OUTCOME BASED EDUCATION
WITH
CHOICE BASED CREDIT SYSTEM

BACHELOR OF TECHNOLOGY
COMPUTER SCIENCE AND ENGINEERING

ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI
(Based on AICTE Model Curriculum)

IARE - R18

B.Tech Regular Four Year Degree Program
(for the batches admitted from the academic year 2018- 2019)

&

B.Tech (Lateral Entry Scheme)
(for the batches admitted from the academic year 2019 - 2020)

FAILURE TO READ AND UNDERSTAND THE REGULATIONS
IS NOT AN EXCUSE
<table>
<thead>
<tr>
<th>S. No</th>
<th>Preliminary Definitions and Nomenclatures</th>
<th>iii</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foreword</td>
<td>vi</td>
</tr>
<tr>
<td>1</td>
<td>Choice Based Credit System</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Medium of Instruction</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Programs Offered</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Semester Structure</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Registration / Dropping / Withdrawal</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Unique Course Identification Code</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Curriculum and Course Structure</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Evaluation Methodology</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>Make-up Examination</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Attendance Requirements and Detention Policy</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>Supplementary Examinations</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>Conduct of Semester End Examinations and Evaluation</td>
<td>11</td>
</tr>
<tr>
<td>13</td>
<td>Scheme for the Award of Grade</td>
<td>11</td>
</tr>
<tr>
<td>14</td>
<td>Letter Grades and Grade Points</td>
<td>12</td>
</tr>
<tr>
<td>15</td>
<td>Computation of SGPA and CGPA</td>
<td>12</td>
</tr>
<tr>
<td>16</td>
<td>Illustration of Computation of SGPA and CGPA</td>
<td>13</td>
</tr>
<tr>
<td>17</td>
<td>Photocopy / Revaluation</td>
<td>13</td>
</tr>
<tr>
<td>18</td>
<td>Promotion Policies</td>
<td>14</td>
</tr>
<tr>
<td>19</td>
<td>Graduation Requirements</td>
<td>14</td>
</tr>
<tr>
<td>20</td>
<td>Betterment of Marks in the Courses Already Passed</td>
<td>15</td>
</tr>
<tr>
<td>21</td>
<td>Award of Degree</td>
<td>15</td>
</tr>
<tr>
<td>22</td>
<td>B.Tech with Honours or additional Minor in Engineering</td>
<td>16</td>
</tr>
<tr>
<td>23</td>
<td>Temporary Break of Study from the Program</td>
<td>18</td>
</tr>
<tr>
<td>24</td>
<td>Termination from the Program</td>
<td>19</td>
</tr>
<tr>
<td>25</td>
<td>With-holding of Results</td>
<td>19</td>
</tr>
<tr>
<td>26</td>
<td>Graduation Day</td>
<td>19</td>
</tr>
<tr>
<td>27</td>
<td>Discipline</td>
<td>19</td>
</tr>
<tr>
<td>28</td>
<td>Grievance Redressal Committee</td>
<td>19</td>
</tr>
<tr>
<td>29</td>
<td>Transitory Regulations</td>
<td>19</td>
</tr>
<tr>
<td>30</td>
<td>Revision of Regulations and Curriculum</td>
<td>22</td>
</tr>
<tr>
<td>31</td>
<td>Course Structure of Computer Science and Engineering</td>
<td>23</td>
</tr>
<tr>
<td>32</td>
<td>Syllabus</td>
<td>29</td>
</tr>
<tr>
<td>33</td>
<td>Vision and Mission of the Institute</td>
<td>237</td>
</tr>
<tr>
<td>34</td>
<td>B. Tech - Program Outcomes (POs)</td>
<td>237</td>
</tr>
<tr>
<td>35</td>
<td>Frequently asked Questions and Answers about autonomy</td>
<td>239</td>
</tr>
<tr>
<td>36</td>
<td>Malpractice Rules</td>
<td>243</td>
</tr>
<tr>
<td>37</td>
<td>Undertaking by Student / Parent</td>
<td>246</td>
</tr>
</tbody>
</table>

"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

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.

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

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 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.

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

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.

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 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.

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

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.

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

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

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

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

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 Semester:** Student who doesn’t want to register for any semester can apply in writing in prescribed format before the 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.

**Honours:** An Honours degree typically refers to a higher level of academic achievement at an undergraduate level.

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

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

**Minor:** Minor are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech degree.

**Pre-requisite:** A specific course or subject, the knowledge of which is required to complete before student register another course at the next grade level.

**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, UG degree program: Bachelor of Technology (B.Tech); PG degree program: Master of Technology (M.Tech) / Master of Business Administration (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 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 - R18” 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. Odd semester commences usually in July and even semester in December of every year.

**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 Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, is an affiliating University.

**Withdraw from a Course:** Withdrawing from a course means that a student can drop from a course within the first two weeks of 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 including J N T University Hyderabad (JNTUH), Hyderabad and AICTE, New Delhi. 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. 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 such as Academic Council and Board of Studies (BOS) 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 in 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 from the principal of the institute, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stakeholders is requested for the successful implementation of the autonomous system in the larger interests of the institute and brighter prospects of engineering graduates.

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

Preamble:
All India Council for Technical Education (AICTE) has introduced Model Curriculum for Bachelor of Technology program with 160 credits in the entire program of 4 years, and additional 20 credits can be acquired for the degree of B.Tech with Honours or additional Minor in Engineering. These additional 20 credits will have to be acquired with online courses (MOOCs), perhaps for the first time in the country, to tap the zeal and excitement of learning beyond the classrooms. So, the students will have to complete additional 20 credits through MOOCs within 4 years of time. This creates an excellent opportunity for students to acquire the necessary skill set for employability through massive open online courses where the rare expertise of world famous experts from academics and industry are available.

Separate certificate will be issued in addition to regular degree program mentioning that the student has cleared Honours / Minor specialization in respective courses in addition to scheduled courses for B.Tech programs.

1. **CHOICE BASED CREDIT SYSTEM**

   The Indian Higher Education Institutions (HEIs) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester system in the 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 lectures / tutorials / laboratory work / field work / project work / comprehensive Examination / seminars / assignments / MOOCs / 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. 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. PROGRAMS OFFERED
Presently, the institute is offering Bachelor of Technology (B.Tech) degree programs in the following disciplines:
1. Aeronautical Engineering
2. Computer Science and Engineering
3. Information Technology
4. Electronics and Communication Engineering
5. Electrical and Electronics Engineering
6. Mechanical Engineering
7. Civil Engineering

4. 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.

4.1 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.
4.2 Each main semester shall have a minimum of 90 working days; out of which 75 days are for teaching/practical and 15 days for conduct of exams and preparation.
4.3 The supplementary semester shall be a fast track semester consisting of eight weeks and this period includes time for registration of courses, course work, and examination preparation, conduct of examinations, assessment, and declaration of final results.
4.4 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.
4.5 The institute may use supplementary semester to arrange add-on courses for regular students and/or for deputing them for practical training/FSI model. A student can register for a maximum number of 15 credits during a supplementary semester.
4.5.1 The registration for the supplementary semester (during May – July, every year) 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) due to any reason.
   Students will not be permitted to register for more than 15 credits (both I and II semester) in the supplementary semester. Students required to register for supplementary semester courses are to pay a nominal fee within the stipulated time. A separate circular shall be issued at the time of supplementary semester.
It will be optional for a student to get registered in the course(s) of supplementary semester; otherwise, he / she can opt to appear directly in supplementary examination. However, if a student gets registered in a course of supplementary semester, then it will be compulsory for a student to fulfill attendance criterion (≥90%) of supplementary semester and he / she will lose option to appear in immediate supplementary examination.

The students who have earlier taken SEE examination and register afresh for the supplementary semester may revoke the CIA marks secured by them in their regular/earlier attempts in the same course. Once revoked, the students shall not seek restoration of the CIA marks.

Supplementary semester will be at an accelerated pace e.g. one credit of a course shall require two hours/week so that the total number of contact hours can be maintained same as in normal semester.

**Instructions and guidelines for the supplementary semester course:**

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

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

<table>
<thead>
<tr>
<th>Table 1: Academic Calendar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FIRST SEMESTER (21 weeks)</strong></td>
</tr>
<tr>
<td>I Spell Instruction Period</td>
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<tr>
<td>I Mid Examinations</td>
</tr>
<tr>
<td>II Spell Instruction Period</td>
</tr>
<tr>
<td>II Mid Examinations</td>
</tr>
<tr>
<td>Preparation and Practical Examinations</td>
</tr>
<tr>
<td>Semester End Examinations</td>
</tr>
<tr>
<td><strong>Semester Break and Supplementary Exams</strong></td>
</tr>
<tr>
<td><strong>SECOND SEMESTER (21 weeks)</strong></td>
</tr>
<tr>
<td>I Spell Instruction Period</td>
</tr>
<tr>
<td>I Mid Examinations</td>
</tr>
<tr>
<td>II Spell Instruction Period</td>
</tr>
<tr>
<td>II Mid Examinations</td>
</tr>
<tr>
<td>Preparation &amp; Practical Examinations</td>
</tr>
<tr>
<td>Semester End Examinations</td>
</tr>
<tr>
<td><strong>Summer Vacation, Supplementary Semester and Remedial Exams</strong></td>
</tr>
</tbody>
</table>

4.6 Students admitted on transfer from JNTUH 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’.

**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 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 circumstances.
5.3. At the time of registration, students should have cleared all the dues of Institute and Hostel for the previous semesters, paid the prescribed fees for the current semester and not been debarred from the institute for a specified period on disciplinary or any other ground.
5.4. The student has to normally register for a minimum of 17 credits and may register up to a maximum of 27 credits, in consultation with HOD/faculty mentor. On an average, a student is expected to register for 22 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 seven groups of courses as listed in the Table 2. The various courses and their two-letter codes are given below;

<table>
<thead>
<tr>
<th>S. No</th>
<th>Branch</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aeronautical Engineering</td>
<td>AE</td>
</tr>
<tr>
<td>2</td>
<td>Computer Science and Engineering</td>
<td>CS</td>
</tr>
<tr>
<td>3</td>
<td>Information Technology</td>
<td>IT</td>
</tr>
<tr>
<td>4</td>
<td>Electronics and Communication Engineering</td>
<td>EC</td>
</tr>
<tr>
<td>5</td>
<td>Electrical and Electronics Engineering</td>
<td>EE</td>
</tr>
<tr>
<td>6</td>
<td>Mechanical Engineering</td>
<td>ME</td>
</tr>
<tr>
<td>7</td>
<td>Civil Engineering</td>
<td>CE</td>
</tr>
</tbody>
</table>

7.0 **CURRICULUM AND COURSE STRUCTURE**

The curriculum shall comprise Theory Courses, Elective Courses, Laboratory Courses, Audit Courses, Mandatory Courses, Mini Project, Internship and Project work. The list of elective courses may also include subjects from allied discipline.

**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 per week.
- **Project Work**: 1 credit for 2 hours of project work per week.
- **Mini Project**: 1 credit for 2 hours per week

### 7.1 TYPES OF COURSES

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

#### 7.1.0 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.

#### 7.1.1 Professional Core Courses:

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 program in the said discipline of study.

#### 7.1.2 Elective Course:
Electives provide breadth of experience in respective branch and application 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 Professional Elective, is a discipline centric focusing on those courses which add generic proficiency to the students or may be Open Elective, chosen from unrelated disciplines.

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

#### 7.1.3 Credit distribution for courses offered is given in Table 3.

**Table 3: Credit distribution**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Theory Course</td>
<td>1 / 2 / 3 / 4</td>
<td>1 / 2 / 3 / 4</td>
</tr>
<tr>
<td>2</td>
<td>Elective Courses</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>MOOC Courses</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Laboratory Courses</td>
<td>2 / 3 / 4</td>
<td>1 / 1.5 / 2</td>
</tr>
<tr>
<td>5</td>
<td>Audit Course / Mandatory Course</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Project / Research based learning</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Full Semester Internship (FSI) / Project Work</td>
<td>-</td>
<td>11</td>
</tr>
</tbody>
</table>
7.2 Course Structure

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.

Table 4: Category Wise Distribution of Credits

<table>
<thead>
<tr>
<th>S. No</th>
<th>Category</th>
<th>Breakup of Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Humanities and Social Sciences (HSMC), including Management.</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Basic Science Courses (BSC) including Mathematics, Physics and Chemistry.</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Engineering Science Courses (ESC), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>Professional Core Courses (PCC), relevant to the chosen specialization / branch.</td>
<td>48</td>
</tr>
<tr>
<td>5</td>
<td>Professional Electives Courses (PEC), relevant to the chosen specialization / branch.</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>Open Elective Courses (OEC), from other technical and/or emerging subject areas.</td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td>Project Based Learning, Research Based Learning and Project Work (PROJ) / Full Semester Internship (FSI)</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>Mandatory Courses / Audit Courses.</td>
<td>Non-Credit</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>160</td>
</tr>
</tbody>
</table>

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 – Project work.

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.

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 CIA examinations or the marks scored in the make-up examination.

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 modules and each modules 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 module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

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

<table>
<thead>
<tr>
<th>%</th>
<th>Emphasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>To test the objectiveness of the concept</td>
</tr>
<tr>
<td>50</td>
<td>To test the analytical skill of the concept  OR to test the application skill of the concept</td>
</tr>
</tbody>
</table>

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 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>THEORY</th>
<th>TOTAL MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Assessment</td>
<td>CIE Exam</td>
<td>Quiz</td>
</tr>
<tr>
<td>Max. CIA Marks</td>
<td>20</td>
<td>05</td>
</tr>
</tbody>
</table>

8.1.2.1 Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 20 marks of 2 hours duration consisting of five descriptive type questions out of which four 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 Examination.

8.1.2.2 Quiz – Online Examination

Two Quiz exams shall be online examination consisting of 50 multiple choice questions and are to be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in testing of knowledge, skills, application, analysis, evaluation and understanding of the students. Marks shall be awarded considering the average of two quiz examinations for every course.

8.1.2.3 Alternative Assessment Tool (AAT)

In order to encourage innovative methods while delivering a course, the faculty members are encouraged to use the Alternative Assessment Tool (AAT). This AAT enables faculty to design own assessment patterns during the CIA. 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 tutorial hours/classes, seminars, assignments, term paper, open ended experiments, METE (Modeling and Experimental Tools in Engineering), 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 the 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 of 10 marks in each semester.

8.3 Mandatory Courses (MC):

These courses are among the compulsory courses but will not carry any credits. However, a pass in each such course during the program shall be necessary requirement for the student to qualify for the award of Degree. Its result shall be declared as “Satisfactory” or “Not Satisfactory” performance.

