse kinematics, solution and programming, degeneracy and dexterity.

| UNIT-III | UNDERSTANDING INHERITANCE AND POLYMORPHISM | Classes: 08 |
|---|---|---|

Jacobian, differential motion of frames, interpretation, calculation of Jacobian.

Inverse Jacobian, robot path planning.

| UNIT-IV | DYNAMIC MODELLING | Classes: 08 |
|---|---|---|

Lagrangian mechanics, two-DOF manipulator, Lagrange, Euler formulation, Newton-Euler formulation, Inverse dynamics.

| UNIT-V | ROBOT CONTROL SYSTEM | Classes: 10 |
|---|---|---|

Linear contol schemes, joint actuators, decentalised PID control, computed torque control, force control, hybrid position force control, impedance, torque control.

**Text Books:**


1. Andrew Troelsen, "Pro C# and the .NET 4 Platform", Springer (India) Private Limited, New Delhi, India, 5th Edition, 2010.
2. David Chappell, "Understanding .NET – A Tutorial and Analysis", Addison Wesley, 2nd Edition, 2002.
3. S. Thamarai Selvi, R. Murugesan "A Textbook on C# ", Pearson Education, 1st Edition, 2003.

**Reference Books:**


1. R.K. Mittal and I J Nagrath, "Robotics and Control", Tata McGraw-Hill, Fourth Reprint 2003.
2. Saeed B. Niku , "Introduction to Robotics ", Pearson Education, 2002.
3. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "Robotics", McGraw-Hill, 1st Edition, 1987.


**Web References:**


1. http://www.beckhoff.com/english.asp?highlights/twincat_kinematic_transformation/default.htm?pk_campaign=AdWords-AdWordsSearch-TwinCAT_Robotic_CNC_EN&pk_kwd=robotic%20control%20systems&gclid=Cj0KEQjwhbzABRDHw_i4q6fXoLIBEiQANZKGW1eDCL0p9ppi9ryYdGv3pyM6qbwgcGf99jnOU4KkFGsaAgVg8P8HAQ


**E-Text Books:**


1. http://bookboon.com/en/automation-and-robotics-ebook


**Course Home Page:**

## ELEMENTS OF MECHANICAL ENGINEERING

**VI Semester: Common for all Branches**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AME551 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Familiarize with fundamentals of mechanical systems.
II. Understand and appreciate the significance of mechanical engineering in different fields of engineering.
III. Understanding of application and usage of various engineering materials.

| UNIT-I | INTRODUCTION TO ENERGY SYSTEMS | Classes: 09 |
|---|---|---|

Introduction: Prime movers and its types, concept of force, pressure, energy, work, power, system, heat, temperature, specific heat capacity, change of state, path, process, cycle, internal energy, enthalpy, statement of zeroth law and first law; Energy: Introduction and application, of energy sources like fossil fuels, nuclear fuels, hydels, solar, wind, and bio-fuels, environment issues like global warming and ozone depletion; Properties of gases: Gas laws, Boyle's law, Charle's law, gas constant, relation between $C_p$ and $C_v$, various non flow processes like constant volume processes, constant pressure process, isothermal process, adiabatic process, poly-tropic process.

| UNIT-II | STEAM TURBINES, HYDRAULIC MACHINES | Classes: 09 |
|---|---|---|

Properties of steam: Steam formation, types of steam enthalpy, specific volume, internal volume, internal energy and dryness fraction of steam, use of steam tables, calorimeters; Heat engine: Heat engine cycle and heat engine, working substances, classification of heat engines, description and thermal efficiency of carnot, Rankine, otto cycle, diesel cycles; Steam boilers: Introduction, cochran, lancashire, babcock, and Wilcox boiler, functioning of different mountings and accessories.

| UNIT-III | INTERNAL COMBSUTION ENGINES, REFRIGERATION AND AIR-CONDITIONING | Classes: 09 |
|---|---|---|

Internal combustion engines: Introduction, classification, engine details, four stroke, two stroke cycle, petrol engine, diesel engine, indicated power, brake power, efficiencies; Pumps: Types, operation of reciprocating. rotary, centrifugal pumps, priming.

Air compressors: Types, operation of reciprocating, rotary air compressors, significance of multi-staging; Refrigeration and air-conditioning: Refrigerant, vapor compression refrigeration system, vapor absorption refrigeration system, domestic refrigerator, window and split air conditioners.

| UNIT-IV | MACHINE TOOLS AND AUTOMATION | Classes: 09 |
|---|---|---|

Machine tools and automation machine tools operation: Turning, facing , knurling, thread cutting, taper turning by swiveling the compound rest, drilling, boring, reaming, tapping, counter sinking, counter boring, plane milling, end milling, slot milling; Robotic and automation: Introduction, classification based on robot configuration, polar, cylindrical, cartesian, coordinate and spherical, application, advantages and advantages; Automation: Definition, types, fixed, programmable and flexible automation, NC/CNC machines, basic elements with simple block diagrams, advantages and disadvantages.

| UNIT-V | ENGINEERING MATERIALS, JOINING PROCESS | Classes: 09 |
|---|---|---|
| Engineering materials and joining processes: Types, applications of ferrous metals, non-ferrous metals, alloys; Composites: Introduction, definition, classification and application (Automobile and Air Craft). | | |

**Text Books:**

1. V. K. Manglik, "Elements of Mechanical Engineering", Prentice Hall, 1st Edition, 2013.
2. Mikell P. Groover, "Automation, Production Systems and CIM", Prentice Hall, 4th Edition, 2015.

**Reference Books:**

1. S. Trymbaka Murthy, "A Text Book of Elements of Mechanical Engineering", University Press, 4th Edition, 2006.
2. K. P. Roy, S. K. Hajra Choudary, Nirjhar Roy, " Element of Mechanical Engineering", Media Promoters & Publishers, 7th Edition, 2012.
3. Pravin Kumar, "Basic Mechanical Engineering", Pearson, 1st Edition, 2013.

**Web References:**

1. http://www.nptel.ac.in/courses/112107144/
2. *http://www.*nptel.ac.in/courses/112101098/download/lecture-37.pdf

**E-Text Books:**

1. www.wiley-vch.de/vch/journals/2081/books/2081_rel_title_varadan.pdfM
2. www.ebooks.cawok.pro/Artech.House.Publishers.An.Introduction.to.Microelectrical.pdf

**Course Home Page:**

# DISASTER MANAGEMENT

<table>
<tr><td colspan="9">VI Semester: Common for all Branches</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td rowspan="1">ACE551</td><td>Elective</td><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="3">Practical Classes: Nil</td><td colspan="4">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Identify the major disaster types and develop an understanding of modern disaster management.
II. Recognize and develop awareness of the chronological phases of natural disaster response and refugee relief operations.
III. Understand the key concepts of disaster management related to development and the relationship of different disaster management activities.
IV. Categorize the organizations that are involved in natural disaster assistance and relief system.

| UNIT-I | ENVIRONMENTAL HAZARDS AND DISASTERS | Classes: 09 |
|---|---|---|

Environmental hazards and disasters: meaning of environmental hazards, environmental disasters and environmental stress; concept of environmental hazards, environmental stress and environmental disasters, different approaches and relation with human ecology, landscape approach, ecosystem approach, perception approach, human ecology and its application in geographical researches.

| UNIT-II | TYPES OF ENVIRONMENTAL HAZARDS AND DISASTERS | Classes: 09 |
|---|---|---|

Types of environmental hazards and disasters: Natural hazards and disasters, man induced hazards and disasters, natural hazards, planetary hazards/ disasters, extra planetary hazards/ disasters, planetary hazards, endogenous hazards, exogenous hazards.

| UNIT-III | ENDOGENOUS HAZARDS | Classes: 09 |
|---|---|---|

Endogenous hazards, volcanic eruption, earthquakes, landslides, volcanic hazards/ disasters, causes and distribution of volcanoes, hazardous effects of volcanic eruptions, environmental impacts of volcanic eruptions.

Earthquake hazards/ disasters, causes of earthquakes, distribution of earthquakes, hazardous effects of, earthquakes, earthquake hazards in India, human adjustment, perception and mitigation of earthquake.

| UNIT-IV | EXOGENOUS HAZARDS | Classes: 09 |
|---|---|---|

Exogenous hazards/ disasters, infrequent events, cumulative atmospheric hazards/ disasters; Infrequent events: Cyclones , lightning , hailstorms; Cyclones: Tropical cyclones and local storms, destruction by tropical cyclones and local storms (causes, distribution human adjustment, perception and mitigation); Cumulative atmospheric hazards/ disasters: Floods, droughts, cold waves, heat waves floods; Causes of floods, flood hazards India, flood control measures ( human adjustment, perception and mitigation); Droughts: Impacts of droughts, drought hazards in India, drought control measures, extra planetary hazards/ disasters, man induced hazards /disasters, physical hazards/ disasters, soil erosion, Soil erosion: Mechanics and forms of soil erosion, factors and causes of soil erosion, conservation measures of soil erosion; Chemical hazards/ disasters: Release of toxic chemicals, nuclear explosion, sedimentation processes; Sedimentation processes: Global sedimentation problems regional sedimentation problems, sedimentation and environmental problems, corrective measures of erosion and sedimentation, biological hazards/ disasters, population explosion.

| UNIT-V | EMERGING APPROACHES IN DISASTER MANAGEMENT | Classes: 09 |
|---|---|---|
| Emerging approaches in Disaster Management, Three Stages<br>1. Pre, disaster stage (preparedness)<br>2. Emergency Stage<br>3. Post Disaster stage, Rehabilitation. | | |

**Text Books:**

1. Pardeep Sahni, "Disaster Mitigation: Experiences and Reflections", PHI Learning Pvt. Ltd., 1st Edition, 2001.
2. J. Glynn, Gary W. Hein Ke, "Environmental Science and Engineering", Prentice Hall Publishers, 2nd Edition, 1996.

**Reference Books:**

1. R.B.Singh (Ed), "Environmental Geography", 2nd Edition, 1990.
2. R.B. Singh (Ed), "Disaster Management", 2nd Edition, 2006.

**Web References:**

1. https://www.google.co.in/?gfe_rd=cr&ei=,iAwWLiDIazv8we8_5LADA#q=disater+mangement
2. http://ndma.gov.in/images/policyplan/dmplan/National%20Disaster%20Management%20Plan%20May%202016.pdf
3. http://www.eib.europa.eu/attachments/pipeline/20080021_eia_en.pdf
4. http://www.ndmindia.nic.in/

**E-Text Books:**

1. https://www.google.co.in/?gfe_rd=cr&ei=,iAwWLiDIazv8we8_5LADA#q=disaster+management+e+textbooks
2. http://cbse.nic.in/natural%20hazards%20&%20disaster%20management.pdf\
3. http://www.digitalbookindex.org/_search/search010emergencydisastera.asp
4. http://www.icbse.com/books/cbse,ebooks,download

**Course Home Page:**

# GEOSPATIAL TECHNIQUES

| VI SEMESTER: Common for all branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| ACE552 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Apply the technical skills to use geo-referenced data for the purpose of economic, educational, and social development.
II. Apply descriptive and analytical knowledge about map reading, statistics, and geospatial technologies.
III. Integrate the domains of geography and apply their knowledge to issues concerning people, places, and environments.
IV. Describe, analyze, and explain the patterns, processes, and interactions of human and physical phenomena on Earth's surface.

| UNIT-I | INTRODUCTION TO GEOSPATIAL DATA | Classes: 09 |
|---|---|---|

Introduction geospatial data, why to study geospatial data, importance of geospatial technology, spatial data infrastructure, three important geospatial technologies, spatial elements, coordinates and coordinate systems, basic electromagnetic radiation.

| UNIT-II | PHOTOGRAMMETRY AND REMOTE SENSING | Classes: 09 |
|---|---|---|

Definition and scope, history of photogrammetry and remote sensing, principle, remote sensing data acquisition, remote sensing data analysis methods, advantages and limitations, hardware and software required; Map vs mosaic, ground control points; Energy interactions with atmosphere and earth surface features.

| UNIT-III | MAPPING AND CARTOGRAPHY | Classes: 09 |
|---|---|---|

What is map and its importance, map scale and types, elements of map and indexing, map coordinate systems, visual interpretation of satellite images, interpretation of terrain evaluation.

Introduction to digital data analysis, cartographic symbolization, classification of symbols, colours in cartography, scale and purpose of a map, cartographic design, thematic cartography, digital cartography.

| UNIT-IV | GEOGRAPHIC INFORMATION SYSTEM | Classes: 09 |
|---|---|---|

Introduction to GIS, definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, a theoretical framework for GIS, GIS data structures, data collection and input overview, processing of spatial data, data input or output, vector data model, raster data model, geometric representation of spatial feature and data structure; Spatial data and modeling, tin, DTM, overlay, spatial measurement etc.

| UNIT-V | GEOSPATIAL TECHNOLOGIES APPLICATIONS | Classes: 09 |
|---|---|---|

Visual image analysis for land use/land cover mapping, land use and land cover in water resources, surface water mapping and inventory, geological and soil mapping, agriculture applications for forestry applications, water resources applications, urban and regional planning, environmental assessment, principles of land form identification and evaluation: sedimentary, igneous and metamorphic rock terrain.

**Text Books:**

1. John D. Bossler, Taylor, Francis, “Manual of Geospatial Science and Technology”, CRC Press, 2010.
2. M. Anji Reddy, “Textbook of Remote Sensing and Geographical Information Systems”, BS Publication, 2001.

**Reference Books:**

1. C. P. Lo Albert, K.W. Yonng, “Concepts and Techniques of GIS”, 2nd Edition, 2007.
2. Otto Huisman and Rolf A. de “Principles of Geographic Information Systems”, 4th Edition, 2009

**Web References:**

1. https://www.aaas.org/content/what-are-geospatial-technologies
2. http://www.istl.org/10-spring/internet2.htmls
3. https://geography.columbian.gwu.edu/applied-geospatial-techniques
4. http://kiran.nic.in/pdf/publications/Geospatial_Techniques.pdf

**E-Text Books:**

1. http://link.springer.com/book/10.1007%2F978-94-007-1858-6
2. http://www.springer.com/us/book/9789400718579
3. http://cbseacademic.in/web_material/doc/2014/7_Geospatial%20Technology%20Text%20Book%20(Class-XII).pdf
4. http://freegeographytools.com/2009/two-free-textbooks-on-geospatialgeostatistical-analysis.

**Course Home Page:**

# PRINCIPLES OF OPERATING SYSTEMS

| **VI Semester:** Common for all Braches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| ACS551 | **Elective** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the functionalities of main components in operating systems.
II. Analyze the algorithms used in memory and process management.
III. Understand the clock synchronization protocols.
IV. Interpret the concepts of input and output storage for file management.

| UNIT-I | INTRODUCTION | Classes: 10 |
|---|---|---|

Operating systems objectives and functions: Computer system architecture, operating systems structure, operating systems operations; Evolution of operating systems: Simple batch, multi programmed, time shared, real time systems, operating system services; Systems calls: Types of systems calls.

| UNIT-II | PROCESS AND CPU SCHEDULING, PROCESS COORDINATION | Classes: 10 |
|---|---|---|

Process concepts: The process, process state, process control block, threads; process scheduling: Scheduling queues, schedulers, context switch, preemptive scheduling, dispatcher, scheduling criteria, scheduling algorithms, Process synchronization, the critical section problem; semaphores and monitors.

| UNIT-III | MEMORY MANAGEMENT AND VIRTUAL MEMORY | Classes: 08 |
|---|---|---|

Logical and physical address space: Swapping, contiguous memory allocation, paging, structure of page table.

Segmentation: Segmentation with paging, virtual memory, demand paging; Page replacement, page replacement algorithms, thrashing.

| UNIT-IV | FILE SYSTEM INTERFACE | Classes: 09 |
|---|---|---|

The concept of a file, access methods, directory structure, file system mounting, file sharing, protection, file system structure, file system implementation, allocation methods, free space management, directory implementation.

| UNIT-V | DEADLOCKS, PROTECTION | Classes: 08 |
|---|---|---|

System model: Deadlock characterization, methods of handling deadlocks, deadlock prevention, dead lock avoidance, dead lock detection, principles of protection, domain of protection, access matrix, implementation of access matrix.