8.4 Value Added Courses:

The value added courses are audit courses offered through joint ventures with various organizations providing ample scope for the students as well as faculty to keep pace with the latest technologies pertaining to their chosen fields of study. A plenty of value added programs will be proposed by the departments one week before the commencement of class work. 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.

8.5 Project / Research Based Learning

This gives students a platform to experience a research driven career in engineering, while developing a device / systems and publishing in reputed SCI / SCOPUS indexed journals and/or filing an Intellectual Property (IPR-Patent/Copyright) to aid communities around the world. Students should work individually as per the guidelines issued by head of the department concerned. The benefits to students of this mode of learning include increased engagement, fostering of critical thinking and greater independence.

The topic 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 work 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.

Project report will be evaluated for 100 marks in total. Assessment will be done for 100 marks out of which, the supervisor / guide will evaluate for 30 marks based on the work and presentation / execution of the work. Subdivision for the remaining 70 marks is based on publication, report, presentation, execution and viva-voce. Evaluation shall be done by a committee comprising the 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.

8.6 Project work
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 and explore the research bent of the mind of the student. A student shall carry out the project work under the supervision of a member of the faculty or may undertake to execute the project in collaboration with an Industry, R&D organization or another academic institution/University where sufficient facilities exist to carry out the project work.

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, the 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.

8.7 Full Semester Internship (FSI)

FSI is a full semester internship program carrying 11 credits. The FSI shall be opted in VII semester or in VIII semester. During the FSI, student has to spend one full semester in an identified industry / firm / R & D organization or another academic institution/University where sufficient facilities exist to carry out the project work.

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 MAKEUP 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 SUPPLEMENTARY EXAMINATIONS:
In addition to the Regular Semester End Examinations held at the end of each semester, Supplementary Semester End Examinations will be conducted within three weeks of the commencement of the teaching of the next semester. Candidates taking the Regular / Supplementary examinations as Supplementary candidates may have to take more than one Semester End Examination per day. A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However the maximum stipulated period for the course shall not be relaxed under any circumstances.

11.0 ATTENDANCE REQUIREMENTS AND DETENTION POLICY

11.1 It is desirable for a candidate to have 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.

11.2 In case 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 the Head of the Department if the attendance is between 75% and 65% in every course, subjected to the submission of medical certificates, medical case file, and other needful documents to the concerned departments.

11.3 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.

11.4 A candidate shall put in a minimum required attendance in atleast 60% of (rounded to the next highest integer) theory courses for getting promoted to next higher class / semester. Otherwise, s/he shall be declared detained and has to repeat semester.

11.5 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.

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

11.7 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 fails to fulfill the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

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

12.0 CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

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

12.2 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.

12.3 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.

12.4 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.
12.5 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.

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

13.0 SCHEME FOR THE AWARD OF GRADE

13.1 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.

13.2 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each Lab / Project based learning / Research based learning / Project work / FSI, if s/he secures
   i. Not less than 40% marks for each Lab / Project based learning / Research based learning / Project work / FSI course in the semester end examination,
   ii. A minimum of 40% marks for each Lab / Project based learning / Research based learning / Project work / FSI course considering both internal and semester end examination.

13.3 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.

14.0 LETTER GRADES AND GRADE POINTS

14.1 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>
<thead>
<tr>
<th>Range of Marks</th>
<th>Grade Point</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 – 90</td>
<td>10</td>
<td>S (Superior)</td>
</tr>
<tr>
<td>89 – 80</td>
<td>9</td>
<td>A+ (Excellent)</td>
</tr>
<tr>
<td>79 – 70</td>
<td>8</td>
<td>A (Very Good)</td>
</tr>
<tr>
<td>69 – 60</td>
<td>7</td>
<td>B+ (Good)</td>
</tr>
<tr>
<td>59 – 50</td>
<td>6</td>
<td>B (Average)</td>
</tr>
<tr>
<td>49 – 40</td>
<td>5</td>
<td>C (Pass)</td>
</tr>
<tr>
<td>Below 40</td>
<td>0</td>
<td>F (Fail)</td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td>AB (Absent)</td>
</tr>
<tr>
<td>Authorized Break of Study</td>
<td>0</td>
<td>ABS</td>
</tr>
</tbody>
</table>

14.2 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”.

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

14.4 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.
14.5 “SA” denotes shortage of attendance (as per item 11) and hence prevention from writing Semester End Examination.
14.6 “W” denotes withdrawal from the exam for the particular course.
14.7 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.

15.0 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) and the 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,

\[
SGPA = \frac{\sum_{i=1}^{n} (C_i G_i)}{\sum_{i=1}^{n} C_i}
\]

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.

\[
CGPA = \frac{\sum_{j=1}^{m} (C_j S_j)}{\sum_{j=1}^{m} C_j}
\]

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.

16.0 ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA

16.1 Illustration for SGPA

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Course Credits</th>
<th>Grade letter</th>
<th>Grade point</th>
<th>Credit Point (Credit x Grade)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course 1</td>
<td>3</td>
<td>A</td>
<td>8</td>
<td>3 x 8 = 24</td>
</tr>
<tr>
<td>Course 2</td>
<td>4</td>
<td>B+</td>
<td>7</td>
<td>4 x 7 = 28</td>
</tr>
<tr>
<td>Course 3</td>
<td>3</td>
<td>B</td>
<td>6</td>
<td>3 x 6 = 18</td>
</tr>
<tr>
<td>Course 4</td>
<td>3</td>
<td>S</td>
<td>10</td>
<td>3 x 10 = 30</td>
</tr>
<tr>
<td>Course 5</td>
<td>3</td>
<td>C</td>
<td>5</td>
<td>3 x 5 = 15</td>
</tr>
<tr>
<td>Course 6</td>
<td>4</td>
<td>B</td>
<td>6</td>
<td>4 x 6 = 24</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus, \(SGPA = 139 / 20 = 6.95\)

16.2 Illustration for CGPA

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 3</th>
<th>Semester 4</th>
</tr>
</thead>
</table>

12 | P a g e
Credit: 20  
SGPA: 6.9

Credit: 22  
SGPA: 7.8

Credit: 25  
SGPA: 5.6

Credit: 26  
SGPA: 6.0

<table>
<thead>
<tr>
<th>Semester 5</th>
<th>Semester 6</th>
</tr>
</thead>
</table>
| Credit: 26  
SGPA: 6.3 | Credit: 25  
SGPA: 8.0 |

Thus, \( CGPA = \frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6.0 + 26 \times 6.3 + 25 \times 8.0}{144} = 6.73 \)

17.0 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.

18.0 PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 11.

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

18.1.1 A student will not be promoted from II semester to III semester unless s/he fulfills the academic requirement of securing 50% of the total credits (rounded to the next lowest integer) from I and II semester examinations, whether the candidate takes the examination(s) or not.

18.1.2 A student will not be promoted from IV semester to V semester unless s/he fulfills the academic requirement of securing 50% of the total credits (rounded to the next lowest integer) up to III semester or 50% of the total credits (rounded to the next lowest integer) up to IV semester, from all the examinations, whether the candidate takes the examination(s) or not.

18.1.3 A student shall be promoted from VI semester to VII semester only if s/he fulfills the academic requirements of securing 50% of the total credits (rounded to the next lowest integer) up to V semester or 50% of the total credits (rounded to the next lowest integer) up to VI semester from all the examinations, whether the candidate takes the examination(s) or not.

18.1.4 A student shall register for all the 160 credits and earn all the 160 credits. Marks obtained in all the 160 credits shall be considered for the award of the Grade.

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

18.2.1 A student will not be promoted from IV semester to V semester unless s/he fulfills the academic requirement of securing 50% of the total credits (rounded to the next lowest integer) up to IV semester, from all the examinations, whether the candidate takes the examination(s) or not.

18.2.2 A student shall be promoted from VI semester to VII semester only if s/he fulfills the academic requirements of securing 50% of the total credits (rounded to the next lowest integer) up to V semester or 50% of the total credits (rounded to the next lowest integer) up to VI semester from all the examinations, whether the candidate
takes the examination(s) or not.

18.2.3 A student shall register for all the 123 credits and earn all the 123 credits. Marks obtained in all the 123 credits shall be considered for the award of the Grade.

19.0 GRADUATION REQUIREMENTS

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

19.1 Student shall register and acquire minimum attendance in all courses and secure 160 credits for regular program and 123 credits for lateral entry program.

19.2 A student of a regular program, who fails to earn 160 credits within eight consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

19.3 A student of a lateral entry program who fails to earn 123 credits within six consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

20.0 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.

21.0 AWARD OF DEGREE

21.1 Classification of degree will be as follows:

<table>
<thead>
<tr>
<th>CGPA ≥ 7.5</th>
<th>CGPA ≥ 6.5 and &lt; 7.5</th>
<th>CGPA ≥ 5.0 and &lt; 6.5</th>
<th>CGPA ≥ 4.0 and &lt; 5.0</th>
<th>CGPA &lt; 4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class with Distinction</td>
<td>First Class</td>
<td>Second Class</td>
<td>Pass Class</td>
<td>Fail</td>
</tr>
</tbody>
</table>

21.2 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).
21.3 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.

21.4 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.

21.5 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.

22 **B.TECH WITH HONOURS OR ADDITIONAL MINORS IN ENGINEERING**

Students acquiring 160 credits are eligible to get B.Tech degree in Engineering. A student will be eligible to get B.Tech degree with Honours or additional Minors in Engineering, if s/he completes an additional 20 credits (3/4 credits per course). These could be acquired through MOOCs from SWAYAM / NPTEL / edX / Coursera / Udacity /PurdueNext / Khan Academy / QEEE etc. The list for MOOCs will be a dynamic one, as new courses are added from time to time. Few essential skill sets required for employability are also identified year wise. 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. Any expense incurred for the MOOC course / summer program should be met by the students.

Only students having no credit arrears and a CGPA of 7.5 or above at the end of the fourth semester are eligible to register for B.Tech (Honours / Minor). After registering for the B.Tech (Honours / Minor) program, if a student fails in any course, s/he will not be eligible for B.Tech (Honours / Minor).

Every Department to develop and submit a Honours / Minors – courses list of 5 - 6 theory courses.

**Honours Certificate for Vertical in his/her OWN Branch for Research orientation; Minor in any OTHER branch for Improving Employability.**

For the MOOCs platforms, where examination or assessment is absent (like SWAYAM) or where certification is costly (like Coursera or edX), faculty members of the institute prepare the examination question papers, for the courses undertaken by the students of respective Institutes, so that examinations Control Office (ECO) can conduct examination for the course. There shall be one 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.

A student can enroll for both Minor & Honours or for two Minors. The final grade sheet will only show the basic CGPA corresponding to the minimum requirement for the degree. The Minors/Honours will be indicated by a separate CGPA. The additional courses taken will also find separate mention in the grade sheet.

If a student drops (or terminated) from the Minor/Honours program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the grade sheet (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “Pass (P)” grade and also choose to omit the mention of the course as for the following:

- All the courses done under the dropped Minor/Honours will be shown in the grade sheet
- None of the courses done under the dropped Minor/Honours will be shown in the grade sheet.

Honours will be reflected in the degree certificate as “B.Tech (honours) in XYZ Engineering”. Similarly, Minor as “B.Tech in XYZ Engineering with Minor in ABC”. If a student has done both honours &
minor, it will be acknowledged as “B.Tech (honours) in XYZ Engineering with Minor in ABC”. And two minors will be reflected as “B.Tech in XYZ Engineering with Minor in ABC and Minor in DEF”.

22.1. **B.Tech with Honours**

The total of 20 credits required to be attained for B.Tech Honours degree are distributed from V semester to VII semester in the following way:

- For V semester: 4 – 8 credits
- For VI semester: 4 – 8 credits
- For VII semester: 4 – 8 credits

Following are the details of such Honours which include some of the most interesting areas in the profession today:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Department</th>
<th>Honours scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aeronautical Engineering</td>
<td>Aerospace Engineering / Space Science etc.</td>
</tr>
<tr>
<td>2</td>
<td>Computer Science and Engineering / Information Technology</td>
<td>Big data and Analytics / Cyber Physical Systems, Information Security / Cognitive Science / Internet of Things (IoT) etc.</td>
</tr>
<tr>
<td>4</td>
<td>Electrical and Electronics Engineering</td>
<td>Renewable Energy systems / Energy and Sustainability / IoT Applications in Green Energy Systems etc.</td>
</tr>
<tr>
<td>5</td>
<td>Mechanical Engineering</td>
<td>Industrial Automation and Robotics / Manufacturing Sciences and Computation Techniques etc.</td>
</tr>
<tr>
<td>6</td>
<td>Civil Engineering</td>
<td>Structural Engineering / Environmental Engineering etc.</td>
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</table>

22.2 **B.Tech with additional Minor in Engineering**

Every Department to develop and submit Minor Courses List of 5 - 6 Theory courses. Student from any department is eligible to apply for Minor from any other department. The total of 20 credits to complete the B.Tech (Minor) program by registering for MOOC courses each having a minimum of 3/4 credits offered by reputed institutions / organization with the approval of the department. Registration of the student for B.Tech (Minor), is from V Semester to VII Semester of the program in the following way:

- For V semester: 4 – 8 credits
- For VI semester: 4 – 8 credits
- For VII semester: 4 – 8 credits

Only students having no credit arrears and a CGPA of 7.5 or above at the end of the fourth semester are eligible to register for B.Tech (Minor). After registering for the B.Tech (Minor) program, if a student fails in any course, s/he will not be eligible for B.Tech (Minor).

Every student shall also have the option to do a minor in engineering. A major is a primary focus of study and a minor is a secondary focus of study. The minor has to be a subject offered by a department other than the department that offers the major of the student or it can be a different major offered by the same department. For example, a student with the declared major in Computer Science and Engineering (CSE) may opt to do a minor in Physics; in which case, the student shall receive the degree B.Tech, Computer Science and Engineering with a minor in Physics. A student can do Majors in chosen filed as per the career goal, and a minor may be chosen to enhance the major thus adding the diversity, breadth and enhanced skills in the field.
Advantages of Minor in Engineering:

The minors mentioned above are having lots of advantages and a few are listed below:

1. To apply the inter-disciplinary knowledge gained through a Major (Stream) + Minor.
2. To enable students to pursue allied academic interest in contemporary areas.
3. To provide an academic mechanism for fulfilling multidisciplinary demands of industries.
4. To provide effective yet flexible options for students to achieve basic to intermediate level competence in the Minor area.
5. Provides an opportunity to students to become entrepreneurs and leaders by taking business/management minor.
6. Combination in the diverse fields of engineering e.g., CSE (Major) + Electronics (Minor) combination increases placement prospects in chip designing companies.
7. Provides an opportunity to Applicants to pursue higher studies in an inter-disciplinary field of study.
8. Provides opportunity to the Applicants to pursue interdisciplinary research.
9. To increase the overall scope of the undergraduate degrees.