**Text Books:**

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Principles", Wiley Student Edition, 8th Edition, 2010.
2. William Stallings, "Operating System- Internals and Design Principles", Pearson Education, 6th Edition, 2002.

**Reference Books:**

1. Andrew S Tanenbaum, "Modern Operating Systems", PHI, 3rd Edition, 2007.
2. D. M. Dhamdhere, "Operating Systems a Concept based Approach", Tata McGraw Hill, 2nd Edition, 2006.

**Web References:**

1. https://www.smartzworld.com/notes/operatingsystems
2. https://www.scoopworld.in
3. https://www.sxecw.edu.in
4. https://www.technofest2u.blogspot.com

**E-Text Books:**

1. https://it325blog.files.wordpress.com/2012/09/operating-system-concepts-7-th-edition.pdf
2. http://mpathinveco.blog.com/2014/11/25/operating-systems-william-stalling-6th-edition/
3. http://www.e-booksdirectory.com/details.php?ebook=10050
4. http://www.e-booksdirectory.com/details.php?ebook=9907
5. http://www.e-booksdirectory.com/details.php?ebook=9460

**Course Home Page:**

# JAVA PROGRAMMING

<table>
<tr><td colspan="10">VI Semester: Common for all Branches</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>ACS552</td><td>Elective</td><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand fundamentals of object-oriented terminology and programming concepts in java.
II. Acquire basics of how to translate solution problem into object oriented form.
III. Develop programs in java for solving simple applications.
IV. Design and implement simple program that use exceptions and multithreads.

| UNIT-I | OOP CONCEPTS AND JAVA PROGRAMMING | Classes: 08 |
|---|---|---|

OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, constructors, methods, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow statements, arrays, parameter passing.

| UNIT-II | INHERITANCE | Classes: 10 |
|---|---|---|

Inheritance: Inheritance hierarchies, super and subclasses, member access rules, Polymorphism**:** Dynamic binding, method overriding, abstract classes and methods.

| UNIT-III | EXCEPTION HANDLING AND MULTI THREADING | Classes: 08 |
|---|---|---|

Exception Handling: Benefits of exception handling, the classification of exceptions, usage of try, catch, throw, throws and finally.

Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads.

| UNIT-IV | INTERFACES AND PACKAGES | Classes: 09 |
|---|---|---|

Interface: Interfaces vs Abstract classes, defining an interface, implement interfaces, Packages: Defining, creating and accessing a package, importing packages.

| UNIT-V | FILES, AND CONNECTING TO DATABASE | Classes: 10 |
|---|---|---|

Files: streams – byte streams, character stream, text input/output, binary input/output, file management; Connecting to Database: Connecting to a database, querying a database and processing the results, updating data with JDBC.

**Text Books:**


1. Herbert Schildt, Dale Skrien, "Java Fundamentals – A Comprehensive Introduction", McGraw-Hill, 1st Edition, 2013.
2. Herbert Schildt, "Java the Complete Reference", McGraw Hill, Osborne, 8thEditon, 2011.
3. T. Budd, "Understanding Object-Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 1999.

**Reference Books:**


1. P. J. Deitel, H. M. Deitel, “Java: How to Program”, Prentice Hall, 6th Edition, 2005.
2. P. Radha Krishna, “Object Oriented Programming through Java”, Universities Press, CRC Press, 2007.
3. Bruce Eckel, “Thinking in Java”, Prentice Hall, 4th Edition, 2006.
4. Sachin Malhotra, Saurabh Chaudhary, “Programming in Java”, Oxford University Press, 2nd Edition, 2014.


**Web References:**

1. http://www.javatpoint.com/java-tutorial
2. http://www.javatutorialpoint.com/introduction-to-java/

**E-Text Books:**

1.http://bookboon.com/en/java-programming-language-ebooks
2.https://en.wikibooks.org/wiki/Java_Programming

**Course Home Page:**

# EMBEDDED SYSTEM DESIGN

| **VI SEMESTER:** Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC551 | **Elective** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: 0** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Imbibe knowledge about the basic functions, structure, concepts and applications of Embedded Systems.
II. Understand Real time operating system concepts.
III. Analyze different tools for development of embedded software.
IV. Understand the architecture of advanced processors.

| | | |
|---|---|---|
| **UNIT-I** | **EMBEDDED COMPUTING** | **Classes: 09** |

Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, complex systems and microprocessor, classification, major application areas, the embedded system design process, , formalisms for system design, design examples

| | | |
|---|---|---|
| **UNIT-II** | **THE 8051 ARCHITECTURE** | **Classes: 09** |

Introduction, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts. The Assembly Language Programming Process, Instructions of 8051 Programming Tools and Techniques, Simple Programs.

| | | |
|---|---|---|
| **UNIT-III** | **INTRODUCTION TO EMBEDDED C AND APPLICATIONS** | **Classes: 09** |

Embedded systems programming in C, binding and running embedded C program in Keil IDE, dissecting the program, building the hardware;

Basic techniques for reading and writing from I/O port pins, LED interfacing, interfacing with keyboards, displays, D/A and A/D conversions, using embedded C interfacing

| | | |
|---|---|---|
| **UNIT-IV** | **INTRODUCTION TO REAL – TIME OPERATING SYSTEMS** | **Classes: 09** |

Tasks and Task States, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Interrupt Routines in an RTOS Environment. Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine

| | | |
|---|---|---|
| **UNIT-V** | **INTRODUCTION TO ADVANCED ARCHITECTURES** | **Classes: 09** |

ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded systems: Bus protocols, I2C bus and CAN bus.

**Text Books:**


1. Wayne Wolf, "Principles of Embedded Computing System Design", Elseveir., 2nd Edition 2014,
2. Kenneth J.Ayala, "The 8051 Microcontroller", Thomson, 3rd Edition 2016,.
3. Dr. K V K K Prasad, "Embedded / Real-Time Systems : Concepts, Design And Programming", Black Book , DreamTech Press, ISBN: 9788177224610

**Reference Books:**

1. Embedding system building blocks, Labrosse, via CMP publishers.
2. Embedded Systems, Raj Kamal, TMH.
3. Micro Controllers, Ajay V Deshmukhi, TMH.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley
5. Microcontrollers, Raj kamal, Pearson Education.
6. An Embedded Software Primer, David E. Simon, Pearson Education.
7. 8051 Microcontroller and Embedded Systems, by Muhammad Ali Mazadi,Janice Mazidi,Janice Gillispie Mazdi

**Web References:**

1. https://www.smartzworld.com/notes/embedded-systems-es/
2. http://notes.specworld.in/embedded-systems-es/
3. http://education.uandistar.net/jntu-study-materials
4. http://www.nptelvideos.in/2012/11/embedded-systems.html

**E-Text Books:**

1. https://www.scribd.com/doc/233633895/Intro-to-Embedded-Systems-by-Shibu-Kv
2. http://www.ee.eng.cmu.ac.th/~demo/think/_DXJSq9r3TvL.pdf
3. https://www.scribd.com/doc/55232437/Embedded-Systems-Raj-Kamal
4. https://docs.google.com/file/d/0B6Cytl4eS_ahUS1LTkVXb1hxa00/edit
5. http://www.ecpe.nu.ac.th/ponpisut/22323006-Embedded-c-Tutorial-8051.pdf

# INTRODUCTION TO AUTOMOBILE ENGINEERING

| VI Semester: Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AME552 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes:45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the function of various parts of automobile, features of fuel supply systems for S.I and C.I engines.
II. Distinguish the features of various types of cooling, ignition and electrical systems.
III. Identify the merits and demerits of the various transmission and suspension systems.
IV. Recognize the working of various braking and steering systems.
V. Summarize the ways and means of reducing the emissions from automobiles.

**UNIT-I INTRODUCTION** — **Classes: 09**

Introduction to automobile engineering, chassis and automobile components, automobile engines, otto cycle, diesel cycle, dual cycle, engine lubrication, lubricating oil, lubrication oil filter, engine servicing; Fuel supply system; Fuel tank, strainer, feed pump, fuel filter, injection pump, injector, filters, electronic controlled fuel injection, common rail direct injection systems.

**UNIT-II COOLING SYSTEM** — **Classes: 09**

Cooling requirements, air cooling, liquid cooling, water forced circulation system, radiators, cooling fan, water pump, thermostat, pressure sealed cooling, antifreeze solutions, intelligent cooling; Ignition system: Function of an ignition system, battery ignition system, storage battery, condenser and spark plug, magneto coil ignition system, electronic ignition system, electronic ignition, spark advance mechanisms; Electrical system: Charging circuit, generator, current-voltage regulator, starting system, bendix drive mechanism solenoid switch, lighting systems, automatic high beam control, horn, wiper, fuel gauge, oil pressure gauge, engine temperature indicator.

**UNIT-III TRANSMISSION AND SUSPENSIONS SYSTEMS** — **Classes: 09**

Transmission system: Clutches, principle, types, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel.

Gear boxes, types, constant mesh, synchro mesh gear boxes, epicyclic gear box, auto transmission, continuous variable transmission, propeller shaft, Hotch-Kiss drive, Torque tube drive, universal joint, differential, rear axles types, wheels and tyres; Suspension system: Objects of suspension systems, rigid axle suspension system, torsion bar, shock absorber, independent suspension system.

**UNIT-IV BRAKING AND STEERING SYSTEMS** — **Classes: 09**

Braking system: Mechanical brake system, Hydraulic brakes system, Master cylinder, wheel cylinder, Requirements of brake fluid, pneumatic and vacuum brake, ABS; Steering system: Steering geometry, camber, castor, king pin, rake, combined angle toe-in, toe-out, types of steering mechanism, Ackerman steering mechanism, Davis steering mechanism, steering gears types, steering linkages.

| UNIT-V | EMISSIONS FROM AUTOMOBILES | Classes: 09 |
|---|---|---|

Emissions from automobiles, pollution standards national and international, pollution control techniques, petrol injection, common rail diesel injection, variable valve timing; Energy alternatives, solar, photo-voltaic, hydrogen, biomass, alcohols, LPG, CNG, liquid fuels and gaseous fuels, hydrogen as a fuel for internal combustion engines, their merits and demerits.

**Text Books:**


1. Willam H crouse, Donald L. Anglin, "Automobile Engineering", McGraw Hill, 10th Edition, 2006.
2. Manzoor, Nawazish Mehdi, Yosuf Ali, "A Text Book Automobile Engineering", Frontline Publications, 1st Edition, 2011.


**Reference Books:**


1. R. K. Rajput, "A Text Book of Automobile Engineering", Laxmi Publications, 1st Edition, 2015.
2. Joseph Heinter, "Automotive Mechanics", CBS, 2nd Edition, 2006.
3. K. Netwon, W. Steeds, T. K.Garrett, "Automotive Engineering", Butterworth-Heinamann, 13th Edition, 2016.
4. S. Srinivasan, "Automotive Engines", Tata McGraw-Hill, 2nd Edition, 2003.
5. Khalil. U. Siddiqui, "A Text Book of Automobile Engineering", New Age International, 1st Edition, 2012.


**Web References:**

1. http://www.nptel.kmeacollege.ac.in/syllabus/125106002/
2. http://www.nptel.ac.in/courses/125106002/

**E-Text Books:**

1. http:// www.engineeringstudymaterial.net/tag/automotive-engineering-books
2. https://www.studynama.com/.../299-Automobile-engineering-lecture-notes-ebook-pdf

**Course Home Page:**

# INTRODUCTION TO ROBOTICS

**VI Semester:** **Common for all Branches**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AME553 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes:45 | Tutorial Classes: Nil | Practical Classes: Nil | | | Total Classes: 45 | | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Familiarize with the automation and brief history of robot and applications.
II. Understand the kinematics of robots and knowledge about robot end effectors and their design.
III. Apply robot actuators and feedback components to automation.

| UNIT-I | INTRODUCTION TO ROBOTICS | Classes: 09 |
|---|---|---|

Introduction: Automation and robotic, an over view of robotics, classification by coordinate system and control systems; Components of the industrial robotics: Degrees of freedom, end effectors: Mechanical gripper, magnetic, vacuum cup and other types of grippers, general consideration on gripper selection and design.

| UNIT-II | MOTION ANALYSIS AND KINEMATICS | Classes: 09 |
|---|---|---|

Motion analysis: Basic rotation matrices, composite rotation matrices, Euler angles, equivalent angle and axis, homogeneous transformation, problems; Manipulator kinematics: D-H notations, joint coordinates and world coordinates, forward and inverse kinematics, problems.

| UNIT-III | KINEMATICS AND DYNAMICS | Classes: 09 |
|---|---|---|

Differential kinematics: Differential kinematics of planar and spherical manipulators, Jacobians, problems.

Robot dynamics: Lagrange, Euler formulations, Newton-Euler formulations, problems on planar two link manipulators.

| UNIT-IV | TRAJECTORY PLANNING AND ACTUATORS | Classes: 09 |
|---|---|---|

Trajectory planning: Joint space scheme, cubic polynomial fit, avoidance of obstacles, types of motion**:** Slew motion, joint interpolated motion, straight line motion, problems; Robot actuators and feedback components; Actuators: pneumatic and hydraulic actuators.

| UNIT-V | ELECTRIC ACTUATORS AND ROBOTIC APPLICATIONS | Classes: 09 |
|---|---|---|

Electric actuators: DC servo motors, stepper motors, feedback components: position sensors, potentiometers, resolvers and encoders, velocity sensors, tactile sensors; Robot application in manufacturing: Material handling, assembly and inspection.

**Text Books:**


1. Groover M. P, "Industrial Robotics", Tata McGraw-Hill, 1st Edition, 2013.
2. J. J Craig," Introduction to Robotic Mechanics and Control", Pearson, 3rd Edition, 2013.

| **Reference Books:** |
|---|
| 1. Richard D. Klafter, "Robotic Engineering", Prentice Hall, 1st Edition, 2013.<br>2. Fu K S, "Robotics", McGraw-Hill, 1st Edition, 2013. |
| **Web References:** |
| 1. https://www.doc.ic.ac.uk/~ajd/Robotics/RoboticsResources/lecture1.pdf<br>2. http://opencourses.emu.edu.tr/course/view.php?id=32<br>3. https://www.researchgate.net/publication/277712686_Introduction_to_Robotics_class_notes_UG_level |
| **E-Text Books:** |
| 1. http://*www.robot.bmstu.ru/*<br>2. http://www.robotee.com/index.php/download-free-robotic-e-books/ |
| **Course Home Page:** |
| |

# AEROSPACE PROPULSION AND COMBUSTION

| VI Semester: Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AAE551 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | Total Classes: 45 | | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Demonstrate with an overview of various aerospace propulsion systems and a sound foundation in the fundamentals of thermodynamics.
II. Distinguish the elementary principles of thermodynamic cycles as applied to propulsion analysis.
III. Prioritize an introduction to combustion& gas kinetic theory.
IV. Discover a working knowledge of and the tools to measure various flight propulsion systems such as turbojets, turbofans, ramjets, rockets, air turbo-rockets and nuclear/electric propulsion systems.

| UNIT-I | ELEMENTS OF AIRCRAFT PROPULSION | Classes: 10 |
|---|---|---|

Classification of power plants, methods of aircraft propulsion, propulsive efficiency, specific fuel consumption, thrust and power, factors affecting thrust and power, illustration of working of gas turbine engine, characteristics of turboprop, turbofan and turbojet, ram jet, scram jet, methods of thrust augmentation, atmospheric properties, turbojet, turbofan, turboprop, turbo-shaft engine construction and nomenclature, theory and performance, introduction to compressors, turbines, combustors and after burners for aircraft engines.

| UNIT-II | PROPELLER THEORY | Classes: 08 |
|---|---|---|

Momentum theory, Blade element theory, combined blade element and momentum theory, propeller power losses, propeller performance parameters, prediction of static thrust and in flight, negative thrust, prop fans, ducted propellers, propeller noise, propeller selection, propeller charts.

| UNIT-III | INLETS, NOZZLES AND COMBUSTION CHAMBERS | Classes: 10 |
|---|---|---|

Subsonic and supersonic inlets, relation between minimum area ratio and external deceleration ratio, starting problem in supersonic inlets, modes of inlet operation, jet nozzle, efficiencies, over expanded, under and optimum expansion in nozzles, thrust reversal.

Classification of combustion chambers, combustion chamber performance flame tube cooling, flame stabilization.

| UNIT-IV | THERMODYNAMICS OF REACTING SYSTEMS | Classes: 09 |
|---|---|---|

Chemical kinetics: equilibrium, analysis of simple reactions, steady, state and partial equilibrium approximations, explosion theories; Transport phenomena: Molecular and convective transports; Conservation equations of multicomponent, reacting systems.

| UNIT-V | PREMIXED FLAMES | Classes: 08 |
|---|---|---|

Rankine hugoniot relations, theories of laminar premixed flame propagation, quenching and flammability limits; Diffusion flames: Burke-Schumann theory, laminar jet diffusion flame, droplet combustion, turbulent combustion, closure problem, premixed and non-premixed turbulent combustion, introduction to DNS and LES.

| Text Books: |
| --- |
| 1. Stephen R. Turns, "An Introduction to Combustion", McGraw-Hill, 3rd Edition, 2012.<br>2. Thomas A. Ward, "Aerospace Propulsion Systems", John Wiley and Sons, 1st Edition, 2010. |
| **Reference Books:** |
| 1. M. H. Sadd, "Elasticity: Theory, Applications, and Numerics", Academic Press, 2nd Edition, 2009.<br>2. R. G. Budynas, "Advanced Strength and Applied Stress Analysis", McGraw-Hill, 2nd Edition, 1999.<br>3. A. P. Boresi, R.J. Schmidt, "Advanced Mechanics of Materials", John Willey & Sons, 5th Edition, 2003. |
| **Web References:** |
| 1. https://www.nptel.ac.in/courses/101101002/<br>2. https://www.en.wikipedia.org/wiki/Airbreathing_jet_engine<br>3. https://www.en.wikipedia.org/wiki/Combustor<br>4. https://www.aero.iisc.ernet.in/page/propulsion |
| **E-Text Books:** |
| 1. https://www.as.wiley.com/WileyCDA/WileyTitle/productCd-1118307984.html<br>2. https://www.sciencedirect.com/science/book/9781856179126<br>3. https://www.books.google.co.in/books?id=iUuPAQAAQBAJ&source=gbs_similarbooks |
| **Course Home Page:** |
| |

# FUNDAMENTALS OF IMAGE PROCESSING

**VII SEMESTER: Common for all Branches**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC552 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 0 | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the image fundamentals and the relationship between pixels.
II. Understand the image enhancement techniques in spatial domain and frequency domain.
III. Analyze the image restoration technique from degraded image using various filtering techniques.
IV. Design segmentation of the image for boundary detection.
V. Differentiate redundancy techniques and apply for image compression.

| UNIT-I | INTRODUCTION | Classes: 09 |
|---|---|---|

Digital image fundamentals and image transforms digital image fundamentals, sampling and quantization, relationship between pixels.

| UNIT-II | IMAGE ENHANCEMENT | Classes: 09 |
|---|---|---|

Introduction, image enhancement in spatial domain, enhancement through point processing, types of point processing, histogram manipulation, linear and non-linear gray level transformation, local or neighborhood operation, median filter processing; Spatial domain high pass filtering, filtering in frequency domain, obtaining frequency domain filters from spatial filters, generating filters directly in the frequency domain, low pass (smoothing) and high pass (sharpening) filters in frequency domain

| UNIT-III | IMAGE RESTORATION | Classes: 9 |
|---|---|---|

Image restoration degradation model, algebraic approach to restoration, inverse filtering.

Least mean square filters, constrained least square restoration, interactive restoration.

| UNIT-IV | IMAGE SEGMENTATION, MORPHOLOGICAL IMAGE PROCESSING | Classes: 9 |
|---|---|---|

Image segmentation detection of discontinuities, edge linking and boundary detection, threshold, region oriented segmentation. Morphological image processing dilation and erosion, structuring element decomposition, the Strel function, erosion; Combining dilation and erosion: Opening and closing the hit and miss transformation.

| UNIT-V | IMAGE COMPRESSION | Classes: 09 |
|---|---|---|

Image compression: Redundancies and their removal methods, fidelity criteria, image compression models, source encoder and decoder, error free compression, lossy compression, JPEG 2000 standard.

**Text Books:**


1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing‖, Pearson", 3rd Edition, 2008.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, "Digital Image Processing", TMH, 3rd Edition, 2010.

**Reference Books:**


1. Rafael, C. Gonzalez, Richard E woods, Stens L Eddings, “Digital Image Processing using MATLAB”, Tata McGraw Hill, 2nd Edition, 2010.
2. A.K. Jain, “Fundamentals of Digital Image Processing”, PHI, 1st Edition, 1989.
3. Somka, Hlavac, Boyle, “Digital Image Processing and Computer Vision”, Cengage Learning, 1st Edition, 2008.
4. Adrain Low, “Introductory Computer vision Imaging Techniques and Solutions”, Tata McGraw-Hill, 2nd Edition, 2008.
5. John C. Russ, J. Christian Russ, “Introduction to Image Processing & Analysis”, CRC Press, 1st Edition, 2010.


**Web References:**


1. https://imagingbook.com/
2. https://en.wikipedia.org/wiki/Digital_image_processing
3. http://www.tutorialspoint.com/dip/
4. http://www.imageprocessingplace.com/
5. http://web.stanford.edu/class/ee368/
6. https://sisu.ut.ee/dev/imageprocessing/book/1
7. https://in.mathworks.com/discovery/digital-image-
8. processing.html?requestedDomain=www.mathworks.com


**E-Text Books:**


1. http://www.sci.utah.edu/~gerig/CS6640-F2010/dip3e_chapter_02.pdf
2. http://www.faadooengineers.com/threads/350-Digital-Image-Processing
3. http://newwayofengineering.blogspot.in/2013/08/anil-k-jain-fundamentals-of-digital.html
4. http://bookboon.com/en/digital-image-processing-part-one-ebook

## FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS

**VII Semester: Common for all Branches**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| ACS553 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | Total Classes: 60 | | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the role of database management system in an organization and learn the database concepts.
II. Design databases using data modeling and data normalization techniques.
III. Construct database queries using relational algebra and calculus.
IV. Understand the concept of a database transaction and related database facilities.
V. Learn how to evaluate set of queries in query processing.

| UNIT-I | CONCEPTUAL MODELING | Classes: 10 |
|---|---|---|

Introduction to file and database systems: Database system structure, data models: entity relationship model, relational model.

| UNIT-II | RELATIONAL APPROACH | Classes: 08 |
|---|---|---|

Relational algebra and calculus: Relational algebra, selection and projection, set operations, renaming, joins, division, examples of algebra queries, relational calculus, tuple relational calculus.

| UNIT-III | BASIC SQL QUERY AND NORMALIZATION | Classes: 10 |
|---|---|---|

SQL data definition; Queries in SQL: updates, views, integrity and security, relational database design.

Normal Forms: 1NF, 2NF, 3NF and BCNF.

| UNIT-IV | TRANSACTION MANAGEMENT | Classes: 09 |
|---|---|---|

Transaction processing: Introduction, need for concurrency control, desirable properties of transaction, schedule and recoverability, Serializability and schedules.

| UNIT-V | CONCURRENCY CONTROL | Classes: 08 |
|---|---|---|

Concurrency control; Types of locks: Two phases locking, deadlock, timestamp based concurrency control, recovery techniques, concepts, immediate update, deferred update, shadow paging.

**Text Books:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill, 4thEdition, 2002.

| **Reference Books:** |
|---|
| 1. Ramez Elmasri, Shamkant B. Navathe, "Fundamental Database Systems", Pearson Education, 3rd Edition, 2003.<br>2. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 3rd Edition, 2003.<br>3. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, "Database System Implementation", Pearson Education, United States, 1st Edition, 2000.<br>4. Peter Rob, Corlos Coronel, "Database System, Design, Implementation and Management", Thompson Learning Course Technology, 5th Edition, 2003. |
| **Web References:** |
| 1. https://www.youtube.com/results?search_query=DBMS+onluine+classes<br>2. http://www.w3schools.in/dbms/<br>3. http://beginnersbook.com/2015/04/dbms-tutorial/ |
| **E -Text Books:** |
| 1. http://www.e-booksdirectory.com/details.php?ebook=10166<br>2. http://www.e-booksdirectory.com/details.php?ebook=7400re |
| **Course Home Page:** |

# BASICS OF INFORMATION SECURITY AND CRYPTOGRAPHY

| VII Semester: Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AIT551 | **Elective** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Learn the basic categories of threats to computers and networks.
II. Understand various cryptographic algorithms and be familiar with public-key cryptography.
III. Apply authentication functions for providing effective security.
IV. Analyze the application protocols to provide web security.
V. Discuss the place of ethics in the Information Security Area.

| UNIT-I | ATTACKS ON COMPUTERS | Classes: 08 |
|---|---|---|

Attacks on computers and computer security: Introduction, the need for security, security approaches, types of security attacks and security services. \

| UNIT-II | SYMMETRIC KEY CIPHERS | Classes: 10 |
|---|---|---|

Symmetric key ciphers: Block cipher principles and algorithms (DES, AES), differential and linear cryptanalysis, block cipher modes of operation, stream ciphers; Asymmetric key ciphers: Principles of public key cryptosystems, algorithms (RSA Diffie – Helman).

| UNIT-III | MESSAGE AUTHENTICATION AND CRYPTOGRAPHY | Classes: 08 |
|---|---|---|

Message authentication algorithm and hash functions: Authentication requirements, functions, message, authentication codes, hash functions, secure hash algorithm, whirlpool, digital signatures.

Cryptography: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography.

| UNIT-IV | E-MAIL SECURITY | Classes: 10 |
|---|---|---|

E-mail security: Pretty good privacy; S/MIMI IP Security: IP security overview, IP security architecture, authentication header, encapsulating security payload, combining security associations, key management.

| UNIT-V | WEB SECURITY | Classes: 09 |
|---|---|---|

Web security: Web security considerations, secure electronic transaction intruders; Virus and firewalls: Intruders, intrusion detection password management, virus and related threats, firewall design principles; Types of firewalls.

**Text Books:**

1. William Stallings, “Cryptography and Network Security”, Pearson Education, 4th Edition, 2005.
2. AtulKahate, “Cryptography and Network Security”, McGraw-Hill, 2nd Edition, 2009.

**Reference Books:**


1. C K Shymala, N Harini, Dr. T R Padmanabhan, "Cryptography and Network Security", Wiley India, 1st Edition, 2016.
2. Behrouz A. Forouzan, Debdeep Mukhopadhyay , "Cryptography and Network Security", McGraw-Hill, 2nd Edition, 2010.


**Web References:**


1. http://bookboon.com/en/search?q=INFORMATION+SECURITY
2. https://books.google.co.in/books/about/Cryptography_Network_Security_Sie_2E.html?id=Kokjwdf0E7QC
3. https://books.google.co.in/books/about/Information_Security.html?id=Bh45pU0_E_4C


**E-Text Books:**


1. https://books.google.co.in/books/about/Information_Security.html
2. http://www.amazon.in/Cryptography-Network-Security-Behrouz-Forouzan/dp/007070208X


**Course Home Page:**

# MODELING AND SIMULATION

| VII Semester: Common to All Branches | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AHS551 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the basic system concept and definitions of system.
II. Study the techniques to model and to simulate various systems.
III. Analyze a system and to make use of the information to improve the performance.

| UNIT-I | INTRODUCTION | Classes: 08 |
| --- | --- | --- |

When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of models; Discrete event system simulation; Steps in a simulation study; The basics of spreadsheet simulation; Simulation example: Simulation of queuing systems in a spreadsheet.

| UNIT-II | GENERAL PRINCIPLES SIMULATION SOFTWARE | Classes: 10 |
| --- | --- | --- |

Concepts in discrete-event simulation: The event-scheduling / time-advance algorithm, world views, manual simulation using event scheduling; List processing, simulation in java; Simulation in GPSS review of terminology and concepts; Useful statistical models; Discrete distributions; Continuous distributions; Poisson process; Empirical distributions.

| UNIT-III | QUEUING MODELS AND RANDOM NUMBERS | Classes: 08 |
| --- | --- | --- |

Characteristics of queuing systems; Queuing notation; Long-run measures of performance of queuing systems; Steady-state behavior of M/G/1 queue; Networks of queues; Rough-cut modeling: An illustration.

Properties of random numbers: Generation of pseudo random numbers; Techniques for generating random numbers; Tests for random numbers random-variate generation: Inverse transforms technique; Acceptance-rejection technique; Special properties.

| UNIT-IV | INPUT MODELING | Classes: 10 |
| --- | --- | --- |

Data collection; Identifying the distribution with data; Parameter estimation; Goodness of fit tests; Fitting a non-stationary poisson process; Selecting input models without data; Multivariate and time-series input models.

| UNIT-V | ESTIMATION OF ABSOLUTE PERFORMANCE | Classes: 09 |
| --- | --- | --- |

Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminating simulations; Output analysis for steady-state simulations; Model building, verification and validation; Verification of simulation models; Calibration and validation of models, optimization via simulation.

| |
|---|
| **Text Books:** |
| Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol, "Discrete-Event System Simulation", Pearson Education, 5th Edition, 2010. |
| **Reference Books:** |
| 1. Lawrence M. Leemis, Stephen K. Park, "Discrete – Event Simulation: A First Course", Pearson Education, 1st Edition, 2006.<br>2. Averill M., "Law: Simulation Modeling and Analysis", Tata McGraw-Hill, 4th Edition, 2007. |
| **Web References:** |
| 1. https://storage.googleapis.com/northwestern14-edu/Vtu-Notes-For-System-Modeling-And Simulation.pd.<br>2. http://www.slideshare.net/qwerty626/system-simulation-modeling-notessjbit. |
| **E-Text Books:** |
| 1. http://www.e-booksdirectory.com/listing.php?category=100<br>2. https://www.google.co.in/?gfe_rd=cr&ei=YGRCWOWMKuPx8AfQqaaoCg#q=simulation+and+modeling+e+books&start=30 |
| **Course Home Page:** |

## RESEARCH METHODOLOGIES

<table>
<tr><td colspan="9">VII Semester: Common for All Branches</td></tr>
<tr><th rowspan="2">Course Code</th><th rowspan="2">Category</th><th colspan="3">Hours / Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><th>L</th><th>T</th><th>P</th><th>C</th><th>CIA</th><th>SEE</th><th>Total</th></tr>
<tr><td rowspan="1">AHS552</td><td>Elective</td><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td>Contact Classes: 45</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 45</td></tr>
</table>

**OBJECTIVES:**

**The course should enable the students to:**

I. Orient the student to make an informed choice from the large number of alternative methods and experimental designs available.
II. Empower the student with the knowledge and skills they need to undertake a research project, to present a conference paper and to write a scientific article.
III. Develop a thorough understanding of the fundamental theoretical ideas and logic of research.
IV. Identify various sources of information for literature review and data collection.

| UNIT-I | INTRODUCION TO RESEARCH AND PHILOSOPHIES | Classes: 07 |
|---|---|---|

Introduction to research: The role of research, research process overview; Philosophies and the language of research theory building: Science and its functions, what is theory, the meaning of methodology.

| UNIT-II | A RESEARCHER PROBLEMS AND HYPOTHESES | Classes: 10 |
|---|---|---|

Thinking like a researcher: Understanding concepts, constructs, variables, and definitions; Problems and hypotheses: Defining the research problem, formulation of the research hypotheses, the importance of problems and hypotheses.

| UNIT-III | RESEARCH DESIGN AND DATA COLLECTION | Classes: 09 |
|---|---|---|

Research design: Experimental and no experimental research design, field research, and survey research.