Following are the details of such Minor / Honours which include some of the most interesting areas in the profession today:

1. Space Science
2. Information Security
3. Data Analytics
4. Cyber Physical Systems
5. Electronic System Design
6. Renewable Energy Sources
7. Energy and Sustainability
8. Industrial Automation and Robotics
9. Aerospace Engineering
10. Manufacturing Sciences and Computation Techniques
11. Structural Engineering
12. Environmental Engineering
13. Internet of Things
14. Computer Science and Engineering
15. Technological Entrepreneurship
16. Materials Engineering
17. Physics (Materials / Nuclear / Optical / Medical)
18. Mathematics (Combinatorics / Logic / Number theory / Dynamical systems and differential equations./ Mathematical physics / Statistics and Probability).

23.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAM

23.1 A candidate is normally not permitted to take a break from 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 seek the approval from 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.

23.2 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.

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

23.4 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 19. The maximum period includes the break period.

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

24.0 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.

25.0 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 and the degree of the candidate will be withheld.

26.0 GRADUATION DAY
The institute shall have its own annual Graduation Day for the award of degrees to the 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.

27.0 DISCIPLINE
Every student is required to observe discipline and decorum both inside and outside the institute and are expected not to indulge in any activity which will tend to bring down the honour 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.

28.0 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.

29.0 TRANSITORY REGULATIONS
A candidate, who is detained or has discontinued 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 the 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 the 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, if 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 up to the 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 up to 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 up to 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.

e) Readmission from IARE-R16 to IARE-R18 regulations

A student took admission in IARE-R16 Regulations, detained due to lack of required number of credits or percentage of attendance at the end of any semester is permitted to take re-admission at appropriate level under any regulations prevailing in the institute subject to the following rules and regulations.

1. Student shall pass all the courses in the earlier scheme of regulations (IARE - R16). However, in case of having backlog courses, they shall be cleared by appearing for supplementary examinations conducted under IARE - R16 regulations from time to time.

2. After rejoining, the student is required to study the courses as prescribed in the new regulations for the re-admitted program at that level and thereafter.

3. If the student has already passed any course(s) of readmitted program in the earlier regulation / semester of study, such courses are exempted in the new scheme to appear for the course(s).

4. The courses that are not done in the earlier regulations / semester as compared with readmitted program need to be cleared after readmission by appearing for the examinations conducted time to time under the new regulations.

5. In general, after transition, course composition and number of credits / semester shall be balanced between earlier and new regulations on case to case basis.

6. In case, the students who do not have option of acquiring required credits with the existing courses offered as per the new curriculum, credit balance can be achieved by clearing the additional courses offered by the respective departments (approved in Academic Council meeting). The additional courses that are offered can be of theory or laboratory courses and shall be offered during semester.

7. Students re-joined in III semester shall be treated on par with “Lateral Entry” students for credits and graduation requirements. However, the student shall clear all the courses in B.Tech I Semester and B.Tech II Semester as per IARE-R16 regulations.
30.0 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 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
# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)  
COMPUTER SCIENCE AND ENGINEERING

## COURSE STRUCTURE

### I SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Subject Area</th>
<th>Category</th>
<th>Periods per week</th>
<th>Credits</th>
<th>Scheme of Examination</th>
<th>Max. Marks</th>
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</table>

| **PRACTICAL** |                                                  |              |                | **0** | **0** | **3** | **1.5** | **30** | **70** | **100** |
| AHSB09      | Engineering Chemistry Laboratory                  | BSC          | Foundation     | **0** | **0** | **3** | **1.5** | **30** | **70** | **100** |
| AEEB05      | Fundamentals of Electrical Engineering Laboratory | ESC          | Foundation     | **0** | **0** | **3** | **1.5** | **30** | **70** | **100** |
| AMEB01      | Workshop / Manufacturing Practices Laboratory     | ESC          | Foundation     | **0** | **0** | **3** | **1.5** | **30** | **70** | **100** |

**TOTAL**  
**09** | **03** | **09** | **16.5** | **180** | **420** | **600** |

### II SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Subject Area</th>
<th>Category</th>
<th>Periods per week</th>
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<td>ESC</td>
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</table>

| **PRACTICAL** |                                                  |              |                | **0** | **0** | **2** | **1** | **30** | **70** | **100** |
| AHSB08      | English Language and Communication Skills Laboratory | HSMC         | Foundation     | **0** | **0** | **2** | **1** | **30** | **70** | **100** |
| AHSB10      | Engineering Physics Laboratory                    | BSC          | Foundation     | **0** | **0** | **3** | **1.5** | **30** | **70** | **100** |
| ACSB02      | Programming for Problem Solving Laboratory        | ESC          | Foundation     | **0** | **0** | **4** | **2** | **30** | **70** | **100** |
| AMEB02      | Engineering Graphics and Design Laboratory        | ESC          | Foundation     | **1** | **0** | **4** | **3** | **30** | **70** | **100** |

**TOTAL**  
**12** | **02** | **13** | **20.5** | **240** | **560** | **800** |
## III SEMESTER

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Subject Area</th>
<th>Category</th>
<th>Periods per week</th>
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## IV SEMESTER

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23 | Page
## V SEMESTER

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SYLLABUS
# LINEAR ALGEBRA AND CALCULUS

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Contact Classes: 45  
Tutorial Classes: 15  
Practical Classes: Nil  
Total Classes: 60

**OBJECTIVES:**  
The course should enable the students to:  
I. Determine rank of a matrix and solve linear differential equations of second order.  
II. Determine the characteristic roots and apply double integrals to evaluate area.  
III. Apply mean value theorems and apply triple integrals to evaluate volume.  
IV. Determine the functional dependence and extremum value of a function.  
V. Analyze gradient, divergence, curl and evaluate line, surface, volume integrals over a vector field.

### Module-I  
**THEORY OF MATRICES AND HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS**  
Classes: 09

**THEORY OF MATRICES:** Real matrices: Symmetric, skew-symmetric and orthogonal matrices; Complex matrices: Hermitian, Skew-Hermitian and unitary matrices; Elementary row and column transformations; Rank of a matrix: Echelon form and normal form; Inverse by Gauss-Jordan method.

**HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS:** 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 \( f(x) = x^n, e^{ax}v(x), xv(x) \); Method of variation of parameters.

### Module-II  
**LINEAR TRANSFORMATIONS AND DOUBLE INTEGRALS**  
Classes: 09

**LINEAR TRANSFORMATIONS:** Cayley-Hamilton theorem: Statement, verification, finding inverse and powers of a matrix; Linear dependence and independence of vectors; Eigen values and Eigen vectors of a matrix and Properties (without proof); Diagonalization of matrix by linear transformation.

**DOUBLE INTEGRALS:** Evaluation of double integrals in Cartesian coordinates and Polar coordinates; Change of order of integration; Area as a double integral; Transformation of coordinate system.

### Module-III  
**FUNCTIONS OF SINGLE VARIABLES AND TRIPLE INTEGRALS**  
Classes: 09

**FUNCTIONS OF SINGLE VARIABLES:** Mean value theorems: Rolle’s theorem, Lagrange’s theorem, Cauchy’s theorem-without proof and geometrical interpretation.

**TRIPLE INTEGRALS:** Evaluation of triple integrals in Cartesian coordinates; volume of a region using triple integration.

### Module-IV  
**FUNCTIONS OF SEVERAL VARIABLES AND EXTREMA OF A FUNCTION**  
Classes: 09

**FUNCTIONS OF SEVERAL VARIABLES:** Partial differentiation, functional dependence, Jacobian.

**EXTREMA OF A FUNCTION:** Maxima and minima of functions of two variables without constraints and with constraints; Method of Lagrange multipliers.
**Module-V**  
**VECTOR DIFFERENTIAL AND INTEGRAL CALCULUS**

<table>
<thead>
<tr>
<th>Classes: 09</th>
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**VECTOR DIFFERENTIAL CALCULUS:** Scalar and vector point functions; Definitions of Gradient, divergent and curl with examples; Solenoidal and irrotational vector point functions; Scalar potential function.

**VECTOR INTEGRAL THEOREMS:** Line integral, surface integral and volume integral, Green’s theorem in a plane, Stoke’s theorem and Gauss divergence theorem without proofs.

<table>
<thead>
<tr>
<th>Text Books:</th>
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<table>
<thead>
<tr>
<th>Reference Books:</th>
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<table>
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<th>Web References:</th>
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<th>E-Text Books:</th>
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ENGINEERING CHEMISTRY

<table>
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<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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<td>1</td>
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<td>Tutorial Classes: 15</td>
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<td>Total Classes: 60</td>
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OBJECTIVES:
The course should enable the students to:
I. Apply the electrochemical principles in batteries, understand the fundamentals of corrosion.
II. Analysis of water for its various parameters and its significance in industrial and domestic applications.
III. Analyze microscopic chemistry in terms of atomic, molecular orbitals and Intermolecular forces.
IV. Analysis of major chemical reactions that are used in the synthesis of molecules.
V. Understand the chemistry of various fuels and their combustion.

MODULE-I ELECTROCHEMISTRY AND CORROSION Classes: 09
Electro chemical cells: Electrode potential, standard electrode potential, types of electrodes; Calomel, Quinhydrone and glass electrode; Nernst equation; Electrochemical series and its applications; Numerical problems; Batteries: Primary (Dry cell) and secondary batteries (Lead-acid storage battery and Lithium ion battery).

Causes and effects of corrosion: Theories of chemical and electrochemical corrosion, mechanism of electrochemical corrosion; Types of corrosion: Galvanic, water-line and pitting corrosion; Factors affecting rate of corrosion; Corrosion control methods: Cathodic protection, sacrificial anode and impressed current; Surface coatings: Metallic coatings- Methods of coating- Hot dipping, cementation, electroplating and Electroless plating of copper.

MODULE -II WATER AND ITS TREATMENT Classes: 08
Introduction: Hardness of water, Causes of hardness; Types of hardness: temporary and permanent, expression and units of hardness; Estimation of hardness of water by complexometric method; Potable water and its specifications, Steps involved in treatment of water, Disinfection of water by chlorination and ozonization; Boiler feed water and its treatment, Calgon conditioning, Phosphate conditioning and Colloidal conditioning; External treatment of water; Ion-exchange process; Desalination of water: Reverse osmosis, numerical problems.

MODULE-III MOLECULAR STRUCTURE AND THEORIES OF BONDING Classes: 08
Shapes of Atomic orbitals, Linear Combination of Atomic orbitals (LCAO), molecular orbitals of diatomic molecules; Molecular orbital energy level diagrams of $N_2$, $O_2$, $F_2$, $CO$, and $NO$ molecules.

Crystal Field Theory (CFT): Salient Features of CFT-Crystal Fields; Splitting of transition metal ion $d$-orbitals in Tetrahedral, Octahedral and square planar geometries; Band structure of solids and effect of doping on conductance.
### MODULE - IV

**STEREOCHEMISTRY, REACTION MECHANISM AND SYNTHESIS OF DRUG MOLECULES**

<table>
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<tr>
<th>Classes: 12</th>
</tr>
</thead>
</table>

Introduction to representation of 3-dimensional structures: Structural and stereoisomers, configurations, symmetry and chirality; Enantiomers, diastereomers, optical activity and Absolute configuration; Confirmation analysis of n-butane. Substitution reactions: Nucleophilic substitution reactions, Mechanism of SN1, SN2 reactions; Electrophilic and nucleophilic addition reactions; Addition of HBr to propene; Markownikoff and anti Markownikoff’s additions; Grignard additions on carbonyl compounds; Elimination reactions: Dehydro halogenation of alkylhalides; Saytzeff rule; Oxidation reactions: Oxidation of alcohols using KMnO4 and chromic acid; Reduction reactions: Reduction of carbonyl compounds using LiAlH4 & NaBH4; Hydroboration of olefins; Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

### MODULE – V

**FUELS AND COMBUSTION**

<table>
<thead>
<tr>
<th>Classes: 08</th>
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</table>

Fuels: 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:**


**Reference Books:**


**Web References:**

OBJECTIVES:
The course should enable the students to:
I. Understand the basic electrical circuits and circuit laws to study behavior of electrical networks.
II. Use different network reduction techniques to study characteristics of electrical networks.
III. Analyze series and parallel AC circuits using complex notation.
IV. State and use DC circuit theorems to determine unknown currents and voltages.
V. Outline the concepts of network topology to reduce complexity of network and study its behaviour.

MODULE - I
INTRODUCTION TO ELECTRICAL CIRCUITS
Classes: 09

Circuit concept: Basic definitions, Ohm’s law at constant temperature, classification of elements, R, L, C parameters, independent and dependent sources, Kirchhoff’s laws, equivalent resistance of series, parallel and series parallel networks.

MODULE - II
ANALYSIS OF ELECTRICAL CIRCUITS
Classes: 10

Circuit analysis: source transformation, Star to delta and delta to star transformation, mesh analysis and nodal analysis, inspection method, super mesh, super node analysis; DC Theorems: Thevenin’s and Norton’s.

MODULE - III
INTRODUCTION TO AC CIRCUITS
Classes: 09

Single phase AC circuits: Representation of alternating quantities, instantaneous, peak, RMS, average, form factor and peak factor for different periodic wave forms.

Phase and phase difference, j notation, representation of rectangular and polar forms. Concept of reactance, impedance, susceptance and admittance.

MODULE - IV
COMPLEX POWER ANALYSIS
Classes: 09

Concept of real, reactive, apparent power and complex power, power factor in single phase AC circuits consisting of R, L, C, RL, RC and RLC combinations.

MODULE - V
NETWORK TOPOLOGY
Classes: 08

Network Topology: Definitions, Graph, Tree, Incidence matrix, Basic cut set and Basic Tie set Matrices for Planar Networks, Duality and Dual Networks.

Text Books:
### Reference Books:


### Web References:

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

### E-Text Books:

3. https://www.allaboutcircuits.com
OBJECTIVES:
The course should enable the students to:
I. Analyze, interpret, and draw conclusions from experimental data.
II. Describe the fluid property of surface tension and viscosity.
III. Perform a complexometric titration to determine the hardness of water from various sources.
IV. Comprehend the experimental results.

LIST OF EXPERIMENTS

Week-1 INTRODUCTION TO CHEMISTRY LABORATORY
Introduction to chemistry laboratory. Do's and Don'ts in chemistry laboratory.