Methods of data collection: Secondary data collection methods, qualitative methods of data collection, and survey methods of data collection.

| UNIT-IV | ATTITUDE MEASUREMENT , SCALING AND SAMPLING TECHNIQUES | Classes: 09 |
|---|---|---|

Attitude measurement and scaling: Types of measurement scales; Questionnaire designing, reliability and validity; Sampling techniques: The nature of sampling, probability sampling design, non probability sampling design, and determination of sample size.

| UNIT-V | PROCESSING AND ANALYSIS OF DATA,ETHICAL ISSUES | Classes: 10 |
|---|---|---|

Processing and analysis of data ; Ethical issues in conducting research; Report generation, report writing, and APA format; Title page, abstract, introduction, methodology, results, discussion, references, and appendices.

**Text Books:**


1. Bryman, Alan, Bell, Emma, “Business Research Methods”, Oxford University Press, 3rd Edition, 2011.
2. Kerlinger, F.N., Lee, H.B.,“Foundations of Behavioral Research”, Harcourt Inc., 4th Edition, 2000.
3. Rubin, Allen, Babbie, Earl, “Essential Research Methods for Social Work”, Cengage Learning Inc., USA, 2009.

**Reference Books:**

1. Anantasi A., Urbina S., "Psychological Testing", Pearson Education, 2004.
2. Chawla, Deepak, Sondhi, Neena, "Research Methodology: Concepts and Cases", Vikas Publishing House Pvt. Ltd. Delhi, 2011.
3. Pawar B. S., "Theory Building For Hypothesis Specification In Organizational Studies", Response Books, New Delhi, 2009.
4. NeumanW.L., "Social Research Methods: Qualitative and Quantitative Approaches", Pearson Education, 2008.

**Web References:**

1. https://en.wikipedia.org/wiki/Online_research_methods
2. https://www.prescott.edu/library/resources/research-bibliography.php

**E-Text Books:**

1. https://www.hcmuaf.edu.vn/.../Research%20Methodology%20-%20Methods%20and%20T...
2. https://www.federaljack.com/ebooks/My%20collection%20of%20medical%20books,%2020...

**Course Home Page**

## ENERGY FROM WASTE

| VII Semester: Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEE551 | **Elective** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | | **Practical Classes: Nil** | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the principles associated with effective energy management and to apply these principles in the day to day life.
II. Develop insight into the collection, transfer and transport of municipal solid waste.
III. Explain the design and operation of a municipal solid waste landfill.
IV. Device key processes involved in recovering energy from wastes, systematically evaluate the main operational challenges in operating thermal and biochemical energy from waste facilities.

| UNIT - I | INTRODUCTION TO WASTE AND WASTE PROCESSING | Classes: 08 |
|---|---|---|

Solid waste sources solid waste sources, types, composition, properties, global warming; Municipal solid waste: Physical, chemical and biological properties, waste collection and, transfer stations, waste minimization and recycling of municipal waste, segregation of waste, size reduction, managing waste, status of technologies for generation of energy from waste treatment and disposal aerobic composting, incineration, furnace type and design, medical waste / pharmaceutical waste treatment technologies, incineration, environmental impacts, measures to mitigate environmental effects due to incineration .

| UNIT - II | WASTE TREATMENT AND DISPOSAL | Classes: 10 |
|---|---|---|

Land fill method of solid waste disposal land fill classification, types, methods and sitting consideration; Layout and preliminary design of landfills: Composition, characteristics, generation, movement and control of landfill leach ate and gases, environmental monitoring system for land fill gases.

| UNIT - III | BIO-CHEMICAL CONVERSION | Classes: 09 |
|---|---|---|

Energy generation from waste bio-chemical conversion: Sources of energy generation, anaerobic digestion of sewage and municipal waste, direct combustion of MSW-refuse derived solid fuel.

Industrial waste, agro residues and anaerobic digestion.

| UNIT - IV | THERMO-CHEMICAL CONVERSION | Classes: 10 |
|---|---|---|

Biogas production, land fill gas generation and utilization, thermo-chemical conversion: Sources of energy generation, gasification of waste using gasifies briquetting, utilization and advantages of briquetting, environmental benefits of bio-chemical and thermo- chemical conversion.

| UNIT - V | E-WASTE MANAGEMENT | Classes: 08 |
|---|---|---|

E-waste: E-waste in the global context: Growth of electrical and electronics industry in India, environmental concerns and health hazards; Recycling e-waste: A thriving economy of the unorganized sector, global trade in hazardous waste, impact of hazardous e-waste in India; Management of e-waste: E-waste legislation, government regulations on e-waste management, international experience, need for stringent health safeguards and environmental protection laws of India.

**Text Books:**

1. Nicholas P Cheremisinoff, “Handbook of Solid Waste Management and Waste Minimization Technologies”, An Imprint of Elsevier, New Delhi, 2003.
2. P Aarne Vesilind, William A Worrell and Debra R Reinhart, “Solid Waste Engineering”, 2nd edition 2002.
3. M Dutta , B P Parida, B K Guha and T R Surkrishnan, “Industrial Solid Waste Management and Landfilling practice”, Reprint Edition New Delhi, 1999.
4. Rajya Sabha Secretariat, “E-waste in India: Research unit”, Reprint Edition, June, 2011.
5. Amalendu Bagchi Design, “Construction and Monitoring of Landfills”, John Wiley and Sons, New York, 1994.
6. M. L. Davis and D. A. Cornwell, “Introduction to environmental engineering”, International Edition, 2008.
7. C. S. Rao, “Environmental Pollution Control Engineering”, Wiley Eastern Ltd. New Delhi, 1995.
8. S. K. Agarwal, “Industrial Environment Assessment and Strategy”, APH Publishing Corporation, New Delhi, 1996.
9. Sofer, Samir S. (ed.), Zaborsky, R. (ed.), “Biomass Conversion Processes for Energy and Fuels”, New York, Plenum Press, 1981.
10. Hagerty, D.Joseph; Pavoni, Joseph L; Heer, John E., “Solid Waste Management”, New York, Van Nostrand, 1973.
11. George Tchobanoglous, Hilary Theisen and Samuel Vigil Prsl: Tchobanoglous, George Theisen, Hillary Vigil, Samuel, “Integrated Solid Waste management: Engineering Principles and Management issues”, New York, McGraw Hill, 1993.

**Reference Books:**

1. C Parker and T Roberts (Ed), “Energy from Waste”, An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985.
2. KL Shah, “Basics of Solid and Hazardous Waste Management Technology”, Prentice Hall, Reprint Edition, 2000.
3. M Datta, “Waste Disposal in Engineered Landfills”, Narosa Publishing House, 1997.
4. G Rich et.al, Hazardous, “Waste Management Technology”, Podvan Publishers, 1987.
5. AD Bhide, BB Sundaresan, “Solid Waste Management in Developing Countries”, INSDOC, New Delhi, 1983.

**Web References:**

1. https://www.e-waste Management: From waste to Resource Klaus Hieronymi, Ramzy Kahnat, Eric williams Tech. & Engg.-2013 (Publisher: Earthscan 2013
2. https://www.What is the impact of E-waste: Tamara Thompson
3. https://www. E-waste poses a Health Hazard: Sairudeen Pattazhy

**E-Text Books:**

1. https://www.unep.org
2. https://www.outledge.com
3. https://www.bookdepository.com
4. https://www.ecoactiv.com

**Course Home Page:**

# FINITE ELEMENT ANALYSIS

**VII Semester: Common for all branches**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AAE552 | Elective | L | T | P | C | CIA | SEE | Total |
| | | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | Total Classes: 45 | | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Possess a good understanding of the theoretical basis of the weighted residual finite element method.
II. Use the commercial finite element package ANSYS to build finite element models and solve a selected range of engineering problems.
III. Communicate effectively in writing to report (both textually and graphically) the method used, the implementation and the numerical results obtained.

| UNIT-I | INTRODUCTION | Classes: 10 |
|---|---|---|

Review of various approximate method, variational approach and weighted residual approach application to structural mechanics problems; Finite difference methods- governing equation and convergence criteria of finite element method.

| UNIT-II | DISCRETE ELEMENTS | Classes: 10 |
|---|---|---|

Bar elements, uniform section, mechanical and thermal loading, varying section, 2D and 3D truss element. Beam element, problems for various loadings and boundary conditions 2D and 3D Frame elements, longitudinal and lateral vibration; Use of local and natural coordinates.

| UNIT-III | CONTINUUM ELEMENTS | Classes: 09 |
|---|---|---|

Plane stress, plane strain and axi-symmetric problem; Derivation of element matrices for constant.

Linear strain triangular elements and axi-symmetric element.

| UNIT-IV | ISOPARAMETRIC ELEMENTS | Classes: 08 |
|---|---|---|

Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, stiffness matrix and consistent load vector, evaluation of element matrices using numerical integration.

| UNIT-V | FIELD PROBLEM AND METHODS OF SOLUTIONS | Classes: 08 |
|---|---|---|

Heat transfer problems, steady state fin problems, derivation of element matrices for two dimensional problems, torsion problems. Bandwidth, elimination method and method of factorization for solving simultaneous algebraic equations, features of software packages, sources of error.

**Text Books:**


1. Tirupathi. R. Chandrapatha, Ashok D. Belegundu, "Introduction to Finite Elements in Engineering", Printice Hall India, 3rd Edition, 2003.
2. Rao. S.S., "Finite Element Methods in Engineering", Butterworth and Heinemann, 5th Edition 2010.
3. Reddy J.N., "An Introduction to Finite Element Method", McGraw-Hill, 3rd Edition, 2005.

| **Reference Books:** |
| --- |
| 1. Krishnamoorthy C.S, "Finite Element Analysis", Tata McGraw Hill, 2nd Edition 2001.<br>2. K. J. Bathe, E. L. Wilson, "Numerical Methods in Finite Elements Analysis", Prentice Hall of India, 1985.<br>3. Robert D Cook, David S Malkus, Michael E Plesha, "Concepts and Applications of Finite Element Analysis", John Wiley and Sons, Inc., 4th Edition, 2003.<br>4. Larry J Segerlind, "Applied Finite Element Analysis", John Wiley and Sons, Inc, 2nd Edition, 1984. |
| **Web References:** |
| 1. http://home.iitk.ac.in/~sbasu/me623_2006/fem_notes_me623.pdf<br>2. http://nptel.ac.in/courses/112104116/<br>3. http://www.me.berkeley.edu/~lwlin/me128/FEMNotes.pdf |
| **E-Text Books:** |
| 1. http://www.civilenggforall.com/2015/09/finite-element-analysis-by-ss-bhavikatti-free-download-pdf-civilenggforall.com.html<br>2. https://books.google.co.in/books/about/Finite_Element_Analysis_For_Engineering.html?id=3XJoK4x5fZwC |
| **Course Home Page:** |
| |

# BASIC REFRIGERATION AND AIR-CONDITIONING

**VI Semester:** **Common for all Branches**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AME554 | Elective | 3 | - | - | 3 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: 45 | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Analyze and understand various concepts and laws of thermodynamics.
II. Understand the concepts of refrigeration and air refrigeration.
III. Understand vapour compression refrigeration system and also vapour absorption refrigeration system.
IV. Identify various psychometric properties and processes.

| UNIT-I | RECAPITULATION OF THERMODYNAMICS | Classes : 09 |
|---|---|---|

Recapitulation of thermodynamics: Thermodynamic systems, laws of thermodynamics, phase, state, process, cycle, concepts of enthalpy, entropy, specific heat, sensible heat, latent heat, dryness fraction, correlations involving enthalpy, entropy and dryness fraction, types of various processes and their representation on T-s, P-V and P-h diagrams, carnot cycle, reversed carnot cycle.

| UNIT-II | INTRODUCTION AND AIR REFRIGERATION | Classes : 09 |
|---|---|---|

Introduction to Refrigeration: Basic concepts, unit of refrigeration; C.O.P: Refrigerators, heat pump, Carnot refrigerators and applications of refrigerator; Air refrigeration cycle: Bell Coleman cycle, open and dense air system – ideal and actual refrigeration, applications, aircraft refrigeration cycles; Refrigerants: Desirable properties, nomenclature and selection of refrigerants, effects of refrigerants on ozone depletion and global warming, alternate refrigerants.

| UNIT-III | VAPOUR COMPRESSION REFRIGERATION | Classes: 09 |
|---|---|---|

Vapor compression refrigeration, ideal cycle, effect of variation in evaporator pressure, condenser pressure, super heating of vapor, sub cooling of liquid.

Evaporator and condenser temperatures, deviations of practical (actual cycle) from ideal cycle, construction and use of p-h chart problems.

| UNIT-IV | VAPOUR ABSORPTION REFRIGERATION | Classes: 09 |
|---|---|---|

Vapor absorption refrigeration: description, working of NH3-Water, Li Br–water system, calculation of HCOP, principle and operation of three fluid vapor absorption refrigeration systems, steam jet refrigeration system, working principle, basic operation, principle and operation of thermo electric and vortex tube or hilsch tube refrigeration systems.

| UNIT-V | INTRODUCTION TO AIR CONDITIONING | Classes : 09 |
|---|---|---|

Psychometric properties and processes, sensible and latent heat loads, characterization, need for ventilation, consideration of infiltration, load concepts of RSHF, ASHF, ESHF and ADP; Concept of human comfort and effective temperature, comfort air conditioning, industrial air conditioning and requirements, air conditioning load calculations.

| **Text Books:** |
|---|
| 1. S. C. Arora, Domkundwar, “A Course in Refrigeration and Air-conditioning”, Dhanpatrai Publications, 2nd Edition, 2014.<br>2. C. P. Arora, “Refrigeration and Air Conditioning”, Tata McGraw-Hill, 17th Edition, 2006. |
| **Reference Books:** |
| 1. Manohar Prasad, “Refrigeration and Air Conditioning”, New Age International, 3rd Edition, 2015.<br>2. P. N Ananthanarayanan, “Basic Refrigeration and Air Conditioning”, Tata McGraw-Hill, 2015. |
| **Web References:** |
| 1. http://www.engineeringstudymaterial.net/tag/air-conditioning-and-refrigeration-books/<br>2. https://www.en.wikipedia.org/wiki/Air_conditioning |
| **E-Text Book:** |
| 1. http://www.mechanicalgeek.com/refrigeration-and-air-conditioning-by-rs-khurmi-pdf/<br>2. http://www.engineeringstudymaterial.net/tag/air-conditioning-and-refrigeration-books/ |
| **Course Home Page:** |
| |

# LAUNCH VEHICLES AND CONTROLS

**VII Semester: Common to all branches**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AAE553 | **Elective** | 3 | - | - | 3 | 30 | 70 | 100 |
| **Contact Classes: 45** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: 45** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the various configurations of launch vehicles and application of controls.
II. Identify different tracking systems for launch vehicles.
III. Distinguish between different errors associated with navigation system and compensation errors.
IV. Compare the guidance systems for short medium and long range missile.

| UNIT-I | INTRODUCTION | Classes: 10 |
|---|---|---|

Types of rockets and missiles, various configurations, components forces on the vehicle during atmospheric flight, nose cone design and drag estimation; Concepts of navigation ADF, VOR/DME, Doppler, LORAN and OMEGA, guidance and control; Introduction to basic principles; Air data information; Guidance trajectories; Radar systems; Principle of working of radar; Radar equations and applications; MTI and pulse Doppler radar; moving target detector; limitation of MTI performance.

| UNIT-II | TRACKING WITH RADAR | Classes: 10 |
|---|---|---|

Mono pulse tracking: Conical scan and sequential lobbing; Automatic tracking with surveillance radar (ADT); CW radar; Applications; Other guidance systems; Gyros and stabilized platforms; Inertial guidance and laser based guidance; Components of inertial navigation system; imaging infrared guidance; Satellite navigation; GPS; Accelerometers.

| UNIT-III | INERTIAL NAVIGATION SYSTEM | Classes: 09 |
|---|---|---|

INS transfer function and errors; Different coordinate system, compensation errors, schuler loops; Cross coupling; Missile control system; Guided missile concept; Augmented systems.