Week-2 PREPARATION OF ORGANIC COMPOUNDS
Synthesis of Aspirin.

Week-3 VOLUMETRIC ANALYSIS
Estimation of Total hardness of water by complexometric method using EDTA.

Week-5 INSTRUMENTATION
Estimation of an HCl by conductometric titrations.

Week-6 INSTRUMENTATION
Estimation of HCl by potentiometric titrations.

Week-7 INSTRUMENTATION
Estimation of Acetic acid by Conductometric titrations.

Week-8 INSTRUMENTATION
Estimation of Fe^{2+} by Potentiometry using KMnO_{4} titrations.
Week-9  |  VOLUMETRIC ANALYSIS
---|---
Determination of chloride content of water by Argentometry.

Week-10  |  PHYSICAL PROPERTIES
---|---
Determination of surface tension of a given liquid using Stalagmometer.

Week-11  |  PHYSICAL PROPERTIES
---|---
Determination of viscosity of a given liquid using Ostwald’s viscometer.

Week-12  |  PHYSICAL PROPERTIES
---|---
Verification of freundlich adsorption isotherm-adsorption of acetic and on charcoal.

Week-13  |  ANALYSIS OF ORGANIC COMPOUNDS
---|---
Thin layer chromatography calculation of $R_f$ values. Eg: ortho and para nitro phenols.

Week-14  |  REVISION
---|---
Revision.

Reference Books:

Web References:
http://www.iare.ac.in

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

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<thead>
<tr>
<th>S. No</th>
<th>Name of the Apparatus</th>
<th>Apparatus Required</th>
<th>Quantity</th>
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<tbody>
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<td>Analytical balance</td>
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<td>100 gm</td>
</tr>
<tr>
<td>2</td>
<td>Beaker</td>
<td>30</td>
<td>100 ml</td>
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<tr>
<td>3</td>
<td>Burette</td>
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<td>4</td>
<td>Burette Stand</td>
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<td>Metal</td>
</tr>
<tr>
<td>5</td>
<td>Clamps with Boss heads</td>
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<td>Metal</td>
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<tr>
<td>6</td>
<td>Conical Flask</td>
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<td>7</td>
<td>Conductivity cell</td>
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<td>8</td>
<td>Calomel electrode</td>
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<td>Glass</td>
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<tr>
<td>9</td>
<td>Digital Potentiometer</td>
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<td>EI</td>
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<tr>
<td>10</td>
<td>Digital Conductivity meter</td>
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<td>Digital electronic balance</td>
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<tr>
<td>13</td>
<td>Funnel</td>
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<td>14</td>
<td>Glass rods</td>
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<td>Measuring Cylinders</td>
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<td>Oswald Viscometer</td>
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<td>Pipette</td>
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<td>18</td>
<td>Platinum Electrode</td>
<td>10</td>
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<td>19</td>
<td>Porcelain Tiles</td>
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<td>20</td>
<td>Reagent bottle</td>
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<td>21</td>
<td>Standard Flask</td>
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<tr>
<td>22</td>
<td>Stalagmo meter</td>
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<tr>
<td>23</td>
<td>TLC Plates</td>
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<tr>
<td>24</td>
<td>UV Chamber</td>
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</table>
FUNDAMENTALS OF ELECTRICAL ENGINEERING LABORATORY

1 Semester: CSE / IT

<table>
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<tr>
<th>Course Code</th>
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<td>-  -  3  1.5</td>
<td>30  70  100</td>
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</tbody>
</table>

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 36  Total Classes: 36

OBJECTIVES:
The course should enable the students to:
I. Examine the basic laws and network reduction techniques.
II. Predict the characteristics of sinusoidal function
III. Measure impedance of series RL, RC and RLC circuits.
IV. Prove the various theorems used to reduce the complexity of electrical network

LIST OF EXPERIMENTS

Expt. 1 OHM’S LAW, KIRCHHOFF’S CURRENT LAW AND VOLTAGE LAW
Verification of ohm’s law, Kirchhoff’s current and voltage laws using hardware and digital simulation.

Expt. 2 VOLT – AMPHERE METHOD
Determination of unknown resistance and its temperature dependency.

Expt. 3 MESH ANALYSIS
Determination of mesh currents using hardware and digital simulation.

Expt. 4 NODAL ANALYSIS
Measurement of nodal voltages using hardware and digital simulation.

Expt. 5 SINGLE PHASE AC CIRCUITS
Calculation of average value, RMS value, form factor, peak factor of sinusoidal wave.

Expt. 6 IMPEDANCE OF SERIES RL CIRCUIT
Examine the impedance of series RL Circuit

Expt. 7 IMPEDANCE OF SERIES RC CIRCUIT
Measure the impedance of series RC Circuit

Expt. 8 IMPEDANCE OF SERIES RLC CIRCUIT
Calculate the impedance of series RLC Circuit

Expt. 9 MEASUREMENT OF POWER CONSUMED BY A FLUORESCENT LAMP
To obtain power consumed and power factor of a fluorescent lamp, operated at different voltages.
<table>
<thead>
<tr>
<th>Expt. 10</th>
<th>CHOOSE COIL PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determination of internal resistance and inductance of choke coil.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Expt. 11</th>
<th>THEVENIN’S THEOREM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reform conversion of complex network into simple series circuit.</td>
<td></td>
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<table>
<thead>
<tr>
<th>Expt. 12</th>
<th>NORTON’S THEOREM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reform conversion of complex network into simple parallel circuit.</td>
<td></td>
</tr>
</tbody>
</table>

**Reference Books:**


**Web References:**

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

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

**SOFTWARE:** Microsoft Windows 7 and MATLAB – V 8.5

**HARDWARE:** 01 numbers of Intel Desktop Computers with 2 GB RAM
WORKSHOP / MANUFACTURING PRACTICES LABORATORY

I Semester: AERO / CSE / IT / MECH | II Semester: ECE / EEE / CE

<table>
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<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
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<td>70  100</td>
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Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 42  Total Classes: 42

OBJECTIVES:
The course should enable the students to:
I. Identify and use of tools, types of joints in carpentry, fitting, tin smithy and plumbing operations.
II. Understand of electrical wiring and components.
III. Observation of the function of lathe, shaper, drilling, boring, milling, grinding machines.

LIST OF EXPERIMENTS

Week-1  MACHINE SHOP-Turning and other machines
Batch I: Working on central lathe and shaping machine.
Batch II: Working on drilling, grinding machines.

Week-2  MACHINE SHOP-Milling and other machines
Batch I: Working on milling machine.
Batch II: Working on milling and shaping machine.

Week-3  ADVANCED MACHINE SHOP
Batch I: Working on CNC Turning machines.
Batch II: Working on CNC Vertical Drill Tap Center.

Week-4  FITTING
Batch I: Make a straight fit and straight fit for given dimensions.
Batch II: Make a square fit for straight fit for given sizes.

Week-5  CARPENTRY-I
Batch I: Preparation of lap joint as per given dimensions.
Batch II: Preparation of dove tail joint as per given taper angle.

Week-6  CARPENTRY-II
Batch I: Preparation of dove tail joint as per given taper angle.
Batch II: Preparation of lap joint as per given dimensions.

Week-7  ELECTRICAL AND ELECTRONICS
Batch I & II: Make an electrical connection to demonstrate domestic voltage and current sharing.
Make an electrical connection to control one bulb with two switches-stair case connection.
<table>
<thead>
<tr>
<th>Week 8</th>
<th>WELDING</th>
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</thead>
<tbody>
<tr>
<td>Batch I: Arc welding &amp; Gas Welding.</td>
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<tr>
<td>Batch II: Gas welding &amp; Arc Welding.</td>
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<table>
<thead>
<tr>
<th>Week 9</th>
<th>MOULD PREPARATION</th>
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</thead>
<tbody>
<tr>
<td>Batch I: Prepare a wheel flange mould using a given wooden pattern.</td>
<td></td>
</tr>
<tr>
<td>Batch II: Prepare a bearing housing using an aluminum pattern.</td>
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<table>
<thead>
<tr>
<th>Week 10</th>
<th>MOULD PREPARATION</th>
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<tbody>
<tr>
<td>Batch I: Prepare a bearing housing using an aluminum pattern.</td>
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<tr>
<td>Batch II: Prepare a wheel flange mould using a given wooden pattern.</td>
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<thead>
<tr>
<th>Week 11</th>
<th>BLACKSMITHY- I, TINSMITHY- I,</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch I: Prepare S-bend &amp; J-bend for given MS rod using open hearth furnace.</td>
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<tr>
<td>Batch II: Prepare the development of a surface and make a rectangular tray and a round tin.</td>
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<thead>
<tr>
<th>Week 12</th>
<th>TINSMITHY- I, BLACKSMITHY- I</th>
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<tbody>
<tr>
<td>Batch I: Prepare the development of a surface and make a rectangular tray and a round tin.</td>
<td></td>
</tr>
<tr>
<td>Batch II: Prepare S-bend &amp; J-bend of given MS rod using open hearth furnace.</td>
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<table>
<thead>
<tr>
<th>Week 13</th>
<th>PLASTIC MOULDING, INJECTION MOULDING, GLASS CUTTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch I: Plastic Moulding and Glass cutting.</td>
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<tr>
<td>Batch II: Plastic Moulding and Glass cutting.</td>
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<tr>
<th>Week 14</th>
<th>BLOW MOULDING</th>
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</thead>
<tbody>
<tr>
<td>Batch I &amp; II: Blow Moulding.</td>
<td></td>
</tr>
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</table>

**Reference Books:**


**Web References:**

http://www.iare.ac.in
ENGLISH

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

<table>
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<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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<td>Foundation</td>
<td>L T P C CIA SEE Total</td>
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<td>2 - - 2 30 70 100</td>
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</table>

Contact Classes: 30 Tutorial Classes: Nil Practical Classes: Nil Total Classes: 30

OBJECTIVES:
The course should enable the students to:
I. Communicate in an intelligible English accent and pronunciation.
II. Use the four language skills i.e., Listening, Speaking, Reading and Writing effectively.
III. Develop the art of writing accurate English with correct spelling, grammar and punctuation.

MODULE - I GENERAL INTRODUCTION AND LISTENING SKILLS Classes: 06

Introduction to communication skills; Communication process; Elements of communication; Soft skills vs hard skills; Importance of soft skills for engineering students; Listening skills; Significance; Stages of listening; Barriers to listening and effectiveness of listening; Listening comprehension.

MODULE - II SPEAKING SKILLS Classes: 06

Significance; Essentials; Barriers and effectiveness of speaking; Verbal and non-verbal communication; Generating talks based on visual prompts; Public speaking; Addressing a small group or a large formal gathering; Oral presentation; Power point presentation.

MODULE - III VOCABULARY & GRAMMAR Classes: 06

Vocabulary:
The concept of Word Formation; Root words from foreign languages and their use in English; Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives; Synonyms; Antonyms; Standard abbreviations; Idioms and phrases; One word substitutes.

Grammar:
Sentence structure; Uses of phrases and clauses; Punctuation; Subject verb agreement; Modifiers; Articles; Prepositions.

MODULE - IV READING SKILLS Classes: 06

Significance; Techniques of reading; Skimming-Reading for the gist of a text; Scanning - Reading for specific information; Intensive; Extensive reading; Reading comprehension; Reading for information transfer; Text to diagram; Diagram to text.

MODULE - V WRITING SKILLS Classes: 06

Significance; Effectiveness of writing; Organizing principles of Paragraphs in documents; Writing introduction and conclusion; Techniques for writing precisely; Letter writing; Formal and Informal letter writing; E-mail writing, Report Writing.
<table>
<thead>
<tr>
<th><strong>Text Books:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Handbook of English for Communication (Prepared by Faculty of English, IARE)</td>
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</table>

<table>
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<tr>
<th><strong>Reference Books:</strong></th>
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<thead>
<tr>
<th><strong>Web References:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <a href="http://www.edufind.com">www.edufind.com</a></td>
</tr>
<tr>
<td>2. <a href="http://www.myenglishpages.com">www.myenglishpages.com</a></td>
</tr>
<tr>
<td>3. <a href="http://grammar.ccc.comment.edu">http://grammar.ccc.comment.edu</a></td>
</tr>
</tbody>
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<thead>
<tr>
<th><strong>E-Text Books:</strong></th>
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PROBABILITY AND STATISTICS

II Semester: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>AHSB12</td>
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<td>L  T  P  C  CIA  SEE  Total</td>
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<td>3  1   -  4  30  70  100</td>
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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 probability on single random variables and probability distributions.
II. Apply the concept of correlation and regression to find covariance.
III. Analyze the given data for appropriate test of hypothesis.
IV. Understand the foundations for classical inference involving confidence intervals and hypothesis testing.

MODULE-I  PROBABILITY AND RANDOM VARIABLES  Classes: 09
Probability, Conditional Probability, Baye’s Theorem; Random variables: Basic definitions, discrete and continuous random variables; Probability distribution: Probability mass function and probability density functions; Mathematical expectation.

MODULE-II  PROBABILITY DISTRIBUTION  Classes: 09
Binomial distribution; Mean and variances of Binomial distribution, Recurrence formula for the Binomial distribution; Poisson distribution: Poisson distribution as a limiting case of Binomial distribution, mean and variance of Poisson distribution, Recurrence formula for the Poisson distribution; Normal distribution; Mean, Variance, Mode, Median, Characteristics of normal distribution.

MODULE-III  CORRELATIONS AND REGRESSION  Classes: 09
Correlation: Karle Pearson’s Coefficient of correlation, Computation of correlation coefficient, Rank correlation, Repeated Ranks; Properties of correlation.

Regression: Lines of regression, Regression coefficient, Properties of Regression coefficient, Angle between two lines of regression; Multiple correlation and Regression.

MODULE-IV  TEST OF HYPOTHESIS - I  Classes: 09
Sampling: Definitions of population, Sampling, Parameter of statistics, standard error; Test of significance: Null hypothesis, alternate hypothesis, type I and type II errors, critical region, confidence interval, level of significance. One sided test, two sided test. Large sample test: Test of significance for single mean, Test of significance for difference between two sample means, Tests of significance single proportion and Test of difference between proportions.