Control of aerodynamic missile; Missile parameters for dynamic analysis; Missile autopilot schematics; Longitudinal and Lateral autopilots.

| UNIT-IV | MISSILE GUIDANCE | Classes: 08 |
|---|---|---|

Missile guidance laws, short and medium range missiles; Proportional navigation guidance; Command guidance; Comparison of guidance system performance; Bank to turn missile guidance; Terminal guidance; Weapon control missile guidance.

| UNIT-V | INTEGRATED FLIGHT/FIRE CONTROL SYSTEM | Classes: 08 |
|---|---|---|

Director fire control system; Fire control modes; Tracking control laws; Longitudinal flight control system; Lateral flight control system; Rate of change of Euler angle, auto pilot; Integrated flight and fire control (IFFC) flight testing.

**Text Books:**


1. Merrilh I. Skolnik, " Introduction to Radar Systems", Tata McGraw-Hill, 3rd Edition, 2001.
2. John H Blakelock, "Automatic control of Aircraft and Missiles", Wile –Inter Science Publication, 2nd Edition, May 1990.

| Reference Books: |
|---|
| 1. R.B. Underdown, Tony Palmer, "Navigation", Black Well Publishing, 6th Edition, 2001.<br>2. R P G Collinson, "Introduction to Avionics Systems", Kulwar Academic Publishers, 3rd Edition, 2003. |
| **Web References:** |
| 1. http://home.iitk.ac.in/~sbasu/me623_2006/fem_notes_me623.pdf<br>2. http://nptel.ac.in/courses/112104116/<br>3. http://www.me.berkeley.edu/~lwlin/me128/FEMNotes.pdf |
| **E-Text Books:** |
| 1. http://www.civilenggforall.com/2015/09/finite-element-analysis-by-ss-bhavikatti-free-download-pdf-civilenggforall.com.html<br>2. https://books.google.co.in/books/about/Finite_Element_Analysis_For_Engineering.html?id=3XJoK4x5fZwC |
| **Course Home Page:** |

# TOTAL QUALITY MANAGEMENT

| IV Semester: Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AHS602 | Perspective | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | - | - | - | - | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: Nil** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the philosophy and core values of Total Quality Management (TQM).
II. Determine the voice of the customer and the impact of quality on economic performance and long-term business success of an organization.
III. Apply and evaluate best practices for the attainment of total quality.
IV. Utilize Statistical Process Control (SPC) techniques as a means to diagnose, reduce and eliminate causes of variation.
V. Describe and apply the development and nature of quality control charts.

## UNIT-I PRINCIPLES AND PRACTICES-1

Introduction, gurus of TQM, historic review, benefits of TQM leadership, characteristics of quality leaders, the deming philosophy, quality councils, strategic planning, customer satisfaction, customer perception of quality service quality, customer retention, employee involvement, employee survey-empowerment, gain sharing, performance appraisal.

## UNIT-II PRINCIPLES AND PRACTICES-2

Continuous process improvement, the jurantrilogy, the PDCA cycle-kaizen, reengineering; Supplier partnership, partnering, sourcing, supplier selection, supplier rating, performance measures, basic concept, strategy quality cost bench marking, reasons for bench marking, process understanding current performance, pitfalls and criticism of benchmarking.

## UNIT-III TOOLS AND TECHNIQUES-1

Information technology, computers and the quality functions, information quality issues, quality management system, benefits of ISO registration, ISO 9000 series standards, internal audits.

Environmental management system, ISO 14000series, benefits of EMS, relation to healthy and safety quality function deployment, the voice of the customer, building a house of quality, QFD process.

## UNIT-IV TOOLS AND TECHNIQUES-2

Quality by design benefits, communication model, failure mode and effective analysis, failure rate, FMEA documentation, the process of FMEA documentation, product liability, proof and expert witness; Total productive maintenance, promoting the philosophy and training-improvements and needs, autonomous work groups.

## UNIT-V MANAGEMENT TOOLS

Management tools introduction-forced field analysis, tree diagram, process decision program chart statistical process control, cause and effect diagram-histogram, state of control, process capability, experimental design, hypothesis, orthogonal design two factors and full factors-quality strategy for Indian industries, quality management in India.

| Text Books: |
|---|
| Joel E Ross, "Total Quality Management", CRC Press, 3rd Edition, 2015. |
| **Reference Books:** |
| 1. Dale H. Besterfeild, Carlon Besterfeild, "Total Quality Management", Pearson Education,1st Edition, 2015.<br>2. Sridhara Bhat, "Total Quality Management Texts and Cases", Himalaya, 1st Edition, 2015.<br>3. Poornima M Charantimath, "Total Quality Management", Pearson Education, 1st Edition, 2015. |
| **Web References;** |
| 1. http://managementhelp.org/quality/total-quality-management.htm<br>2. http://www.tandfonline.com/toc/ctqm20/current |
| **E-Text Books:** |
| 1. https://www.scribd.com/doc/19378602/Quality-Management-eBook<br>2. http://bookboon.com/en/quality-management-ebook |
| **Course Home Page:** |

# PROFESSIONAL ETHICS AND HUMAN VALUES

| **IV Semester:** Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AHS603 | **Perspective** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | - | - | - | - | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: Nil** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the fundamental theoretical and historic graphical topics of professional ethics and human values.

II. Study independence and self-evaluation professional ethics and human values, so that they can grasp the core values as independent thinkers.

III. Develop their analytical and pragmatic abilities & situational reasoning aligned towards right and wrong.

## UNIT-I INTRODUCTION TO PROFESSIONAL ETHICS

Basics of profession: Engineering and professionalism, two models of professionalism, three types of ethics or morality, the negative face of engineering ethics, the positive face of engineering ethics, responsibility in engineering, engineering standards, the standard care, blame responsibility and causation.

## UNIT-II PROFESSIONAL ETHICS IN ENGINEERING

Engineering ethics , variety of moral issues, types of inquiry moral dilemmas, moral autonomy, the problems of many hands, Kohlburg's theory, Gilligan's theory impediments to responsible action, engineering as social experimentation, framing the problem, determining the facts, codes of ethics, clarifying concepts application issues, common ground, general principles, utilitarian thinking respect for persons.

## UNIT-III ETHICS AND HUMAN VALUES

Human values, morals, values, and ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully.

Caring, sharing, honesty, courage, valuing time, co-operation, commitment, empathy, self-confidence, spirituality, character.

## UNIT-IV MORAL RESPONSIBILITIES & RIGHTS

Ethics consensus, controversy, models of professional roles, theories about right action, self, interest, customs and religion, uses of ethical theories, responsibility for rights, respect for authority, conflicts of interest, occupational crime, professional rights and employee rights, communicating risk and public policy, collective bargaining.

## UNIT-V GLOBAL ETHICS & VALUES

Global issues, multinational corporations, environmental ethics, engineers as managers, advisors, and experts witnesses, moral leadership sample codes of ethics problem of bribery, extortion and grease payments, problem of nepotism, excessive gifts, paternalism, different business practices, negotiating tax, global trends.

| |
|---|
| **Text Books:** |
| 1. PSR Murthy, "Indian Culture Values and Professional Ethics", BS Publications, 1st Edition, 2013.<br>2. Mike Martin, Roland Schinzinger, "Ethics in Engineering", McGraw Hill, 3rd Edition, 2003.<br>3. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, 4th Edition, 2012.<br>4. George Reynolds, "Ethics in Information Technology", Cengage Learning, 5th Edition, 2012. |
| **Reference Books:** |
| 1. Mike Martin, Roland Schinzinger, "Ethics in Engineering", McGraw Hill, 4th Edition, 2004.<br>2. Charles E Harris, Micheal J Rabins, "Engineering Ethics", Cengage Learning, 5th Edition, 2014.<br>3. Edmund G Seebauer, Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 1st Edition, 2000. |
| **Web References:** |
| 1. http://www.imd.inder.cu/adjuntos/article/524/Professional%20Ethics%20and%20Human%20Values.pdfhttp://bit.ly/29SyL7i<br>2. https://books.google.com/books/about/Textbook_on_Professional_Ethics_and_Huma.html?id=-dPiHmlV_ |
| **E-Text Books:** |
| 1. https://www.amazon.com/Professional-Ethics-Human-Values-Govindarajan-ebook/dp/B00K6GSSUW<br>2. http://bookboon.com/en/business-ethics-ebook |
| **Course Home Page:** |

# LEGAL SCIENCES

**IV Semester: Common for all Branches**

| Course Code | Category | Hours / Week | | | Credit | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Tota |
| AHS604 | Perspective | - | - | - | - | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: Nil | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Acquaint the student with the scientific method of social science research.
II. Provide the knowledge of the technique of selection, collection and interpretation of primary and secondary data in socio legal research.
III. Emphasis would be laid on practical training in conducting research.

**UNIT-I CONCEPT OF LEGAL SCIENCE**

Fundamentals of legal science, law systems in India, comparative public law, law and justice in a globalizing world. Impact of the human rights instruments on domestic law.

**UNIT-II TECHNOLOGY & LEGAL SYSTEMS**

Principles of corporate law conjunction, temporal, subordinate clauses complex sentences, intellectual property rights, contract law, cyber law.

**UNIT-III CONSTITUTION AND ADMINISTRATIVE LAW**

Minorities law, human rights, international and national sphere, media law.

Health law, globalization vis-à-vis human rights, significance of human rights.

**UNIT-IV HUMAN RIGHTS INTERNATIONAL AND NATIONAL SPHERE**

Human rights with special reference to right to development, rights of disadvantaged and vulnerable groups, critical analysis, cultural relativism and human rights, human rights in the Indian sphere, an over view, constitution and the analysis of preamble, social action litigation and the role of Indian judiciary, critical examination of the human rights council and human rights commission, treaty mechanism with respect to covenants ICESCR and ICCPR, convention on the elimination of discrimination against women and child rights convention.

**UNIT-V SCIENTIFIC METHODOLOGY IN LEGAL SYSTEMS**

The science of research and scientific methodology ,analysis of law with scientific methods, scientific approach to socio legal problems, interrelation between speculation, fact and theory building fallacies of scientific methodology with reference to socio legal research ,inter-disciplinary research and legal research models, arm chair research vis-a-vis empirical research, legal research-common law and civil law legal systems.

**Text Books:**


1. Robert Watt, “Concise book on Legal Research”, Abe Books publishers, 1st Edition, 2015.
2. Ram Ahuja, “Research Method”, News Way Publishers, 1st Edition, 2012.
3. Goode and Hatt, “Research Methodology”, Eastern Limited Publication, 1st Edition reprinted, 2006.

| |
|---|
| **Reference Books:** |
| 1. B. Somekh & C. Lewin, "Research Methods", Vistaar Publications, 1st Edition, 2005.<br>2. Bhandarkar, "Research Methods, Research styles and Research Strategies", Wilkinson Publishers, 1st Edition, 2009. |
| **Web References:** |
| 1. http://humansecurityconf.polsci.chula.ac.th/Documents/Presentations/Shanawez.pdf<br>2. http://www.lexisnexis.com/documents/pdf/20080806034945_large.pdf<br>3. http://www.theglobaljusticenetwork.org/journal<br>4. http://humansecurityconf.polsci.chula.ac.th/Documents/Presentations/Shanawez.pdf<br>5. http://as.nyu.edu/docs/IO/1172/globaljustice.pdf |
| **E-Text Books:** |
| 1. www.bookboon.com/en/natural-sciences-eBooks |
| **Course Home Page:** |

# CLINICAL PSYCHOLOGY

| IV Semester: Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AHS605 | Perspective | L | T | P | C | CIA | SEE | Total |
| | | - | - | - | - | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: Nil | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Develop the knowledge pertinent to the organism, developmental, social and situational factors those are relevant to the initiation and maintenance of human behavior.
II. Understand the present and implement effective strategies to deal with these issues during work with patients.
III. Study the professional identity and practice as clinical psychologists through fundamental knowledge of psychology, commitment to professional ethics.
IV. Understand the multiculturalism, diversity and participation in life-long learning.

## UNIT-I BASIC PSYCHOLOGY

Introduction: Psychology, definition, psychology as a science, early schools of psychology, modern perspectives, methods of psychology, experimental method, systematic observation, case study method, survey method, fields of psychology.

## UNIT-II BIOLOGY OF BEHAVIOR AND SENSORY PROCESS

Neurons and synapses: Nervous system , peripheral and central nervous system: brain and sleep: importance of fore brain, association cortex, left and right hemisphere functions; Some general properties of senses, subliminal stimuli, the visual sense, auditory sense, the other senses; Consciousness, meaning, functions, divided consciousness, stages of sleep, dreams, meditation, hypnosis.

## UNIT-III ATTENTION AND PERCEPTION

Selective attention; physiological correlates of attention, internal influences on perception, learning set, motivation and emotion, cognitive styles.

External influences on perception, figure ground, movement, illusions, perceptual organization, constancy, depth perception, binocular and monocular cues.

## UNIT-IV MOTIVATION AND EMOTION MOTIVES

Definitions, motivation cycle, theories of motivation, biological motivation, social motives, frustration and conflicts of motives, defense mechanism, emotion, expression and judgment of emotion, the physiology of emotion, theories of emotion.

## UNIT-V CLINICAL PSYCHOLOGY AND MENTAL HEALTH

History of clinical psychology and its role in understanding and alleviation of mental illness, promotion of mental health and rehabilitation of the mentally ill, role and functions of clinical psychologists in DMHP, professional code of conduct and ethical issues.

| Text Books: |
|---|
| 1. M. S. Bhatia, "Clinical Psychology", B J Publishers, 1st Edition, 2008.<br>2. Paul Bennett, "Abnormal and Clinical Psychology: An Introductory Textbook", Pearson publishers, 2nd Edition, 2006. |
| **Reference Books:** |
| 1. Robert A. Baron, Girishwar Misra, "Psychology: Indian Subcontinent Edition", Pearson Education, 5th Edition, 2009.<br>2. HillGard, E. R., C. A. Richard, L. A. Rita, "Introduction to Psychology", Oxford & IBH, New Delhi, 6th Edition, 1976. |
| **Web References:** |
| 1. https://www.amazon.com/Clinical-Psychology-Counseling-Books/b?ie=UTF8&node=11143<br>2. https://global.oup.com/academic/content/series/o/oxford-textbooks-in-clinical-psychology-otcp/?cc=in&lang=en& |
| **E-Text Books:** |
| 1. https://www.amazon.com/Clinical-Psychology-Counseling-Books/b?ie=UTF8&node=11143<br>2. https://books.google.co.in/books/about/Clinical_Psychology.html?id=u4aDPdw0Fi4C&redir_esc=y |
| **Course Home Page:** |

# ENGLISH FOR SPECIAL PURPOSES

**IV Semester:** **Common for all Branches**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| AHS606 | Perspective | L | T | P | C | CIA | SEE | Total |
| | | - | - | - | - | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: Nil** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Learn the structure and style of effective sentences, paragraphs, and essays.
II. Focus on diction and spelling, punctuation and mechanics, and functional grammar in direct relation to students' own writing.
III. Understand and apply the basic conventions of syntax and mechanics; and proofread competently and prepare acceptable manuscripts.
IV. Emphasize the importance of language in academic and employability
V. Empower the communicative skills which enhance the employability skills with self-confidence.

**UNIT-I PRESENTATION SKILLS**

English presentation, effective presentation, live presentation, web access, language orientation, classifications, method of presentations, declarations ,impact, concepts of presentation, skill oriented presentations, analysis of presentation, types of presentations.

**UNIT-II NON-VERBAL COMMUNICATION**

Overview, this unit includes body language, posture, distance different levels of physical closeness appropriate to different types of relationship, right usage of gestures, open and closed postures, to be aware of facial expressions and their importance in non verbal communication.

**UNIT-III INTERPERSONAL SKILLS**

To build rapport, handling the criticism, giving and receive the feedback, be assertive, influencing and negotiation skills.

Methods of interpersonal skills, problem solving, decision making, verbal communication, peer negotiation, effective participating.