MODULE-V  TEST OF HYPOTHESIS - II  Classes: 09
Small sample tests: Student t-distribution, its properties: Test of significance difference between sample mean and population mean; difference between means of two small samples. Snedecor’s F-distribution and its properties; Test of equality of two population variances Chi-square distribution and it’s properties; Test of equality of two population variances Chi-square distribution, it’s properties, Chi-square test of goodness of fit.
### Text Books:


### Reference Books:


### Web References:


### E-Text Books:

SEMICONDUCTOR PHYSICS

II Semester: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>AHSB13</td>
<td>Foundation</td>
<td>L  T  P</td>
<td>C  CIA  SEE   Total</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>3  1  -</td>
<td>4</td>
<td>30  70  100</td>
</tr>
</tbody>
</table>

Contact Classes:45  Tutorial Classes: 15  Practical Classes: Nil  Total Classes: 60

OBJECTIVES:
The course should enable the students to:
I. Enrich the knowledge in principals of quantum mechanics and semiconductors.
II. Develop strong fundamentals of electronic and optoelectronic materials.
III. Enrich knowledge about measuring resistivity, conductivity and other parameters.
IV. Correlate principles and applications of lasers and fiber optics.

MODULE-I  QUANTUM MECHANICS  Classes: 10
Introduction to quantum physics, Black body radiation, Planck’s law, Photoelectric effect, Compton effect, De-Broglie’s hypothesis, Wave-particle duality, Davisson and Germer experiment, Time-independent Schrodinger equation for wave function, Born interpretation of the wave function, Schrodinger equation for one dimensional problems – particle in a box.

MODULE-II  ELECTRONIC MATERIALS AND SEMICONDUCTORS  Classes: 10
Free electron theory, Bloch’s theorem for particles in a periodic potential, Kronig-Penney model (Qualitative treatment), Origin of energy bands, Types of electronic materials: metals, semiconductors, and insulators; Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier-concentration and temperature, Hall effect.

MODULE-III  LIGHT-SEMICONDUCTOR INTERACTION  Classes: 06
Carrier generation and recombination, Carrier transport: diffusion and drift, Direct and indirect band gaps, p-n junction, V-I characteristics, Energy Band diagram, Biasing of a junction.

Photo voltaic effect, Construction and working of LED, Photo detectors, PIN, Avalanche photodiode, Solar cell.

MODULE-IV  ENGINEERED ELECTRIC AND MAGNETIC MATERIALS  Classes: 09
Polarisation, Permittivity, Dielectric constant, Internal field in solids, Clausius Mosotti equation, Ferroelectricity, Piezoelectricity, Pyroelectricity; Magnetisation, Permeability, Susceptibility, 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.

MODULE-V  LASERS AND FIBER OPTICS  Classes: 10
Characteristics of lasers, Spontaneous and stimulated emission of radiation, Metastable state, Population inversion, Lasing action, Ruby laser, Semiconductor diode laser and applications of lasers; Principle and construction of an optical fiber, Acceptance angle, Numerical aperture, Types of optical fibers (Single mode, multimode, step index, graded index), Attenuation in optical fibers, Optical fiber communication system with block diagram.
<table>
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<th>Text Books:</th>
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<tr>
<th>Reference Books:</th>
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<tbody>
<tr>
<td>3. Monica Katiyar and Deepak Gupta on NPTEL. Online course: “Optoelectronic Materials and Devices”.</td>
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</table>

<table>
<thead>
<tr>
<th>Web References:</th>
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<tbody>
<tr>
<td>2. <a href="http://www.thphys.physics.ox.ac.uk">http://www.thphys.physics.ox.ac.uk</a></td>
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<tr>
<th>E-Text Books:</th>
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<tbody>
<tr>
<td>1. <a href="http://www.peaceone.net/basic/Feynman/">http://www.peaceone.net/basic/Feynman/</a></td>
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</table>
PROGRAMMING FOR PROBLEM SOLVING

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>ACSB01</td>
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<td>L  T  P C</td>
<td>CIA</td>
<td>SEE</td>
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<td>3  -  - 3</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>

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.

MODULE - I  INTRODUCTION

Introduction to Programming: Computer system, components of a computer system, computing environments, computer languages, creating and running programs, algorithms, flowcharts; Introduction to C language: Computer languages, 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.

MODULE - II  CONTROL STRUCTURES

Conditional Control structures: Decision statements; Simple if, if-else, else if ladder, Nested if and Case Statement-switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements

MODULE - III  ARRAYS AND FUNCTIONS

Arrays: Concepts, one dimensional arrays, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi-dimensional arrays; Strings: Arrays of characters, variable length character strings, inputting character strings, character library functions, string handling functions.

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 directive

MODULE - IV  STRUCTURES, UNIONS AND POINTERS

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; Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, pointers and arrays, pointers as functions arguments, functions returning pointers. Dynamic memory allocation: Basic concepts, library functions
## Module - V
### File Handling and Basic Algorithms

| Classes: 08 |
|---|---|
| Files: Streams, basic file operations, file types, file opening modes, input and output operations with files, special functions for working with files, file positioning functions, command line arguments. Searching, basic sorting algorithms (bubble, insertion, selection), algorithm complexity through example programs (no formal definitions required). |

#### Text Books:


#### Reference Books:


#### Web References:

1. https://www.bfoit.org/itp/Programming.html
2. https://www.khanacademy.org/computing/computer-programming

#### E-Text Books:


#### MOOC Course

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>AHSB08</td>
<td>Foundation</td>
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<td>2</td>
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</table>

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 ACTIVITIES**

<table>
<thead>
<tr>
<th>Week</th>
<th>LISTENING SKILL</th>
</tr>
</thead>
</table>
| 1    | a. Listening to conversations and interviews of famous personalities in various fields; Listening practice related to the TV talk shows and news.  
     b. Listening for specific information; Listening for summarizing information – Testing. |
| 2    | 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: Abdul Kalam, British: Helen Keller and American: Barrack Obama speakers to analyze intercultural differences – Testing. |
| 3    | a. Functions of English Language; Introduction to pronunciation; Vowels and Consonants  
     b. Tips on how to develop fluency, body language and communication; Introducing oneself: Talking about yourself, others, leave taking. |
| 4    | a. Sounds - Speaking exercises involving the use of Vowels and Consonant sounds in different contexts; Exercises on Homophones and Homographs  
     b. Just a minute (JAM) session. |
| 5    | a. Stress patterns.  
     b. Situational Conversations: common everyday situations; Acting as a compere and newsreader; Greetings for different occasions with feedback preferably through video recording. |
| 6    | a. Intonation.  
     b. Reading newspaper and magazine articles; Reading selective autobiographies for critical commentary. |
<table>
<thead>
<tr>
<th>Week 7</th>
<th>READING SKILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Improving pronunciation through tongue twisters.</td>
</tr>
<tr>
<td>b.</td>
<td>Reading advertisements, pamphlets; Reading comprehension exercises with critical and analytical questions based on context.</td>
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</table>

<table>
<thead>
<tr>
<th>Week 8</th>
<th>WRITING SKILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Listening to inspirational short stories.</td>
</tr>
<tr>
<td>b.</td>
<td>Writing messages, leaflets, Notice; Writing tasks; Flashcards – Exercises.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 9</th>
<th>WRITING SKILL</th>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>Write the review on a video clipping of short duration (5 to 10 minutes).</td>
</tr>
<tr>
<td>b.</td>
<td>Write a slogan related to the image; Write a short story of 6-10 lines based on the hints given.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Week 10</th>
<th>WRITING SKILL</th>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>Minimizing Mother Tongue Influence to improve fluency through watching educational videos.</td>
</tr>
<tr>
<td>b.</td>
<td>Writing practices – précis writing; Essay writing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 11</th>
<th>THINKING SKILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Correcting common errors in day to day conversations.</td>
</tr>
<tr>
<td>b.</td>
<td>Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms, proverbs.</td>
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<table>
<thead>
<tr>
<th>Week 12</th>
<th>THINKING SKILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Correcting common errors in day to day conversations.</td>
</tr>
<tr>
<td>b.</td>
<td>Making pictures and improvising diagrams to form English words, phrases and proverbs.</td>
</tr>
</tbody>
</table>

**Reference Books:**


**Web References:**

1. http://learnenglish.britishcouncil.org
EQUIPMENT REQUIRED FOR A BATCH OF 60 STUDENTS (ORAL AND MULTIMEDIA)

1. Career laboratory: 1 Room
2. Server computer for the laboratory with high configuration: 1 no
3. Computers: 30 nos
4. Software: K Van Solution
5. LCD Projector: 1 no
6. Speakers with amplifiers, one wireless mic and one collar mic
7. Podium: 1
8. Chairs: 30
9. Discussion Tables: 2
10. White board: 1
ENGINEERING PHYSICS LABORATORY

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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<tr>
<td>AHSB10</td>
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</tbody>
</table>

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 39  Total Classes: 39

OBJECTIVES:
The course should enable the students to:
I. Upgrade practical knowledge in optics.
II. Analyze the behavior and characteristics of various materials for its optimum utilization.
III. Enrich the knowledge of electric and magnetic properties.

LIST OF EXPERIMENTS

Week-1  INTRODUCTION TO PHYSICS LABORATORY
Do's and Don'ts in physics laboratory. Precautions to be taken in laboratory.

Week-2  HALL EFFECT (LORENTZ FORCE)
Determination of charge carrier density.

Week-3  MELDE’E EXPERIMENT
Determination of frequency of a given tuning fork.

Week-4  STEWART GEE’S APPARATUS
Magnetic field along the axis of current carrying coil-Stewart and Gee’s method.

Week-5  B-H CURVE WITH CRO
To determine the value of retentivity and coercivity of a given magnetic material.

Week-6  ENERGY GAP OF A SEMICONDUCTOR DIODE
Determination of energy gap of a semiconductor diode.

Week-7  PIN AND AVALANCHE DIODE
Studying V-I characteristics of PIN and Avalanche diode.

Week-8  OPTICAL FIBER
Evaluation of numerical aperture of a given optical fiber.

Week-9  WAVE LENGTH OF LASER LIGHT
Determination of wavelength of a given laser light using diffraction grating.
<table>
<thead>
<tr>
<th>Week-10</th>
<th>PLANK’S CONSTANT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Determination of Plank’s constant using LED.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week-11</th>
<th>LIGHT EMITTING DIODE</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Studying V-I characteristics of LED</td>
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</table>

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<thead>
<tr>
<th>Week-12</th>
<th>NEWTONS RINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Determination of radius of curvature of a given plano-convex lens.</td>
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<thead>
<tr>
<th>Week-13</th>
<th>SINGLE SLIT DIFFRACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Determination of width of a given single slit.</td>
</tr>
</tbody>
</table>

**Manuals:**


**Web Reference:**

http://www.iare.ac.in
PROGRAMMING FOR PROBLEM SOLVING LABORATORY

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
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<th>Maximum Marks</th>
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<td>ACSB02</td>
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<td>-</td>
<td>4</td>
</tr>
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</table>

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 48  Total Classes: 48

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 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 \((a + b \div c \times d - e) \times (f - g)\). 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 these sequences.
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.

<table>
<thead>
<tr>
<th>Characters</th>
<th>ASCII values</th>
</tr>
</thead>
<tbody>
<tr>
<td>A–Z</td>
<td>65–90</td>
</tr>
<tr>
<td>a–z</td>
<td>97–122</td>
</tr>
<tr>
<td>0–9</td>
<td>48–57</td>
</tr>
<tr>
<td>Special symbols</td>
<td>0–47, 58–64, 91–96, 123–127</td>
</tr>
</tbody>
</table>

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:
   \[ \text{sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10! \]
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 1if 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: \(1+x+x^2+x^3+\ldots+\ldots+x^n\). For example: if \(n=3\) and \(x=5\), 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 \(n<0\). 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 15meters.

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.
<table>
<thead>
<tr>
<th>Week-12</th>
<th>COMMAND LINE ARGUMENTS AND NUMERICAL METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Write a C program to read two numbers at the command line and perform arithmetic operations on it.</td>
</tr>
<tr>
<td>b.</td>
<td>Write a C program to read a file name at the command line and display its contents.</td>
</tr>
<tr>
<td>c.</td>
<td>Write a C program to solve numerical methods problems (root finding, numerical differentiation and numerical integration)</td>
</tr>
</tbody>
</table>

**Reference Books:**


**Web References:**

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

<table>
<thead>
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Contact Classes: 15  Tutorial Classes: Nil  Practical Classes: 60  Total Classes: 75

OBJECTIVES:
The course should enable the students to
I. Understand the basic principles of engineering drawing and construction of curves used in engineering field.
II. Apply the knowledge of interpretation of projection in different quadrants.
III. Understand the projections of solids, when it is inclined to both planes simultaneously.
IV. Convert the pictorial views into orthographic view and vice versa.
V. Create intricate details of components through sections and develop its surfaces.

LIST OF EXPERIMENTS

MODULE - I  INTRODUCTION TO ENGINEERING DRAWING
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales - Plain, Diagonal and Vernier Scales.

MODULE - II  OVERVIEW OF COMPUTER GRAPHICS, CUSTOMIZATION & CAD DRAWING, ANNOTATIONS, LAYERING & OTHER FUNCTIONS, DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT
Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]. Consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles. Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling.
MODULE - III  ORTHOGRAPHIC PROJECTIONS

Principles of Orthographic Projections- Conventions- Projections of Points and lines inclined to both planes.

Projections of planes inclined Planes- Auxiliary Planes.

MODULE - IV  PROJECTIONS OF REGULAR SOLIDS AND SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS

Those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Draw the sectional orthographic views of geometrical solids of Prism, Pyramid, Cylinder and Cone; Objects from industry and dwellings (foundation to slab only).

MODULE - V  DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTIONS

Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT:
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Text Books


Reference Books:


Web References:

1. http://nptel.ac.in/courses/112103019
2. http://www.autocadtutorials.net/

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:

SOFTWARE: AUTOCAD 2016
HARDWARE: 30 numbers of Intel Desktop Computers with 2 GB RAM
III Semester: CSE / IT

<table>
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<tr>
<th>Course Code</th>
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Contact Classes: 45 Tutorial Classes: 15 Practical Classes: Nil Total Classes: 60

OBJECTIVES:
The course should enable the students to:
I. Introduce components such as diodes, BJTs and FETs.
II. Know the applications of components.
III. Understand common forms of number representation in logic circuits.
IV. Learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
V. Understand the concepts of combinational logic circuits and sequential circuits.

MODULE-I DIODE AND APPLICATIONS
Diode - Static and Dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances, Diode Applications: Switch-Switching times. Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive Filter

MODULE-II BIPOLAR JUNCTION TRANSISTOR (BJT)
Principle of Operation and characteristics - Common Emitter, Common Base, Common Collector Configurations, Operating point, DC & AC load lines, Transistor Hybrid parameter model, Determination of h-parameters from transistor characteristics, Conversion of h-parameters.

MODULE-III NUMBER SYSTEMS
Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.


MODULE-IV MINIMIZATION OF BOOLEAN FUNCTIONS
Karnaugh Map Method - Up to five Variables, Don’t Care Map Entries, Tabular Method, Combinational Logic Circuits: Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

MODULE-V SEQUENTIAL CIRCUITS FUNDAMENTALS
Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.
Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.
### Text Books:


### Reference Books:

2. Electronic Devices and Circuits, S. Salivahanan, N.Suresh Kumar, A Vallvaraj, 2nd Edition, TMH.

### Web References:

3. [http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASIC ELECTRONICS/home_page.htm](http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASIC ELECTRONICS/home_page.htm)
4. [mcsbzu.blogspot.com](http://mcsbzu.blogspot.com)
5. [http://books.askvenkat.com](http://books.askvenkat.com)
6. [http://worldclassprogramme.com](http://worldclassprogramme.com)

### E-Text Books:

2. [http://nptel.ac.in/courses/122106025/](http://nptel.ac.in/courses/122106025/)
4. [https://books.google.co.in/books/about/Switching_Theory_and_Light_Design](https://books.google.co.in/books/about/Switching_Theory_and_Light_Design)
DATA STRUCTURES

III Semester: ME / CSE / IT / ECE / CE | IV Semester AE / EEE

<table>
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</table>

Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Learn the basic techniques of algorithm analysis.
II. Demonstrate searching and sorting algorithms and analyze their time complexities.
III. Implement linear data structures viz. stack, queue and linked list.
IV. Demonstrate non-linear data structures viz. tree and graph traversal algorithms.
V. Study and choose appropriate data structure to solve problems in real world.

MODULE - I  INTRODUCTION TO DATA STRUCTURES, SEARCHING AND SORTING  Classes: 09
Basic concepts: Introduction to data structures, classification of data structures, operations on data structures; Searching techniques: Linear search and Binary search; Sorting techniques: Bubble sort, selection sort, insertion sort and comparison of sorting algorithms.

MODULE - II  LINEAR DATA STRUCTURES  Classes: 09
Stacks: Primitive operations, implementation of stacks using arrays, applications of stacks arithmetic expression conversion and evaluation; Queues: Primitive operations; Implementation of queues using Arrays, applications of linear queue, circular queue and double ended queue (deque).

MODULE - 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 and Queue.

MODULE - IV  NON LINEAR DATA STRUCTURES  Classes: 09
Trees: Basic concept, binary tree, binary tree representation, array and linked representations, binary tree traversal, binary tree variants, application of trees; Graphs: Basic concept, graph terminology, graph implementation, graph traversals, Application of graphs.

MODULE - V  BINARY TREES AND HASHING  Classes: 09
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:**


**Reference Books:**


**Web References:**

DISCRETE MATHEMATICAL STRUCTURES

III Semester: CSE / IT

<table>
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</table>

| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | Total Classes: 60 |

OBJECTIVES:
The course should enable the students to:
I. Describe the logical and mathematical foundations, and study abstract models of computation.
II. Illustrate the limitations of predicate logic.
III. Define modern algebra for constructing and writing mathematical proofs.
IV. Solve the practical examples of sets, functions, relations and recurrence relations.
V. Recognize the patterns that arise in graph problems and use this knowledge for constructing the trees and spanning trees.

MODULE - I MATHEMATICAL LOGIC AND PREDICATES
Mathematical logic: Statements and notations, connectives, well-formed formulas, truth tables, tautology, equivalence implication; Normal forms: Disjunctive normal forms, conjunctive normal forms, principle disjunctive normal forms, principle conjunctive normal forms; Predicate calculus: Predicative logic, statement functions, variables and quantifiers, free and bound variables, rules of inference, consistency, proof of contradiction, automatic theorem proving.

MODULE - II RELATIONS, FUNCTIONS AND LATTICES
Relations: Properties of binary relations, equivalence, compatibility and partial ordering relations, lattices, Hasse diagram; Functions: Inverse function, composition of functions, recursive functions; Lattices: Lattices as partially ordered sets; Definition and examples, properties of lattices, sub lattices, some special lattices.

MODULE - III ALGEBRAIC STRUCTURES AND COMBINATORICS
Algebraic structures: Algebraic systems, examples and general properties, semi groups and monoids, groups, sub groups, homomorphism, isomorphism, rings.
Combinatory: The fundamental counting principles, permutations, disarrangements, combinations, permutations and combinations with repetitions, the binomial theorem, multinomial theorem, generalized inclusion exclusion principle.

MODULE - IV RECURRENCE RELATION
Recurrence relation: Generating functions, function of sequences calculating coefficient of generating function, recurrence relations, solving recurrence relation by substitution and generating functions, Characteristics roots solution of homogeneous recurrence relation.

MODULE - V GRAPHS AND TREES
Graphs: Basic concepts of graphs, isomorphic graphs, Euler graphs, Hamiltonian graphs, planar graphs, graph coloring, digraphs, directed acyclic graphs, weighted digraphs, region graph, chromatic numbers; Trees: Trees, spanning trees, minimal spanning trees.
**Text Books:**


**Reference Books:**


**Web References:**

1. http://www.web.stanford.edu/class/cs103x
5. http://www.nptel.ac.in/courses/106106094/

**E-Text Books:**

1. https://people.eecs.berkeley.edu/~daw/teaching/cs70-s05/
OBJECT ORIENTED PROGRAMMINGS THROUGH PYTHON

III Semester: CSE / IT

<table>
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<tr>
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<th>Category</th>
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</tbody>
</table>

Contact Classes: 45 Tutorial Classes: Nil Practical Classes: Nil Total Classes: 45

OBJECTIVES:
The course should enable the students to:

I. Understand the fundamentals of Python programming concepts and its applications.
II. Understand the object-oriented concepts using Python in problem solving.
III. Apply string handling and function basics to solve real-time problems.
IV. Illustrate the method of solving errors using exception handling.
V. Design and implement programs using multi threading concepts.

MODULE – I INTRODUCTION TO PYTHON AND OBJECT ORIENTED CONCEPTS Classes: 09

Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements.
Introduction to Object Oriented Concepts: Features of Object oriented programming system (OOPS) – Classes and Objects, Encapsulation, Abstraction, Inheritance, Polymorphism.

MODULE – II PYTHON CLASSES AND OBJECTS Classes: 09

Classes and Objects: Creating a class, The Self variable, Constructor, Types of Variable, Namespaces, Types of Methods, Inheritance and Polymorphism – Constructors in inheritance, the super() method, types of inheritance, polymorphism, abstract classes and interfaces.

MODULE – III STRINGS AND FUNCTIONS Classes: 09

Strings: Creating strings and basic operations on strings, string testing methods.
Functions: Defining a function, Calling a function, returning multiple values from a function, functions are first class objects, formal and actual arguments, positional arguments, recursive functions.

MODULE – IV EXCEPTION HANDLING Classes: 09

Exception: Errors in a Python program, exceptions, exception handling, types of exceptions, the except block, the assert statement, user-defined exceptions.

MODULE – V GRAPHICAL USER INTERFACE Classes: 09

GUI in Python: The root window, fonts and colors, working with containers, Canvas, Frames, Widgets – Button widget, Label widget, message widget, text widget, radio button widget, entry widget.

Text Books:
**Reference Books:**


**Web References:**

<table>
<thead>
<tr>
<th></th>
<th>Reference</th>
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<tr>
<td>1</td>
<td><a href="https://realpython.com/python3-object-oriented-programming/">https://realpython.com/python3-object-oriented-programming/</a></td>
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<td>2</td>
<td><a href="https://python.swaroopch.com/oop.html">https://python.swaroopch.com/oop.html</a></td>
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<td><a href="https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html">https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html</a></td>
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<td><a href="https://www.programiz.com/python-programming/">https://www.programiz.com/python-programming/</a></td>
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BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

III Semester: CSE / IT | V Semester: EEE / CE / MECH | VI Semester: ECE

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

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. Analyze how capital budgeting decisions are carried out for selecting the best investment proposal.
III. Learn how organizations make important investment and financing decisions.
IV. Analyze a company’s financial statements and come to a reasoned conclusion about the financial situation of the company.
V. Acquire the basics of how to analyze and interpret the financial statements through ratio analysis.

MODULE – 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.

MODULE – 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.

MODULE – 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 organizations: Sole proprietorship, partnership, joint stock company, public enterprises and their types.

MODULE – 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).

MODULE – 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 and 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:


### Reference Books:


### Web References:

4. 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
4. http://books.google.com/books/about/Managerial economics and financial analysis
DATA STRUCTURES LABORATORY

III Semester: ME / CSE / IT / ECE / CE | IV Semester AE / EEE

<table>
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<td>- - 3 1.5 30 70 100</td>
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Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 36  Total Classes: 36

COURSE OBJECTIVES:
The course should enable the students to:

I. Understand various data representation techniques in the real world.
II. Implement linear and non-linear data structures.
III. Analyze various algorithms based on their time and space complexity.
IV. Develop real-time applications using suitable data structure.
V. Identify suitable data structure to solve various computing problems.

LIST OF EXPERIMENTS

Week -1  BASICS OF PYTHON

Write Python programs for the following:
- To find the biggest of given n numbers using control statements and lists
- To print the Fibonacci series using functions
- To find GCD of two numbers

Week -2  SEARCHING TECHNIQUES

Write Python programs for implementing the following searching techniques to arrange a list of integers in ascending order.
- Linear search
- Binary search

Week -3  SORTING TECHNIQUES

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

Week -4  IMPLEMENTATION OF STACK AND QUEUE

Write Python programs for the following:
- Design and implement Stack and its operations using List.
- Design and implement Queue and its operations using List.

Week -5  APPLICATIONS OF STACK

Write Python programs for the following:
- Uses Stack operations to convert infix expression into postfix expression.
- Uses Stack operations for evaluating the postfix expression.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Description</th>
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<tbody>
<tr>
<td>6</td>
<td>IMPLEMENTATION OF SINGLE LINKED LIST</td>
<td>Write Python programs for the following operations on Single Linked List. (i) Creation (ii) insertion (iii) deletion (iv) traversal</td>
</tr>
<tr>
<td>7</td>
<td>IMPLEMENTATION OF CIRCULAR SINGLE LINKED LIST</td>
<td>Write Python programs for the following operations on Circular Linked List. (i) Creation (ii) insertion (iii) deletion (iv) traversal</td>
</tr>
<tr>
<td>8</td>
<td>IMPLEMENTATION OF DOUBLE LINKED LIST</td>
<td>Write Python programs for the following operations on Double Linked List. (i) Creation (ii) insertion (iii) deletion (iv) traversal in both ways.</td>
</tr>
<tr>
<td>9</td>
<td>IMPLEMENTATION OF STACK USING LINKED LIST</td>
<td>Write a Python program to implement Stack using linked list.</td>
</tr>
<tr>
<td>10</td>
<td>IMPLEMENTATION OF QUEUE USING LINKED LIST</td>
<td>Write a Python program to implement Linear Queue using linked list.</td>
</tr>
<tr>
<td>11</td>
<td>GRAPH TRAVERSAL TECHNIQUES</td>
<td>Write Python programs to implement the following graph traversal algorithms: a. Depth first search. b. Breadth first search.</td>
</tr>
<tr>
<td>12</td>
<td>IMPLEMENTATION OF BINARY SEARCH TREE</td>
<td>Write a Python program to perform the following: a. Create a binary search tree. b. Traverse the above binary search tree recursively in pre-order, post-order and in-order. c. Count the number of nodes in the binary search tree.</td>
</tr>
</tbody>
</table>

**LIST OF REFERENCE BOOKS:**

**WEB REFERENCES:**
1. https://docs.python.org/3/tutorial/datastructures.html
7. http://cse01-iiith.vlabs.ac.in/
C++ STANDARD TEMPLATE LIBRARY

III Semester: CSE / IT

<table>
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<td>30  70   100</td>
<td></td>
</tr>
</tbody>
</table>

Contact Classes: Nil       Tutorial Classes: Nil       Practical Classes: 36       Total Classes: 36

Objectives:
The course should enable the students to:
I. Understand how C++ STL improves C with predefined libraries.
II. Learn how to implement C++ standard Template Libraries.
III. Understand the concept of vectors, maps, stacks, queues and many more

LIST OF EXPERIMENTS

Week -1         CONTROL STRUCTURES

a. In this problem, you need to print the pattern of the following form containing the numbers from 1 to n.

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

Input:
2
Output:
2 2 2
2 1 2
2 2 2

b. Given a positive integer denoting n, do the following:
   If 1<=n<=9, then print the lowercase English word corresponding to the number (e.g., one for , two for , etc.).
   If n>9, print Greater than 9.
Input:
5
Output:
five

Week -2         VECTORS AND MAPS

a. A left rotation operation on a vector of size N shifts each of the array's elements 1 unit to the left. For example, if 2 left rotations are performed on array [1,2,3,4,5], then the array would become[3,4,5,1,3]. Given an vector of n integers and a number, d, perform d left rotations on the array. Then print the updated array as a single line of space-separated integers. Print a single line of n space-separated integers denoting the final state of the array after performing d left rotations.
Sample Input
b. Prasad is working as teacher in one school. He evaluated exam papers for all students. He decided to store their marks in his computer using their names. Can you please suggest best data structure. For example
Marks["Ramu"]=98
Marks["Janu"]=87

---

**Week -3 **  
**STACK AND QUEUE**

a. You have an empty sequence, and you will be given  queries. Each query is one of these three types:
   1 x  -Push the element x into the stack.
   2  -Delete the element present at the top of the stack.
   3  -Print the maximum element in the stack.
For each type 3 query, print the maximum element in the stack on a new line.
Sample Input
10
1 97
2
1 20
2
1 26
1 20
2
3
1 91
3
Sample Output
91

b. You must first implement a queue using two stacks. Then process  queries, where each query is one of the 3 following types:
   1 x: Enqueue element into the end of the queue.
   2: Dequeue the element at the front of the queue.
   3: Print the element at the front of the queue.
For each query of type , print the value of the element at the front of the queue on a new line.
Sample Input
10
1 42
2
1 14
3
1 28
3
1 60
1 78
2
2
Sample Output
14
14
Week -4  SETS AND STRINGS

a. You will be given Q queries. Each query is of one of the following three types:
   1. \( x \) : Add an element \( x \) to the set.
   2. \( x \) : Delete an element \( x \) from the set. (If the number is not present in the set, then do nothing).
   3. \( x \) : If the number \( x \) is present in the set, then print "Yes" (without quotes) else print "No" (without quotes).

   For queries of type 3 print "Yes" (without quotes) if the number \( x \) is present in the set and if the number is not present, then print "No" (without quotes).