**UNIT-IV LISTENING**

Listen effectively, how to make notes, the difference between active listening and passive listening to understand different dialects. Initiating the contact, the important context in communicating. the reluctant speaker, appendices, problems in listening.

**UNIT-V SPEAKING AND READING**

Actively participate in GDs and debates, deal with JAM topics, answer questions in interviews, vocabulary section, useful information, discussing, socializing the effectiveness; How to read critically, to understand the main idea and tone of the author to understand complex ideas.

**Text Books:**

1. Susan E. Boyer, "Word Building Activities for Beginners of English" Birrong Book Publishers,1ST Edition, 2009.
2. Clive Oxenden, Christina Latham-Koenig, Paul Seligson, "New English File. Intermediate. Workbook", Oxford Publications,1st Edition, 2006
3. P Peter Bullions, "Practical Lessons in English Grammar and Composition", ESL Publications, 1st Edition, 1849.

**Reference Books:**

1. Wren and Martin, "High school English Grammar and Composition", S Chand Publications,1st Edition, 2013.
2. Ron Cowan, "The Teacher's Grammar of English,Cambridge University Press, 1st Edition, 2008

**Web References:**

1. http://www.cde.ca.gov/be/st/ss/documents/englangdevstnd.pdf
2. http://ell.stanford.edu/sites/default/files/ELP_task_force_report_rev.pdf

**E-Text Books:**

1. http://www.linguistik-online.org/40_09/dahmardeh.pdf
2. http://bookboon.com/en/english-language-ebooks

**Course Home Page:**

# ENTREPRENEURSHIP

| IV Semester: Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AHS607 | Perspective | L | T | P | C | CIA | SEE | Total |
| | | - | - | - | - | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: Nil | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Identify and apply the elements of entrepreneurship and to entrepreneurial processes;
II. Recognize the importance of entrepreneurship and identify the profile of entrepreneurs and their role in economic growth.
III. Analyze the business environment, opportunity recognition, and the business idea-generation process;
IV. Develop an idea on the legal framework and also understand strategic perspectives in entrepreneurship.

## UNIT-I UNDERSTANDING ENTREPRENEURIAL MINDSET

The revolution impact of entrepreneurship: The evolution of entrepreneurship; Approaches to entrepreneurship; Process approach; Twenty first centaury trends in entrepreneurship.

## UNIT-II THE INDIVIDUAL ENTREPRENEURIAL MINDSET

The individual entrepreneurial mind set and personality, the entrepreneurial journey, stress and the entrepreneur, the entrepreneurial ego, entrepreneurial motivation, corporate entrepreneurial mindset the nature of corporate entrepreneur, conceptualization of corporate entrepreneurship strategy sustaining corporate entrepreneurship.

## UNIT-III LAUNCHING ENTREPRENEURIAL VENTURES

Opportunities identification, entrepreneurial imagination and creativity, the nature of the creativity process, innovation and entrepreneurship, methods to initiate ventures.

Creating new ventures acquiring an established entrepreneurial venture, franchising-hybrid disadvantage of franchising.

## UNIT-IV LEGAL CHALLENGES OF ENTREPRENEURSHIP

Intellectual property protection, patents, copyrights trademarks and trade secrets-avoiding trademark pitfalls, formulation of the entrepreneurial plan, the challenges of new venture start-ups, poor financial understanding, and critical factors for new venture development-the evaluation process-feasibility criteria approach.

## UNIT-V STRATEGIC PERSPECTIVES IN ENTREPRENEURSHIP

Strategic planning, strategic actions, strategic positioning business stabilization, building the adaptive firms-understanding the growth stage, unique managerial concern of growing ventures.

**Text Books:**


1. D F Kuratko, T V Rao, "Entrepreneurship: A South Asian Perspective", Cengage Learning, 1st Edition, 2012.
2. Gordon, K. Natarajan, "Entrepreneurship Development", Himalaya, 4th Edition, 2008.
3. Coulter, "Entrepreneurship in Action", PHI, 2nd Edition, 2002.
4. S. S. Khanka, "Entrepreneurial Development", S. Chand & Co. Ltd, 5th Edition, 2007.


**Reference Books:**


1. Vijay Sathe, "Corporate Entrepreneurship", Cambridge, 1st Edition, 2009.
2. Vasanth Desai, "Dynamics of Entrepreneurial Development and Management", HPH, Millenium Edition, 2007.
3. P. Narayana Reddy, "Entrepreneurship – Text and Cases", Cengage Learning", 1st Edition, 2010.
4. David H. Hott, "Entrepreneurship New Venture Creation", PHI, 1st Edition, 2004.


**Web References:**


1. http://www.tutorialspoint.com/entrepreneurship_development/entrepreneurship_development_tutorial.pdf
2. http://www.advalue-project.eu/content_files/EN/33/AdValue_Personal_Effectiveness_EN.pdf


**E-Text Books:**


1. http://www.freebookcentre.net/Business/Entrepreneurship-Books.html
2. http://www.e-booksdirectory.com/listing.php?category=390
3. http://www.bookboon.com/en/entrepreneurship-ebooks


**Course Home Page:**

# GERMAN LANGUAGE

| IV Semester: Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AHS608 | Perspective | L | T | P | C | CIA | SEE | Total |
| | | - | - | - | - | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: Nil | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Complete reading, writing, speaking, and listening assignments with ever increasing proficiency and accuracy.
II. Increase grammatical accuracy on written assignments.
III. Implement the language skills in listening, speaking, reading and writing in German language.

| UNIT-I | GERMAN SOUNDS |
|---|---|

Vowels, consonants, diphthongs, umlaut, the nouns, gender distinctions, cases, definite and indefinite articles, conjugation of verbs, verbs with separable and inseparable prefixes, modal verbs, personal pronouns, possessive pronouns, reflexive pronouns, cases nominative, accusative and dative; Structure of sentence and categories of sentences, subordinate clause, causative and conditional sentences; A very interesting slideshow presentation is held to enlighten the students about the culture, people, and lifestyle in Germany.

| UNIT-II | SENTENCES FORMATION |
|---|---|

Infinite sentences, use of conjunctive and conjunctive ii (contd.) plus quam perfect, modal verb (contd.) Conjunction, temporal, subordinate clauses complex sentences.

| UNIT-III | GERMAN BASIC GRAMMAR |
|---|---|

Verbs: Different forms, past tense and present perfect tense, adjectives and their declension, degrees of comparison; Prepositions, genitive case, conjunctive.

Different conjunctions (co-ordinating and subordinating), simple, complex and compound sentences, active and passive voice, relative pronouns.

| UNIT-IV | PURPOSE OF LANGUAGE STUDY |
|---|---|

Pictures and perceptions, conflicts and solutions, change and the future, the purpose of the study of the German language, listening, understanding, reacting, speaking, communicating, use of language, pronunciation and intonation ,reading, reading and understanding, writing, text writing, text forming, use of language, language reflection, building up the language, language comparison, culture reflection, other cultures and cultural identity.

| UNIT-V | GERMAN ADVANCED COMMUNICATION LEVEL-1 |
|---|---|

The significance of language study 1. Speaking and thinking 2. Self – discovery 3. Communication 4. Language Competence 5. Language and culture 6. Language changes 7. Connection with other areas of study 8. The mother—language 9. Other languages.

**Text Books:**

| |
|---|
| 1. Korbinian, Lorenz Nieder Deutschals Fremdsprache IA. Ausländer ,“German Language”, Perfect Paperback Publishers, 1st Edition, 1992.<br>2. Deutsch alsFremdsprache, IB, Ergänzungskurs,”German Language”, Front Cover. Klett, Glossar Deutsch-Spanisch Publishers, 1st Edition, 1981. |
| **Reference Books:** |
| 1. Griesbach, “Moderner Gebrauch der deutschen Sprache”, Schulz Publishers, 10th Edition, 2011.<br>2. Anna Quick , Hermann Glaser U.A , “Intermediate German: A Grammar and workbook”, Paperback, 1st Edition,2008. |
| **Web References:** |
| 1. http://www.prsformusicfoundation.com/docs/408/Schenke%20-%20Seago%20-%20Basic%20German.pdf<br>2. https://upload.wikimedia.org/wikipedia/commons/2/2d/German.pdf |
| **E-Text Books:** |
| 1. http://www.staidenshomeschool.com/files/Learning_German_Ebook.pdf |
| **Course Home Page:** |

# DESIGN HISTORY

| IV Semester: Common for all Branches | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AHS609 | Perspective | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | - | - | - | - | 30 | 70 | 100 |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: Nil** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the fundamental theoretical and historiographical topics of design, from the fifties of the twentieth century to the present day.
II. Use methodological tools and develop their analytical and critical capacities, so that they can grasp the bonds that link works of design with their respective social, economic and cultural backdrop.
III. Identify the influences at work between the various different creative disciplines.
IV. Develop their analytical and critical abilities, focusing on their search for their own expressive design language.

**UNIT-I INTRODUCTION TO DESIGN HISTORY**

Materials and techniques of design, design in the machine age, design body, environmental design.

**UNIT-II DESIGN PRODUCTS**

Innovative ideas of design products, intellectual and creative research, commercial and critical perspectives on design products, social, ethical and economic impact of your design.

**UNIT-III GLOBAL INNOVATION IN DESIGN**

Styles of global innovation design, the service design basics.

Concepts of vehicle design, techniques of design engineering (IDE).

**UNIT-IV THE DESIGN INTERACTIONS**

Interaction design, digital media, fine art, products, graphic and furniture design, architecture, life sciences, biotech, social sciences, and computer science, human consequences of different technological design futures.

**UNIT-V RESEARCH IN DESIGN HISTORY**

Research in craftsmanship and artisanal cultures, design, trade and exchange, design exhibitions, curatorial practice, history and theory, design and national, global identities, the design and material culture of the domestic interior, material history and the history of materiality, Asian design history.

**Text Books:**


1. R. S. Khurmi, "A Textbook of Machine Design", Eurasia Publishing House (pvt.) Ltd., 14th Edition, 2005.
2. Nicolas, "Beyond Design Ethnography", Nova Publishers, 2nd Edition, 2014.
3. Mariana Amatullo, "Career Pathways in Design for Social Innovation; Design matters at Art Center College of Design", LEAP Dialogues, 1st Edition, 2016.

| Reference Books: |
|---|
| 1. Max Bruinsma, “Design for the Good Society”, Paperback, 1st Edition, 2015.<br>2. Beppe Finessi, “How to Break the Rules of Brand Design”, Global Publishers, 1st Edition, 2009. |
| **Web References:** |
| 1. https://en.wikipedia.org/wiki/Web_design<br>2. https://en.wikipedia.org/wiki/Responsive_web_design |
| **E-Text Books:** |
| 1. http://www.creativebloq.com/design/free-ebooks-designers-7133700<br>2. https://www.amazon.com/Designing-History-East-Asian-Textbooks/dp/0415855586 |
| **Course Home Page:** |

# GENDER SENSITIVITY

| III Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AHS017 | Perspective | L | T | P | C | CIA | SEE | Total |
| | | - | - | - | - | - | - | - |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: Nil | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the basic concepts relating to gender and to provide logical understanding of gender roles.
II. Analyze present various perspective of body and discourse on power relationship.
III. Develop cultural construction of masculinity and femininity.
IV. Study the evolution of gender studies from women's studies

**UNIT-I INTRODUCTION**

Sex and gender; types of gender, gender roles and gender division of labour, gender stereotyping and gender discrimination-the other and objectification, male gaze and objectivity.

**UNIT-II GENDER PERSPECTIVES OF BODY**

Biological-phenomenological and socio-cultural perspectives of body, body as a site and articulation of power relations- cultural meaning of female body and women's lived experiences -gender and sexual culture.

**UNIT-III SOCIAL CONSTRUCTION OF FEMININITY**

Bio-social perspective of gender, gender as attributional fact, essentialism in the construction of femininity, challenging cultural notions of femininity.

Butler, Douglas, Faucault and Haraway, images of women in sports, arts, entertainment and fashion industry, media and feminine identities.

**UNIT-IV SOCIAL CONSTRUCTION OF MASCULINITY**

Definition and understanding of masculinities, sociology of masculinity, social organization of masculinity and privileged position of masculinity, politics of masculinity and power, media and masculine identities.

**UNIT-V WOMEN'S STUDIES AND GENDER STUDIES**

Evolution and scope of women's studies, from women's studies to gender studies: A paradigm shift, women's studies vs. gender studies, workshop, gender sensitization through gender related.

**Text Books**

1. Gender, "How Gender Inequality Persists in the Modern World", Oxford University Press, Reprinted Edition, 2011.
2. William M Johnson, "Recent reference books in religion", Duke University Publications, Reprinted Edition, 2014

**Reference Books**

Alolajis.Mustapha, Sara Mils, "Gender representation in learning materials", Pearson Publications, 1st Edition, 2015.

**Web References:**

1. https://www.google.co.in/search?q=clinical++pscyology+ebooks&ie=utf-8&oe=utf-8&client=firefox-b-ab&gfe_rd=cr&ei=xPmJV6OhFcuL8Qf3qam4Cw#q=gender+sensitivity+web+references
2. https://en.wikipedia.org/wiki/Gender_sensitization

**E-Text Books:**

1. http://ebooklibrary.org/articles/gender_sensitization
2. http://cbseacademic.in/publication_ebooks.html

**Course Home Page:**

# ELEMENTS MACHINE LEARNING

| VI SEMESTER: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC801 | SKILL | L | T | P | C | CIA | SEE | Total |
| | | - | - | - | - | - | - | - |
| Contact Classes: | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Apply knowledge of computing and mathematics appropriate to the discipline.
II. Illustrate the concepts of machine learning and related algorithms.
III. Understand the dimensionality problems using linear discriminants.
IV. Study various statistical models for analyzing the data.
V. Learn clustering algorithms for unlabeled data.

| UNIT - I | TYPES OF MACHINE LEARNING |
|---|---|

Concept learning: Introduction, version spaces and the candidate elimination algorithm; Learning with trees: Constructing decision trees, CART, classification example.

| UNIT - II | LINEAR DISCRIMINANTS |
|---|---|

Perceptron (MLP): Going forwards, backwards, MLP in practices, deriving back; Propagation support vector Machines: Optimal separation, kernels.

| UNIT - III | BASIC STATISTICS |
|---|---|

Averages, variance and covariance, the Gaussian; The bias-variance tradeoff Bayesian learning: Introduction, Bayes theorem, Bayes optimal classifier, naïve Bayes classifier. Graphical models: Bayesian networks, approximate inference, making Bayesian networks, hidden Markov models, the forward algorithm.

| UNIT-IV | EVOLUTIONARY LEARNING |
|---|---|

Genetic Algorithms, genetic operators; Genetic programming; Ensemble learning: Boosting, bagging; Dimensionality reduction: Linear discriminate analysis, principal component analysis (JAX-RPC).

| UNIT - V | CLUSTERING |
|---|---|

Similarity and distance measures, outliers, hierarchical methods, partitional algorithms, clustering large databases, clustering with categorical attributes, comparison.

**Text Books:**


1. Tom M. Mitchell, "Machine Learning ", McGraw Hill, 1st Edition, 2013.
2. Stephen Marsland, "Machine Learning - An Algorithmic Perspective ", CRC Press, 1st Edition, 2009.


**Reference Books:**


1. Margaret H Dunham, "Data Mining", Pearson Edition, 2nd Edition, 2006.
2. Galit Shmueli, Nitin R Patel, Peter C Bruce, "Data Mining for Business Intelligence", John Wiley and Sons, 2nd Edition, 2007.
3. Rajjal Shinghal, "Pattern Recognition and Machine Learning", Springer-Verlag, New York, 1st Edition, 2006.

| **Web References:** |
|---|
| 1. Httd://ww.udemy.com/MachineLearning/Online_Course<br>2. https://en.wikipedia.org/wiki/Machine_learning |
| **E-Text Books:** |
| 1. http://www.e-booksdirectory.com/details.php?ebook=1118<br>2. http://www.otexts.org/sfml |

# IOT & APPLICATIONS

| VI SEMESTER: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC802 | SKILL | L | T | P | C | CIA | SEE | Total |
| | | -- | -- | -- | -- | -- | -- | -- |
| Contact Classes: | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the architecture of Internet of Things and connected world.
II. Explore on use of various hardware and sensing technologies to build IoT applications.
III. Illustrate the real time IoT applications to make smart world.
IV. Understand the available cloud services and communication API's for developing smart cities.