   Each query of type 3 should be printed in a new line.

Sample Input
8
1 9
1 6
1 10
1 4
3 6
3 14
2 6
3 6

Sample Output
Yes
No
No

b. You are given a string containing characters A and B only. Your task is to change it into a string such that there are no matching adjacent characters. To do this, you are allowed to delete zero or more characters in the string.

   Your task is to find the minimum number of required deletions.

   For example, given the string \( s=AABAAB \), remove an A at positions 0 and 3 to make \( s=ABAB \) in 2 deletions.

Week -5  SORTINGS AND PAIRS

a. Raju and Ravi are friends. Raju asked Ravi to arrange the set of string in ascending order (Dictionary format). Please help the Ravi to put the strings in ascending order.

b. Teacher given a task to students find the unvisited elements in the given matrix. The students are struggling to find the unvisited elements in the list. Please help them to solve.

Week -6  ARRAYS AND LISTS

a. All friends are invited and they arrive at the party one by one in an arbitrary order. However, they have certain conditions — for each valid \( i \), when the \( i \)-th friend arrives at the party and sees that at that point, strictly less than \( A_i \) other people (excluding Chef) have joined the party, this friend leaves the party; otherwise, this friend joins the party. Help Chef estimate how successful the party can be — find the maximum number of his friends who could join the party (for an optimal choice of the order of arrivals).

Input:
6
3 1 0 0 5 5

Output:
4
**Week -7**  
**MULTISET AND MULTIMAPS**

a. Kattapa, as you all know was one of the greatest warriors of his time. The kingdom of Maahishmati had never lost a battle under him (as army-chief), and the reason for that was their really powerful army, also called as Mahasena. Kattapa was known to be a very superstitious person. He believed that a soldier is "lucky" if the soldier is holding an even number of weapons, and "unlucky" otherwise. He considered the army as "READY FOR BATTLE" if the count of "lucky" soldiers is strictly greater than the count of "unlucky" soldiers, and "NOT READY" otherwise. Given the number of weapons each soldier is holding, your task is to determine whether the army formed by all these soldiers is "READY FOR BATTLE" or "NOT READY".

Input:

4
11 12 13 14
Output:
NOT READY

---

**Week -8**  
**UNORDERED SETS**

a. You are given two lists of N distinct numbers. Sort both the list and print them alternatively starting with list one.

Input:

7
5 4 3 6 2 1 7
15 14 13 16 12 11 17
Output:
1 11 2 12 3 13 4 14 5 15 6 16 7 17

---

**Week -9**  
**SET UNION AND INTERSECTION**

a. A class contains two subjects and students can take one or two subjects as there wish. Here, students opted subjects on there own interest. Now, your task is to print all the total students count and students names, and also print how many took two subjects and their names.

Input:

string first[] = { "John", "Bob", "Mary", "Serena" };
string second[] = { "Jim", "Mary", "John", "Bob" };
Output:
Total students: 6
Names: Neha Rakesh Sachin Sandeep Serena Vaibhav
Opted Two subjects: 3
Names: Bob John Mary

---

**Week -10**  
**IMPLEMENTATION OF QUEUE USING LINKED LIST**

a. A class contains two subjects and students can take one or two subjects as there wish. Here, students opted subjects on their own interest. Now your task to find the student names who are attending first subject but not second and vice versa.

Input:

4
"John", "Bob", "Mary", "Serena"
4
"Jim", "Mary", "John", "Bob"
Output:
PERMUTATIONS

IARE college has designed a new challenge called BuildIT Competitive Programming. In this game, each team contains N members and they are specialised in either Java Programming or Python Programming. The challenge contains n1 java questions and n2 Python questions. So, team members are decided to seat in all specialized members as one group. So that, number of ways the N members seat in the programming contest.

For example: a team contains ‘ab’ java programmers and ‘cde’ python programmers

(a, b)      (c, d, e)
(b, a)      (c, e, d)
            (d, c, e)
            (d, e, c)
            (e, c, d)
            (e, d, c)

So, total ways are = 12

Sample Input:
ab cde

Sample Output:
abcde
abced
abcdc
abdec
abedc
badce
badcc
badec
baecd
baedc

LEXICOGRAPHICAL

a. Ravi and Raju are best friends. Ravi given a set of strings to Raju and ask him to find smaller string as per lexicographical order. Please help him to find.

For example:

Input:
4
abacus
apple
car
abba

Output:
abacus

Reference Books:


Web References:
SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 60 STUDENTS:

**HARDWARE:**
Desktop systems: 30 nos
Printers: 02

**SOFTWARE:**
Application Software’s: MS Office.
Programming Languages: Borland C++ (open Source).
### OBJECTIVES:
The course will enable the students to:

I. Understand the fundamental concepts of computer networking.

II. Use the preamble of LaTeX file to define document class and layout options.

III. Use LaTeX and various templates acquired from the course to compose Mathematical documents, presentations, and reports.

IV. Understand web design concepts.

### LIST OF EXPERIMENTS

**Week-1**  LaTeX FORMATTING

Introduction of LaTeX and LaTeX document formatting:
Create a LaTeX document with following formatting: All margins with 1.5, headings with bold, text with normal, chapter name with blue color, line space with 1.5.

**Week-2**  TECHNICAL PAPER PREPARATION IN LaTeX

Essential steps in writing the technical report:
Create a technical report according to IEEE format includes title of the paper, authors name and affiliations, abstract and keywords, introduction section, background section, and other sections, references.

**Week-3**  FORMATTING MATHEMATICAL EQUATIONS IN LaTeX

Create a LaTeX document with following mathematical equations along with equation numbers in Italic format: summation (represent in sigma symbol), integration, integral of summation, average of summation, trigonometric equations, polynomial and non-polynomial equations.

**Week-4**  GRAPHICS AND TABLES IN LaTeX

Create a LaTeX documents with images and image caption at centre alignment, table with thick border and table caption with centre alignment, row height, content with cell centre alignment.

**Week-5**  VARIOUS FORMATTING STYLES IN LaTeX

Using 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 both LaTeX.

**Week-6**  EXCEL SPREADSHEETS

Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Calculating GPA - Features to be covered:- Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.

**Week-7**  PREPARATION OF POWERPOINT PRESENTATION IN LaTeX
Student should work on basic power point utilities and tools in Latex which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows

<table>
<thead>
<tr>
<th>Week-8</th>
<th>WEBPAGES CREATION AND DESIGNING</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>HTML, creating simple web pages, images and links, design of web pages</td>
</tr>
<tr>
<td></td>
<td>Develop home page: Student should learn to develop his/her home page using HTML consisting of his/her photo, name, address and education details as a table and his/her skill set as a list.</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Week-9</th>
<th>WEB DESIGN FOR SAMPLE PROJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Create a webpage with HTML describing your department. Use paragraph and list tags.</td>
</tr>
<tr>
<td></td>
<td>Apply various colors to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags.</td>
</tr>
<tr>
<td></td>
<td>Create links on the words e.g. “Wi-Fi” and “LAN” to link them to Wikipedia pages.</td>
</tr>
<tr>
<td></td>
<td>Insert an image and create a link such that clicking on image takes user to other page.</td>
</tr>
<tr>
<td></td>
<td>Change the background color of the page.</td>
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<td></td>
<td>At the bottom create a link to take user to the top of the page.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week-10</th>
<th>NETWORK CONNECTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate how to access the websites and email.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Week-11</th>
<th>SURFING THE WEB</th>
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<tbody>
<tr>
<td></td>
<td>Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers.</td>
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</table>

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<thead>
<tr>
<th>Week-12</th>
<th>ROUTER CONFIGURATION</th>
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<tbody>
<tr>
<td></td>
<td>Cabling a network using CCNA, basic and challenge router configuration, subnetting, practical test router connections and settings, troubleshooting challenges</td>
</tr>
</tbody>
</table>

**Reference Books:**

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education India, 2005
2. LaTeX Companion – Leslie Lamport, PHI/Pearson.

**Web References:**


**Course Home Page:**

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 24 STUDENTS:

**HARDWARE:** Desktop Computer Systems: 24 nos.

**SOFTWARE:** LaTeX
## COMPUTER ORGANIZATION AND ARCHITECTURE

### IV Semester: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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</thead>
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<tr>
<td>ACSB07</td>
<td>Core</td>
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</table>

Contact Classes: 45  
Tutorial Classes: Nil  
Practical Classes: Nil  
Total Classes: 45

### OBJECTIVES:
The course should enable the students to:

I. Understand the organization and architecture of computer systems and electronic computers.
II. Study the assembly language program execution, instruction format and instruction cycle.
III. Design a simple computer using hardwired and microprogrammed control methods.
IV. Study the basic components of computer systems besides the computer arithmetic.
V. Understand input-output organization, memory organization and management, and pipelining.

### MODULE - I  
**INTRODUCTION TO COMPUTER ORGANIZATION**  
Classes: 08

Basic computer organization, CPU organization, memory subsystem organization and interfacing, input or output subsystem organization and interfacing, a simple computer levels of programming languages, assembly language instructions, instruction set architecture design, a simple instruction set architecture.

### MODULE - II  
**ORGANIZATION OF A COMPUTER**  
Classes: 10

Register transfer: Register transfer language, register transfer, bus and memory transfers, arithmetic micro operations, logic micro operations, shift micro operations; Control unit: Control memory, address sequencing, micro program example, and design of control unit.

### MODULE - III  
**CPU AND COMPUTER ARITHMETIC**  
Classes: 08

CPU design: Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer and manipulation, program control.
Computer arithmetic: Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.

### MODULE - IV  
**INPUT-OUTPUT ORGANIZATION AND MEMORY ORGANIZATION**  
Classes: 10

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Input or output organization: Input or output Interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access.

### MODULE - V  
**MULTIPROCESSORS**  
Classes: 09

Pipeline: Parallel processing, pipelining-arithmetic pipeline, instruction pipeline; Multiprocessors: Characteristics of multiprocessors, inter connection structures, inter processor arbitration, inter processor communication and synchronization.
<table>
<thead>
<tr>
<th>Text Books:</th>
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<table>
<thead>
<tr>
<th>Reference Books:</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Web References:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <a href="https://www.tutorialspoint.com/computer_logical_organization/">https://www.tutorialspoint.com/computer_logical_organization/</a></td>
</tr>
<tr>
<td>2. <a href="https://www.courseera.org/learn/comparch">https://www.courseera.org/learn/comparch</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E-Text Books:</th>
</tr>
</thead>
</table>
THEORY OF COMPUTATION

IV Semester: CSE / IT

<table>
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<th>Course Code</th>
<th>Category</th>
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<th>Credits</th>
<th>Maximum Marks</th>
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<tr>
<td>AITB03</td>
<td>Core</td>
<td>3 L 1 T - P 4</td>
<td>CIA 30  SEE 70  Total 100</td>
<td></td>
</tr>
</tbody>
</table>

Contact Classes: 45  Tutorial Classes: 15  Practical Classes: Nil  Total Classes: 60

OBJECTIVES:
The course should enable the students to:
I. Comprehend abstract, mathematical models of computation and use them to solve computational problems.
II. Interpret the relationship between formal languages in Chomsky's hierarchy and different machines.
III. Analyze and explain the behavior of push-down automata.
IV. Understand the limits and capacities of Turing's machines to recognize languages.

MODULE -I  FINITE AUTOMATA  Classes: 10
Fundamentals: Alphabet, strings, language, operations; Introduction to finite automata: The central concepts of automata theory, deterministic finite automata, nondeterministic finite automata, an application of finite automata, finite automata with epsilon transitions.

MODULE -II  REGULAR LANGUAGES  Classes: 9
Regular sets, regular expressions, identity rules, constructing finite automata for a given regular expressions, conversion of finite automata to regular expressions, pumping lemma of regular sets, closure properties of regular sets (proofs not required), regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and finite automata, inter conversion.

MODULE -III  CONTEXT FREE GRAMMARS  Classes: 8
Context free grammars and languages: Context free grammar, derivation trees, sentential forms, right most and leftmost derivation of strings, applications.

Ambiguity in context free grammars, minimization of context free grammars, Chomsky normal form, Greibach normal form, pumping lemma for context free languages, enumeration of properties of context free language (proofs omitted).

MODULE -IV  Pushdown Automata  Classes: 9
Pushdown automata, definition, model, acceptance of context free language, acceptance by final state and acceptance by empty stack and its equivalence, equivalence of context free language and pushdown automata, inter conversion;(Proofs not required); Introduction to deterministic context free languages and deterministic pushdown automata.

MODULE -V  Turing Machine  Classes: 10
Turing machine: Turing machine, definition, model, design of Turing machine, computable functions, recursively enumerable languages, Church's hypothesis, counter machine, types of Turing machines (proofs not required), linear bounded automata and context sensitive language, Chomsky hierarchy of languages.
**Text Books:**


**Reference Books:**


**Web References:**

2. https://www.iitg.ernet.in/dgoswami/Flat-Notes.pdf

**E-Text Books:**


**MOOC Course**

1. http://nptel.ac.in/courses/111103016/
2. http://nptel.ac.in/courses/106106049/
## OPERATING SYSTEMS

**IV Semester: CSE / IT**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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</thead>
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<td>AITB04</td>
<td>Core</td>
<td>L T P C CIA SEE Total</td>
<td>3 - - 30 70 100</td>
<td></td>
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</tbody>
</table>

**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.

### MODULE -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, personal computer, parallel distributed systems, real time systems, special purpose systems, operating system services, user operating systems interface; Systems calls: Types of systems calls, system programs, protection and security, operating system design and implementation, operating systems structure, virtual machines.

### MODULE -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, multiple processor scheduling; Real time scheduling; Thread scheduling; Case studies Linux windows; Process synchronization, the critical section problem; Peterson’s solution, synchronization hardware, semaphores and classic problems of synchronization, monitors.

### MODULE -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; Performance of demand paging: Page replacement, page replacement algorithms, allocation of frames, thrashing.

### MODULE -IV  
**FILE SYSTEM INTERFACE, MASS-STORAGE STRUCTURE**  
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, efficiency and performance; Overview of mass storage structure: Disk structure, disk attachment, disk scheduling, disk management, swap space management; Dynamic memory allocation: Basic concepts; Library functions.
# MODULE V
## DEADLOCKS, PROTECTION

<table>
<thead>
<tr>
<th>Classes: 08</th>
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</thead>
</table>

System model: Deadlock characterization, methods of handling deadlocks, deadlock prevention, dead lock avoidance, dead lock detection and recovery form deadlock system protection, goals of protection, principles of protection, domain of protection, access matrix, implementation of access matrix, access control, revocation of access rights, capability based systems, language based protection.