**UNIT -I INTRODUCTION TO INTERNET OF THINGS (IoT)**

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT enabling technologies, IoT levels and deployment, domain specific IoTs.

**UNIT -II IoT AND M2M**

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

**UNIT-III IOT ARCHITECTURE AND PYTHON**

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data structures, control flow, functions, modules, packages, file handling.

**UNIT -IV IoT PHYSICAL DEVICES AND ENDPOINTS**

Introduction to Raspberry Pi interfaces (Serial, SPI, I2C), programming Raspberry PI with Python, other IoT devices.

**UNIT -V IoT PHYSICAL SERVERS AND CLOUD OFFERINGS**

Introduction to cloud storage models and communication APIs; WAMP: AutoBahn for IoT, Xively cloud for IoT; Case studies illustrating IoT design: Home automation, smart cities, smart environment.

**Text Books:**


1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on-Approach", VPT, 1st Edition, 2014.
2. Matt Richardson, Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 3rd Edition, 2014.


**Reference Books:**


1. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons, 1st Edition, 2014.

**Web References:**

1. https://www.upf.edu/pra/en/3376/22580.
2. https://www.coursera.org/learn/iot.
3. https://bcourses.berkeley.edu.
4. www.innovianstechnologies.com.

**E-Text Books:**

1. https://mitpress.mit.edu/books/internet-things
2. http://www.apress.com

# ARTIFICIAL INTELLIGENCE

| VI SEMESTER: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC803 | SKILL | L | T | P | C | CIA | SEE | Total |
| | | -- | -- | -- | -- | -- | -- | -- |
| Contact Classes: | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand and study the fundamental concepts of artificial intelligence in problem solving.
II. Explore the methods of agents and reasoning patterns.
III. Introduce the concepts of knowledge representation and learning.
IV. Analyze and solve statistical learning methods using AI techniques.

## UNIT -I WHAT IS ARTIFICIAL INTELLIGENCE

The AI problems, what is an AI technique, the levels of the model, the underlying assumption, problems; Problem spaces and search: Defining the problem as a state space search, production systems, problem characteristics and production system characteristics; Problem-solving: Uninformed search strategies; Informed search strategies: Heuristic search strategies, local search algorithms and optimization problems, backtracking search for csps.

## UNIT -II KNOWLEDGE AND REASONING

Logical agents, knowledge-based agents, the wumpus world and propositional logic, reasoning patterns in propositional logic and agents based on propositional logic; First-order logic: Syntax and semantic of first-order logic, knowledge engineering in first-order logic; Inference in first-order logic: Propositional vs first-order inference, unification and lifting, forward chaining, backward chaining, resolution.

## UNIT -III KNOWLEDGE REPRESENTATION

Ontological engineering, categories and objects, actions, situations and events, mental events and mental objects: The internet shopping world, reasoning systems for categories, truth maintenance systems. Uncertain knowledge and reasoning: Uncertainty, acting under uncertainty, basic probability notation.

## UNIT -IV LEARNING

Learning from observations, forms of learning, the axioms of probability, inference using full joint distributions, independence, Baye's rule and its use; Inductive learning: Learning decision trees, ensemble learning; Why learning works: Computational learning theory.

## UNIT -V STATISTICAL LEARNING METHODS

Knowledge in learning: A logical formulation of learning, knowledge in learning; Neural networks; Fuzzy logic systems: Introduction, crisp sets, fuzzy sets, some fuzzy terminology, fuzzy logic control, sugeno style of fuzzy inference processing, fuzzy hedges, α cut threshold.

**Text Books:**


1. Elaine Rich, Kevin Knight , Shiva Shankar B Nair, "Artificial Intelligence", Tata McGraw-Hill, 3rd Edition, 2008.
2. Stuart J. Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 3rd Edition, 2013.

**Reference Books:**

1. George F. Luther, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", Pearson Education, 5th Edition, 2005.
2. Eugene Charniak , Drew McDermott, "Introduction to Artificial Intelligence", Addison – Wesley Series in Computer Science, Revised Edition,1985.

**Web References:**

1. http://www.udacity.com/
2. http://www.library.thinkquest.org/2705/
3. http://www.ai.eecs.umich.edu/
4. http://www.macs.hw.ac.uk/alison/ai3notes/chapter2_5.html

**E-Text Books:**

1. http://www.stpk.cs.rtu.lv/sites/all/.../Artificial%20Intelligence%20A%20Modern%20Approach.pdf
2. http://www.bookboon.com/en/artificial-intelligence-ebooks
3. http://www.onlineprogrammingbooks.com/ai-and-robotics
4. http://www.e-booksdirectory.com

# VLSI TESTING

| VI SEMESTER: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC804 | **SKILL** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | -- | --- | -- | -- | -- | -- | -- |
| **Contact Classes:** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes:** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Understand the design methods for digital systems.
II. Understand the design of sequential circuits.
III. Illustrate the fault classes and models.
IV. Learn to generate the test cases using conventional methods.
V. Study designing of PLAs and its minimization.

**UNIT - I DESIGN OF DIGITAL SYSTEMS**

ASM charts, Hardware description language and control sequence method, Reduction of state tables, state assignments.

**UNIT - II SEQUENTIAL CIRCUIT DESIGN**

Design of Iterative circuits, design of sequential circuits using ROMs and PLAs, sequential circuit design using CPLD, FPGAs.

**UNIT - III FAULT MODELING**

Fault classes and models – Stuck at faults, bridging faults, transition and intermittent faults.

Fault diagnosis of Combinational circuits by conventional methods – Path Sensitization technique, Boolean difference method, Kohavi algorithm.

**UNIT - IV TEST PATTERN GENERATION**

D – Algorithm, PODEM, Random testing, transition count testing, Signature analysis and testing for bridging faults.

**UNIT - V PROGRAMMING LOGIC ARRAYS**

Design using PLA's, PLA minimization and PLA folding.

**Text Books:**


1. Z. Kohavi – "Switching & finite Automata Theory" Tata McGraw Hill Publishing, 2nd Edition 2009.
2. N. N. Biswas – "Logic Design Theory" (PHI), 2nd Edition 2008.
3. Nolman Balabanian, Bradley Calson, "Digital Logic Design Principles" – Wily Student Edition 2004.


**Reference Books:**


1. M. Abramovici, M. A. Breues, A. D. Friedman , "Digital System Testing and Testable Design", Jaico Publications.
2. Charles H. Roth Jr., "Fundamentals of Logic Design", 4th Edition, 2010.

3. Frederick. J. Hill & Peterson – "Computer Aided Logic Design", Wiley, 4th Edition, 2010.




**Web References:**

1 https://web.stanford.edu/class/archive/ee/ee371/ee371.1066/lectures
2 http://www.ee.ncu.edu.tw/~jfli/vlsi21/lecture/

**E-Text Books:**

1. https://profs.basu.ac.ir/abdoli/upload_file/roth(722.3450.file_ref.3310.3617).pdf

# ARM PROCESSOR ARCHITECTURES

| VII Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC805 | **SKILL** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | -- | -- | -- | -- | -- | -- | -- |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: Nil** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Provide in-depth knowledge about ARM Architecture and its instruction set.
II. Explain the systems development using ARM target boards.
III. Understand the importance of memory hierarchy, ARM CPU cores and its applications.
IV. Design the system applications using Embedded C programming.

**UNIT - I ARM ARCHITECTURE AND INSTRUCTION SET**

ARM Design Philosophy, Registers, PSR, Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families. Instruction Set: Data Processing Instructions, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions.

**UNIT - II ARM PROGRAMMING MODEL**

Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Interrupts, Software Interrupt Instructions, Exception handling.

**UNIT - III ARM PROGRAMMING USING HIGH LEVEL LANGUAGE**

Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops.

**UNIT - IV MEMORY MANAGEMENT**

Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Content Switch.

**UNIT - V INTEGER AND FLOATING POINT ARITHMETIC ON ARM**

Double precision Integer Multiplication, Division, Square roots, Endian Reversal and Bit Operations, Random Number Generation, DSP on ARM – FIR filters, IIR filters.

**Text Books:**


1. Andrew N. Sloss, Dominic Symes, Chris Wright, “ARM Systems Developer’s Guides- Designing & Optimizing System Software”, Elsevier, 2008.


**Reference Books**


1. Jonathan W. Valvano, Brookes / Cole, “Embedded Microcomputer Systems, Real Time Interfacing”, Thomas Learning, 1999.

| Web References: |
| --- |
| 1 https://www.arm.com/files/pdf/ARM_Arch_A8.pdf<br>2 https://www.cs.umd.edu/~meesh/cmsc411/website/proj01/arm/<br>3 https://www.cs.umd.edu/~meesh/cmsc411/website/proj01/arm/history. |
| **E-Text Book:** |
| 1.https://www.arm.com/resources/education/textbooks<br>2.https://www.quora.com/Which-book-is-most-suitable-to-learn-ARM-Processor<br>3.www.keil.com/books/armbooks.asp |

# NANO TECHNOLOGY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VII Semester:** ECE | | | | | | | | |
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| AEC806 | **SKILL** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| | | -- | -- | -- | -- | -- | -- | -- |
| **Contact Classes: Nil** | **Tutorial Classes: Nil** | **Practical Classes: Nil** | | | | **Total Classes: Nil** | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Impart the basic knowledge in Nano Science and Technology.
II. Give insight into many aspects of Nano science, technology and their applications in the prospective of materials science.
III. Develop new devices and technologies for applications in a wide range of industrial sectors including information technology, medicine, manufacturing, high-performance materials

**UNIT-I** **INTRODUCTION**

History and scope, can small things make a big difference, classification of nanostructured materials, fascinating nanostructures, applications of nanomaterials, Nature: The best of nanotechnologist, challenges, and future prospects.

**UNIT-II** **UNIQUE PROPERTIES OF NANOMATERIALS**

Microstructure and Defects in Nanocrystalline Materials: Dislocations, twins, stacking faults and voids, grain boundaries, triple, and disclinations, effect of Nano-dimensions on materials behavior: Elastic properties, melting point, diffusivity, grain growth characteristics, enhanced solid solubility; Magnetic Properties: Soft magnetic Nanocrystalline alloy, permanent magnetic Nanocrystalline materials, giant magnetic resonance, electrical properties, optical properties, thermal properties, and mechanical properties.

**UNIT-III** **SYNTHESIS ROUTES**

Bottom up approaches: Physical vapor deposition, inert gas condensation, laser ablation, chemical vapor deposition, molecular beam Epitaxy, solgel method, self assembly.

Top down approaches: Mechanical alloying, Nano-lithography, consolidation of Nano powders: Shock wave consolidation, hot isostatic pressing and cold isostatic pressing spark plasma sintering.

**UNIT-IV** **TOOLS TO CHARACTERIZE NANOMATERIALS**

X-Ray Diffraction (XRD), small angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

**UNIT-V** **APPLICATIONS OF NANOMATERIALS**

Nano-electronics, micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, food and agricultural industry, cosmetic and consumer goods, structure and engineering, automotive industry, water treatment and the environment, Nano-medical applications, textiles, paints, energy, defence and space applications, concerns and challenges of Nanotechnology.

**Text Books:**

1. B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, “Text Book of Nano Science and Nano Technology”, University Press-IIM.
2. Charles P. Poole, Jr., and Frank J. Owens, “Introduction to Nanotechnology”, Wiley India Edition, 2012.

**Reference Books**


1. T. Pradeep, “Nano: The Essentials”, McGraw- Hill Education.
2. David Ferry, “Transport in Nano structures”, Cambridge University Press, 2000.
3. Challa S., S. R. Kumar, J. H. Carola, “Nanofabrication towards Biomedical Application: Techniques, tools”, Application and impact Edition.
4. Michael J. O’Connell. “Carbon Nanotubes: Properties and Applications”, Cambridge University Press.
5. S. Dutta, “Electron Transport in Mesoscopic Systems”, Cambridge University Press.


**Web References:**

1.https://www.dummies.com/education/.../useful-nanotechnology-information-websites/
2.https://www.ncbi.nlm.nih.gov/books/NBK21031/
3.https://libguides.northwestern.edu › LibGuides

**E-Text Book:**

1. https://www.accessengineeringlibrary.com/.../textbook-of-nanoscience-and-nanotechn
2. https://www.azonano.com/book-reviews-index.aspx
3. https://en.wikibooks.org/wiki/Nanotechnology/Print_version

# VERILOG HDL

**VII Semester:** ECE

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| AEC807 | SKILL | -- | -- | -- | -- | -- | -- | -- |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: Nil | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Describe Verilog hardware description languages (HDL).
II. Write Register Transfer Level (RTL) models of digital circuits
III. Synthesize RTL models to standard cell libraries and FPGAs
IV. Implement RTL models on FPGAs and testing & verification

**UNIT-I INTRODUCTION TO VERILOG HDL**

Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools Language Constructs and Conventions: Introduction, Keywords, Identifiers, White space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data types, Scalars and Vectors, Parameters, Operators.

**UNIT-II GATE LEVEL MODELING**

Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip, Flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuit. Modeling at Dataflow Level: Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.

**UNIT-III BEHAVIORAL MODELING**

Introduction, Operations and Assignments, Functional Bifurcation, 'Initial' Construct, 'Always' Construct, Assignments with Delays, 'Wait' Construct, Multiple Always Block, Designs at Behavioral Level, Blocking and Non- Blocking Assignments, The 'Case' Statement, Simulation Flow 'If' an 'If-Else' Constructs, 'Assign-De-Assign' Construct, 'Repeat' Construct, for Loop, 'The Disable' Construct, 'While Loop', Forever Loop, Parallel Blocks, 'Force- Release, Construct, Event.

**UNIT-IV SWITCH LEVEL MODELING**

Basic Transistor Switches, CMOS Switches, Bi Directional Gates, Time Delays With Switch Primitives, Instantiation with 'Strengths' and 'Delays', Strength Contention with Trireg Nets. System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters, System Tasks and Functions, File Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

**UNIT-V SEQUENTIAL CIRCUIT DESCRIPTION**

Sequential Models – Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis Component Test and Verification: Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification.

**Text Books:**


1. T R. Padmanabhan, B Bala Tripura Sundari, “Design through Verilog HDL”, Wiley Publications, 2009.
2. Zainalabdien Navabi, “Verilog Digital System Design”, Tata Mc-Graw Hill, 2nd Edition, 2009.


**Reference Books**


1. Stephen Brown, Zvonkoc Vranesic, “Fundamentals of Digital Logic with Veilog Design”, Tata Mac-Graw Hill, 2nd Edition, 2010.
2. Sunggu Lee, “Advanced Digital Logic Design using Verilog, State Machine & Synthesis for FPGA”, Cengage Learning, 2012.
3. Samir Palnitkar, “Verilog HDL”, Pearson Education, 2nd Edition, 2009.
4. Michel D. Ciletti, “Advanced Digital Design with the Verilog HDL”, PHI, 2009.


**Web References:**


1. www.asic-world.com/verilog/verilinks.html
2. https://web.stanford.edu/class/ee183/handouts_win2003/VerilogQuickRef.pdf
3. esd.cs.ucr.edu/labs/tutorial/


**E-Text Book:**


1. https://robo-tronix.weebly.com/uploads/2/3/2/1/.../veriloghdlsamirpalnitkar.pdf
2. https://www.amazon.in/Digital-Design-Introduction-Verilog-System/dp/9353062012
3. https://www.amazon.in/Digital-Design-Introduction-Verilog-Hdl/dp/9332535760

# TELEVISION ENGINEERING

| VII Semester: ECE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| AEC808 | SKILL | L | T | P | C | CIA | SEE | Total |
| | | -- | -- | -- | -- | -- | -- | -- |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: Nil | | | | Total Classes: Nil | | |

**OBJECTIVES:**

**The course should enable the students to:**

I. Familiarize with the television transmitters and receivers and TV signal transmission.
II. Study various colour television systems with greater emphasis on television standards.
III. Introduce the basics of picture transmission and reception.
IV. Introduce most latest and revolutionary ideas in the field of digital TV, HDTV, WDTV

**UNIT-I INTRODUCTION**

TV transmitter and receivers, synchronization. Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal, TV standards. Camera tubes: image Orthicon, Plumbicon, vidicon, silicon Diode Array vidicon, Comparison of camera tubes, Monochrome TV camera, TV Signal Transmission and Propagation: Picture Signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW,TV transmitter, TV signal propagation, interference, TV broadcast channels, TV transmission Antennas.

**UNIT-II MONOCHROME TV RECEIVER**

RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits, AGC, noise cancellation, video and inter carrier sound signal detection, vision IF subsystem of Black and White receivers, Receiver sound system: FM detection, FM Sound detectors, and typical applications.

**UNIT-III SYNC SEPARATION AND DETECTION**

TV Receiver Tuners, Tuner operation, VHF and UHF tuners, digital tuning techniques, remote control of receiver functions. Sync Separation, AFC and Deflection Oscillators: Synchronous separation, k noise in sync pulses, separation of frame and line sync pulses. AFC, single ended AFC circuit, Deflection Oscillators, deflection drive ICs, Receiver Antennas, Picture Tubes.

**UNIT-IV COLOR TELEVISION**

Colour signal generation, additive colour mixing, video signals for colours, colour difference signals, encoding, Perception of brightness and colours luminance signal, Encoding of colour difference signals, formation of chrominance signals, color cameras, Colour picture tubes. Color Signal Encoding and Decoding: NTSC colour system PAL colour system, PAL encoder, PAL-D Decoder, chrome signal amplifiers, separation of U and V signals, colour burst separation, Burst phase discriminator, ACC amplifier, Reference oscillator, Indent and colour killer circuits, U& V demodulators.

**UNIT-V COLOR RECEIVER**

Introduction to colour receiver, Electron tuners, IF subsystem, Y-signal channel, Chroma decoder, Separation of U & V Color, Phasors, synchronous demodulators, Sub carrier generation, raster circuits. Digital TV: Introduction to Digital TV, Digital Satellite TV, Direct to Home Satellite TV, Digital TV

| |
|---|
| Transmitter, Digital TV Receiver, Digital Terrestrial TV, LCD TV, LED TV, CCD Image Sensors, HDTV. |
| **Text Books:** |
| 1. A.M.Dhake, "Television and Video Engineering", $2^{nd}$ Edition, 2001.<br>2. R.R.Gallatin, "Modern Television Practice – Principles, Technology and Service", New Age International Publication, 2002.<br>3. R.R. Gulati, "Monochrome and Colour TV", New Age International Publication, 2002. |
| **Reference Books** |
| 1. S.P.Bali, "Colour Television Theory and Practice" Tata McGraw Hill, 1994.<br>2. B.Grob and C.E.Herndon, "Basic Television and Video Systems", McGraw Hill, 1999. |
| **Web References:** |
| 1. https://www.sciencedirect.com/book/.../tv-and-video-engineers-reference-book<br>2. https://en.wikipedia.org/wiki/Broadcast_engineering<br>3. https://www.amazon.com/TV-Video-Engineers-Reference-Book/dp/0750619538 |
| **E-Text Book:** |
| 1. https://www.pdfdrive.com/television-engineering-book-4-cpdf-e34365735.html<br>2. http://www.stpetershyd.com/Academics/btech/ece/syllabus/elective-II/Television%20Engineering.pdf<br>3. https://www.scribd.com/.../Text-Monochrome-Colour-Television-R-R-Gulati-pdf |

# VISION AND MISSION OF THE INSTITUTE

## VISION

To bring forth professionally competent and socially sensitive engineers, capable of working across cultures meeting the global standards ethically.

## MISSION

To provide students with an extensive and exceptional education that prepares them to excel in their profession, guided by dynamic intellectual community and be able to face the technically complex world with creative leadership qualities.

Further, be instrumental in emanating new knowledge through innovative research that emboldens entrepreneurship and economic development for the benefit of wide spread community.

# B.TECH - PROGRAM OUTCOMES (POS)

**PO-1:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems (**Engineering Knowledge**).

**PO-2:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences **(Problem Analysis).**

**PO-3:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations **(Design/Development of Solutions).**

**PO-4:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions **(Conduct Investigations of Complex Problems).**

**PO-5:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations **(Modern Tool Usage).**

**PO-6:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice **(The Engineer and Society).**

**PO-7:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development **(Environment and Sustainability).**

**PO-8:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice **(Ethics).**

**PO-9:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings **(Individual and Team Work).**

**PO-10:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions **(Communication).**

**PO-11:** Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO-12**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change **(Life-long learning).**

# OBJECTIVES OF THE DEPARTMENTS

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### Programme Educational Objectives (PEO's)

A graduate of the Electronics and Communication Engineering Program should:

**PEO – I**: To be successful in professional career by acquiring the knowledge in the fundamentals of Electronics and Communication Engineering principles and professional skills.

**PEO – II**: To be in a position to analyze real life problems and design socially accepted and economically feasible solutions in the respective fields.

**PEO – III**: To involve themselves in lifelong learning and professional development by pursuing higher education and participation in research and development activities.

**PEO – IV:** To exhibit good communication skills in their professional career, lead a team with good leadership traits and good interpersonal relationship with the members related to other engineering streams.

### PROGRAM SPECIFIC OUTCOMES (PSO's)

**PSO – I:** **Professional Skills:** An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.

**PSO – II:** **Problem-Solving Skills:** An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.

**PSO – III:** **Successful Career and Entrepreneurship:** An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.

# FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT AUTONOMY

1. **Who grants Autonomy? UGC, Govt., AICTE or University**
   In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy but only after concurrence from the respective state Government as well as UGC. The State Government has its own powers to grant autonomy directly to Govt. and Govt. aided Colleges.

2 **Shall IARE award its own Degrees?**
No. Degree will be awarded by Jawaharlal Nehru Technological University, Hyderabad with a mention of the name IARE on the Degree Certificate.

3 **What is the difference between a Deemed University and an Autonomy College?**
A Deemed University is fully autonomous to the extent of awarding its own Degree. A Deemed University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4 **How will the Foreign Universities or other stake – holders know that we are an Autonomous College?**
Autonomous status, once declared, shall be accepted by all the stake holders. The Govt. of Telangana mentions autonomous status during the First Year admission procedure. Foreign Universities and Indian Industries will know our status through our website.

5 **What is the change of Status for Students and Teachers if we become Autonomous?**
An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic performances, our capability of self- governance and the kind of quality education we offer.

6 **Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?**
There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee, which will keep a watch on the academics and keep its reports and recommendations every year. In addition the highest academic council also supervises the academic matters. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7 **Will the students of IARE as an Autonomous College qualify for University Medals and Prizes for academic excellence?**
No. IARE has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural on co-curricular organized by the University the students shall qualify.

8 **Can IARE have its own Convocation?**
No. Since the University awards the Degree the Convocation will be that of the University, but there will be Graduation Day at IARE.

9 **Can IARE give a provisional degree certificate?**
Since the examinations are conducted by IARE and the results are also declared by IARE, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

**10 Will Academic Autonomy make a positive impact on the Placements or Employability?**

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

**11 What is the proportion of Internal and External Assessment as an Autonomous College?**

Presently, it is 70 % external and 30% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

**12 Is it possible to have complete Internal Assessment for Theory or Practicals?**

Yes indeed. We define our own system. We have the freedom to keep the proportion of external and internal assessment component to choose.

**13 Why Credit based Grade System?**

The credit based grade system is an accepted standard of academic performance the world over in all Universities. The acceptability of our graduates in the world market shall improve.

**14 What exactly is a Credit based Grade System?**

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like A, B,C,D, etc. are assigned for a Range of Marks. (e.g. 91% and above is A+, 80 to 90 % could be A etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

**15 What are the norms for the number of Credits per Semester and total number of Credits for UG/PG programme?**

These norms are usually defined by UGC or AICTE. Usually around 25 Credits per semester is the accepted norm.

**16 What is a Semester Grade Point Average (SGPA)?**

The performance of a student in a semester is indicated by a number called SGPA. The SGPA is the weighted average of the grade points obtained in all the courses registered by the student during the semester.

$$SGPA = \sum_{i=1}^{n}\left(C_i\, G_i\right) / \sum_{i=1}^{n} C_i$$

Where, $C_i$ is the number of credits of the $i^{th}$ course and $G_i$ is the grade point scored by the student in the $i^{th}$ course and $i$ represent the number of courses in which a student registered in the concerned semester. SGPA is rounded to two decimal places.

**17 What is a Cumulative Grade Point Average (CGPA)?**

An up-to-date assessment of overall performance of a student from the time of his first registration is obtained by calculating a number called CGPA, which is weighted average of the grade points obtained in all the courses registered by the students since he entered the Institute.

$$CGPA = \sum_{j=1}^{m}\left(C_j\, S_j\right) / \sum_{j=1}^{m} C_j$$

Where, $S_j$ is the SGPA of the $j^{th}$ semester and $C_j$ is the total number of credits upto the semester and $m$ represent the number of semesters completed in which a student registered upto the semester. CGPA is rounded to two decimal places.

**18 Is there any Software available for calculating Grade point averages and converting the same into Grades?**

Yes, The institute has its own MIS software for calculation of SGPA, CGPA, etc.

**19 Will the teacher be required to do the job of calculating SGPAs etc. and convert the same into Grades?**

No. The teacher has to give marks obtained out of whatever maximum marks as it is. Rest is all done by the computer.

**20 Will there be any Revaluation or Re-Examination System?**

No. There will double valuation of answer scripts. There will be a make up Examination after a reasonable preparation time after the End Semester Examination for specific cases mentioned in the Rules and Regulations. In addition to this, there shall be a 'summer term' (compressed term) followed by the End Semester Exam, to save the precious time of students.

**21 How fast Syllabi can be and should be changed?**

Autonomy allows us the freedom to change the syllabi as often as we need.

**22 Will the Degree be awarded on the basis of only final year performance?**

No. The CGPA will reflect the average performance of all the semester taken together.

**23 What are Statutory Academic Bodies?**

Governing Body, Academic Council, Examination Committee and Board of Studies are the different statutory bodies. The participation of external members in every body is compulsory. The institute has nominated professors from IIT, NIT, University (the officers of the rank of Pro-vice Chancellor, Deans and Controller of Examinations) and also the reputed industrialist and industry experts on these bodies.

**24 Who takes Decisions on Academic matters?**

The Governing Body of institute is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like Boards of Studies. Decisions taken at the Boared of Studies level are to be ratified at the Academic Council and Governing Body.

**25 What is the role of Examination committee?**

The Examinations Committee is responsible for the smooth conduct of internal, End Semester and make up Examinations. All matters involving the conduct of examinations spot valuations, tabulations preparation of Grade Cards etc fall within the duties of the Examination Committee.

**26 Is there any mechanism for Grievance Redressal?**

The institute has grievance redressal committee, headed by Dean - Student affairs and Dean - IQAC.

**27 How many attempts are permitted for obtaining a Degree?**

All such matters are defined in Rules & Regulation

**28 Who declares the result?**

The result declaration process is also defined. After tabulation work wherein the SGPA, CGPA and final Grades are ready, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the Examinations and Result Committee for its approval. The result is then declared on the institute notice boards as well put on the web site and Students Corner. It is eventually sent to the University.

29 **Who will keep the Student Academic Records, University or IARE?**
It is the responsibility of the Dean, Academics of the Autonomous College to keep and preserve all the records.

30 **What is our relationship with the JNT University?**
We remain an affiliated college of the JNT University. The University has the right to nominate its members on the academic bodies of the college.

31 **Shall we require University approval if we want to start any New Courses?**
Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

32 **Shall we get autonomy for PG and Doctoral Programmes also?**
Yes, presently our PG programmes also enjoying autonomous status.

# MALPRACTICES RULES

## DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

| S.No | Nature of Malpractices/Improper conduct | Punishment |
|---|---|---|
| | *If the candidate:* | |
| 1. (a) | Possesses or keeps accessible in examination hall, any paper, note book, programmable calculator, cell phone, pager, palm computer or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) | Expulsion from the examination hall and cancellation of the performance in that subject only. |
| (b) | Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. |
| 2. | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.<br>The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations. |
| 3. | Impersonates any other candidate in connection with the examination. | The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. |

| | | |
|---|---|---|
| 4. | Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 5. | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | Cancellation of the performance in that subject. |
| 6. | Refuses to obey the orders of the Controller of Examinations /Additional Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the COE or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the COE or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the Institute premises or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. |
| 7. | Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 8. | Possess any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already |

| | | |
|---|---|---|
| | | appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. |
| 9. | If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8. | Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.<br><br>Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them. |
| 10. | Comes in a drunken condition to the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. |
| 11. | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. | Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations. |
| 12. | If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment. | |

# INSTITUTE OF AERONAUTICAL ENGINEERING

**(Autonomous)**

Dundigal, Hyderabad - 500 043

## UNDERTAKING BY STUDENT / PARENT

"To make the students attend the classes regularly from the first day of starting of classes and be aware of the College regulations, the following Undertaking Form is introduced which should be signed by both student and parent. The same should be submitted to the Dean, Academic".

I, Mr./Ms. ------------------------------------------------------------------------- joining I Semester / III Semester for the academic year 2016-2017 / 2017-2018 in Institute of Aeronautical Engineering, Hyderabad, do hereby undertake and abide by the following terms, and I will bring the ACKNOWLEDGEMENT duly signed by me and my parent and submit it to the Dean, Academic.

1. I will attend all the classes as per the timetable from the starting day of the semester specified in the institute Academic Calendar. In case, I do not turn up even after two weeks of starting of classes, I shall be ineligible to continue for the current academic year.
2. I will be regular and punctual to all the classes (theory/practical/drawing) and secure attendance of not less than 75% in every course as stipulated by Institute. I am fully aware that an attendance of less than 65% in more than three theory courses will make me lose one year.
3. I will compulsorily follow the dress code prescribed by the college.
4. I will conduct myself in a highly disciplined and decent manner both inside the classroom and on campus, failing which suitable action may be taken against me as per the rules and regulations of the institute.
5. I will concentrate on my studies without wasting time in the Campus/Hostel/Residence and attend all the tests to secure more than the minimum prescribed Class/Sessional Marks in each course. I will submit the assignments given in time to improve my performance.
6. I will not use Mobile Phone in the institute premises and also, I will not involve in any form of ragging inside or outside the campus. I am fully aware that using mobile phone to the institute premises is not permissible and involving in Ragging is an offence and punishable as per JNTUH/UGC rules and the law.
7. I declare that I shall not indulge in ragging, eve-teasing, smoking, consuming alcohol drug abuse or any other anti-social activity in the college premises, hostel, on educational tours, industrial visits or elsewhere.
8. I will pay tuition fees, examination fees and any other dues within the stipulated time as required by the Institution / authorities, failing which I will not be permitted to attend the classes.
9. I will not cause or involve in any sort of violence or disturbance both within and outside the college campus.
10. If I absent myself continuously for 3 days, my parents will have to meet the HOD concerned/ Principal.
11. I hereby acknowledge that I have received a copy of IARE - R16 Academic Rules and Regulations, Syllabus copy and hence, I shall abide by all the rules specified in it.

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### ACKNOWLEDGEMENT

I have carefully gone through the terms of the undertaking mentioned above and I understand that following these are for my/his/her own benefit and improvement. I also understand that if I/he/she fail to comply with these terms, shall be liable for suitable action as per Institute/JNTUH/AICTE/UGC rules and the law. I undertake that I/he/she will strictly follow the above terms.

**Signature of Student with Date**

**Signature of Parent with Date**
**Name & Address with Phone Number**