### Text Books:


### Reference Books:


### Web References:

1. www.smartzworld.com/notes/operatingsystems
2. www.technofest2u.blogspot.com
3. https://nptel.ac.in/courses/106106144/

### E-Text Books:

### DESIGN AND ANALYSIS OF ALGORITHMS

**IV Semester: CSE / IT**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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</tbody>
</table>

Contact Classes: 45  
Tutorial Classes: 15  
Practical Classes: Nil  
Total Classes: 60

**OBJECTIVES:**  
The course should enable the students to:  
I. Assess how the choice of data structures and algorithm design methods impacts the performance of programs.  
II. Solve problems using data structures such as binary search trees, and graphs and writing programs for these solutions.  
III. Choose the appropriate data structure and algorithm design method for a specified application.  
IV. Solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound and writing programs for these solutions.

### MODULE -I  
**INTRODUCTION**  
Classes: 09  
Algorithm: Pseudo code for expressing algorithms; Performance analysis: Space complexity, time complexity; Asymptotic notations: Big O notation, omega notation, theta notation and little o notation, amortized complexity; Divide and Conquer: General method, binary search, quick sort, merge sort, Strassen’s matrix multiplication.

### MODULE -II  
**SEARCHING AND TRAVERSAL TECHNIQUES**  
Classes: 08  
Disjoint set operations, union and find algorithms; Efficient non recursive binary tree traversal algorithms, spanning trees; Graph traversals: Breadth first search, depth first search, connected components, biconnected components.

### MODULE -III  
**GREEDY METHOD AND DYNAMIC PROGRAMMING**  
Classes: 10  
Greedy method: The general method, job sequencing with deadlines, knapsack problem, minimum cost spanning trees, single source shortest paths.  
Dynamic programming: The general method, matrix chain multiplication optimal binary search trees, 0/1 knapsack problem, single source shortest paths, all pairs shortest paths problem, the travelling salesperson problem.

### MODULE -IV  
**BACKTRACKING AND BRANCH AND BOUND**  
Classes: 09  
Backtracking: The general method, the 8 queens problem, sum of subsets problem, graph coloring, Hamiltonian cycles; Branch and bound: The general method, 0/1 knapsack problem, least cost branch and bound solution, first in first out branch and bound solution, travelling salesperson problem.
<table>
<thead>
<tr>
<th>MODULE -V</th>
<th>NP-HARD AND NP-COMPLETE PROBLEMS</th>
<th>Classes:09</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic concepts: Non-deterministic algorithms, the classes NP - Hard and NP, NP Hard problems, clique decision problem, chromatic number decision problem, Cook's theorem.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Text Books:**


**Reference Books:**


**Web References:**


**E-Text Books:**

2. https://drive.google.com/file/d/0B_Y1VbyboEDBTDVxVXpVbnk4TVE/edit?pref=2&pli=1

**MOOC Course**

1. https://www.coursera.org/learn/algorithm-design-analysis
3. https://www.onlinecourses.nptel.ac.in/noc16_cs04/preview
### DATABASE MANAGEMENT SYSTEMS

#### IV Semester: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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<td></td>
<td>3  -  -  3  30  70  100</td>
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</tbody>
</table>

**Contact Classes: 45**  **Tutorial Classes: Nil**  **Practical Classes: Nil**  **Total Classes: 45**

#### 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 Logical database design techniques.

III. Construct database queries using relational algebra and calculus and SQL.

IV. Understand the concept of a database transaction and related concurrent, recovery facilities.

V. Learn how to evaluate a set of queries in query processing.

#### MODULE - I  CONCEPTUAL MODELING INTRODUCTION  Classes: 10

Introduction to Data bases: Purpose of Database Systems, View of Data, Data Models, Database Languages, Database Users, Various Components of overall DBS architecture, Various Concepts of ER Model, Basics of Relational Model

#### MODULE - 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, Domain relational calculus, expressive power of algebra and calculus.

#### MODULE - III  SQL QUERY - BASICS, RDBMS - NORMALIZATION  Classes: 10

SQL – Data Definition commands, Queries with various options, Meta manipulation commands, Views, Joins, views, integrity and security; Relational database design: Pitfalls of RDBD, Lossless join decomposition, Functional dependencies, Armstrong Axioms, Normalization for relational databases 1<sup>st</sup>, 2<sup>nd</sup> and 3rd normal forms, Basic definitions of MVDs and JDs, 4<sup>th</sup> and 5<sup>th</sup> normal forms

#### MODULE - IV  TRANSACTION MANAGEMENT  Classes: 10


#### MODULE - V  DATA STORAGE AND QUERY PROCESSING  Classes: 07

**Text Books:**


**Reference Books:**


**Web References:**

1. https://www.youtube.com/results?search_query=DBMS+online+classes
2. http://www.w3schools.in/dbms/

**E-Text Books:**

3. https://docs.google.com/file/d/0B9aJA_iV4kHYM2dieHZhMHhyRVE/edit

**MOOC Course**

1. https://onlinecourses.nptel.ac.in/noc18_cs15/preview
OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY

IV Semester: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
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<th>Credits</th>
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Contact Classes: 13  Tutorial Classes: Nil  Practical Classes: 26  Total Classes: 39

OBJECTIVES:
The course will enable the students to:
I. Practice object-oriented programs and build java applications.
II. Implement java programs for establishing interfaces.
III. Implement sample programs for developing reusable software components.
IV. Create database connectivity in java and implement GUI applications.

LIST OF EXPERIMENTS

<table>
<thead>
<tr>
<th>Week-1</th>
<th>BASIC PROGRAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Try debug step by step with small program of about 10 to 15 lines which contains at least one if else condition and a for loop.</td>
</tr>
<tr>
<td>b.</td>
<td>Write a java program that prints all real solutions to the quadratic equation (ax^2+bx+c=0). Read in a, b, c and use the quadratic formula.</td>
</tr>
<tr>
<td>c.</td>
<td>The Fibonacci sequence is defined by the following rule. The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a java program that uses both recursive and non-recursive functions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week-2</th>
<th>MATRICES, OVERLOADING, OVERRIDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Write a java program to multiply two given matrices.</td>
</tr>
<tr>
<td>b.</td>
<td>Write a java program to implement method overloading and constructors overloading.</td>
</tr>
<tr>
<td>c.</td>
<td>Write a java program to implement method overriding.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week-3</th>
<th>PALINDROME, ABSTRACT CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Write a java program to check whether a given string is palindrome.</td>
</tr>
<tr>
<td>b.</td>
<td>Write a java program for sorting a given list of names in ascending order.</td>
</tr>
<tr>
<td>c.</td>
<td>Write a java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week-4</th>
<th>INTERFACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write a program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.</td>
<td></td>
</tr>
</tbody>
</table>
Week-5  MULTITHREADING

a. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

b. Write a java program that correct implements of producer consumer program.

Week-6  FILES

a. Write a java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b. Write a java program that displays the number of characters, lines and words in a text file.

c. Write a java program that reads a file and displays the file on the screen with line number before each line.

Week-7  FILES

a. Suppose that table named table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using labels in grid layout.

b. Write a java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.

Week-8  JAVA PROGRAM WITH DATABASE

a. Write a java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (/t). It takes a name or phone number as input and prints the corresponding other value from the hash table. Hint: Use hash tables.

b. Implement the above program with database instead of a text file.

Week-9  FILES

a. Write a java program that takes tab separated data (one record per line) from a text file and insert them into a database.

b. Write a java program that prints the metadata of a given table.

Week-10  TRAFFIC LIGHT

Write a java program that simulates a traffic light. The program lets the user select one of three lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriate message with "STOP" or "READY" or "GO" should appear above the buttons in selected color. Initially, there is no message shown.

Week-11  MOUSE EVENTS

a. Write a java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. Use adapter classes.

b. Write a java program to demonstrate the key event handlers.

Week-12  CALCULATOR

Write a java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +,-,*,% operations. Add a text field to display the result. Handle any possible exception like divided by zero.
### Week-13  
**APPLET**

a. Develop an applet that displays a simple message.
b. Develop an applet that receives an integer in one text field and computes its factorial value and returns it in another text field, when the button named `compute` is clicked.

### Reference Books:


### Web References:

1. www.nicedelhi.ac.in
3. www.rank1infotech.com

### Course Home Page:

**SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 24 STUDENTS:**

**HARDWARE:** Desktop Computer Systems: 24 nos.

**SOFTWARE:** Java Development Kit (Open source)
IV Semester: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
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<td></td>
<td>-  -  3  1.5</td>
<td>30  70  100</td>
<td></td>
</tr>
</tbody>
</table>

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 36  Total Classes: 36

OBJECTIVES:
The course should enable the students to:
I. Learn how to analyze a problem and design the solution for the problem.
II. Design and implement efficient python programming for a specified application.
III. Identify and apply the suitable algorithm for the given real world problem.

LIST OF EXPERIMENTS

Week-1  QUICK SORT
Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

Week-2  MERGE SORT
Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

Week-3  KNAPSACK PROBLEM
Implement 0/1 Knapsack problem using Dynamic Programming.

Week-4  SHORTEST PATHS ALGORITHM
From a given vertex in a weighted connected graph, find shortest paths from 0 to other vertices using Dijkstra’s algorithm.
<table>
<thead>
<tr>
<th>Week-5</th>
<th>MINIMUM COST SPANNING TREE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal’s algorithm.</td>
</tr>
<tr>
<td><img src="image" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week-6</th>
<th>TREE TRAVERSALS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Perform various tree traversal algorithms for a given tree.</td>
</tr>
<tr>
<td><img src="image" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week-7</th>
<th>GRAPH TRAVERSALS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. Print all the nodes reachable from a given starting node in a digraph using BFS method.</td>
</tr>
<tr>
<td><img src="image" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Check whether a given graph is connected or not using DFS method.</td>
</tr>
</tbody>
</table>
### Week-8  **SUM OF SUB SETS PROBLEM**

Find a subset of a given set \( S = \{s_1, s_2, \ldots, s_n\} \) of \( n \) positive integers whose sum is equal to a given positive integer \( d \). For example, if \( S = \{1, 2, 5, 6, 8\} \) and \( d = 9 \) there are two solutions \( \{1, 2, 6\} \) and \( \{1, 8\} \). A suitable message is to be displayed if the given problem instance doesn't have a solution.

### Week-9  **TRAVELLING SALES PERSON PROBLEM**

Implement any scheme to find the optimal solution for the Traveling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.

### Week-10  **MINIMUM COST SPANNING TREE**

Find Minimum Cost Spanning Tree of a given undirected graph using Prim’s algorithm.

![Minimum Cost Spanning Tree Diagram](image)

### Week-11  **ALL PAIRS SHORTEST PATHS**

Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

![All Pairs Shortest Paths Diagram](image)
Week-12 | N QUEENS PROBLEM
--- | ---
Implement N Queen's problem using Back Tracking.

**Reference Books:**

**Web Reference:**
3. [http://www.facweb.iitkgp.ernet.in/~sourav/daa.html](http://www.facweb.iitkgp.ernet.in/~sourav/daa.html)
IV Semester: CSE / IT

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<tr>
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<td>SEE</td>
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<td></td>
<td></td>
<td>3  1.5</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 36  Total Classes: 36

OBJECTIVES:
The course should enable the students to:
I. Implement the basic knowledge of SQL queries and relational algebra.
II. Construct database models for different database applications.
III. Apply normalization techniques for refining of databases.
IV. Practice various triggers, procedures, and cursors using PL/SQL.

LIST OF EXPERIMENTS

Week-1  CREATION OF TABLES

1. Create a table called Employee with the following structure.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empno</td>
<td>Number</td>
</tr>
<tr>
<td>Ename</td>
<td>Varchar2(20)</td>
</tr>
<tr>
<td>Job</td>
<td>Varchar2(20)</td>
</tr>
<tr>
<td>Mgr</td>
<td>Number</td>
</tr>
<tr>
<td>Sal</td>
<td>Number</td>
</tr>
</tbody>
</table>

a. Add a column commission with domain to the Employee table.
b. Insert any five records into the table.
c. Update the column details of job
d. Rename the column of Employ table using alter command.
e. Delete the employee whose empno is 19.

2. Create department table with the following structure.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deptno</td>
<td>Number</td>
</tr>
<tr>
<td>Deptname</td>
<td>Varchar2(20)</td>
</tr>
<tr>
<td>location</td>
<td>Varchar2(20)</td>
</tr>
</tbody>
</table>

a. Add column designation to the department table.
b. Insert values into the table.
c. List the records of emp table grouped by deptno.
d. Update the record where deptno is 9.
e. Delete any column data from the table.
3. Create a table called Customer table

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cust name</td>
<td>Varchar2(20)</td>
</tr>
<tr>
<td>Cust street</td>
<td>Varchar2(20)</td>
</tr>
<tr>
<td>Cust city</td>
<td>Varchar2(20)</td>
</tr>
</tbody>
</table>

a. Insert records into the table.
b. Add salary column to the table.
c. Alter the table column domain.
d. Drop salary column of the customer table.
e. Delete the rows of customer table whose cust_city is ‘hyd’.

Create a table called branch table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branch name</td>
<td>Varchar2(20)</td>
</tr>
<tr>
<td>Branch city</td>
<td>Varchar2(20)</td>
</tr>
<tr>
<td>asserts</td>
<td>Number</td>
</tr>
</tbody>
</table>

a. Increase the size of data type for asserts to the branch.
b. Add and drop a column to the branch table.
c. Insert values to the table.
d. Update the branch name column.
e. Delete any two columns from the table.

5. Create a table called sailor table

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sid</td>
<td>Number</td>
</tr>
<tr>
<td>Sname</td>
<td>Varchar2(20)</td>
</tr>
<tr>
<td>rating</td>
<td>Varchar2(20)</td>
</tr>
</tbody>
</table>

a. Add column age to the sailor table.
b. Insert values into the sailor table.
c. Delete the row with rating >8.
d. Update the column details of sailor.
e. Insert null values into the table.

6. Create a table called reserves table

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boat id</td>
<td>Integer</td>
</tr>
<tr>
<td>sid</td>
<td>Integer</td>
</tr>
<tr>
<td>day</td>
<td>Integer</td>
</tr>
</tbody>
</table>

a. Insert values into the reserves table.
b. Add column time to the reserves table.
c. Alter the column day data type to date.
d. Drop the column time in the table.
e. Delete the row of the table with some condition.
### Week 2: QUERIES USING DDL AND DML

1. a. Create a user and grant all permissions to the user.
   b. Insert the any three records in the employee table and use rollback. Check the result.
   c. Add primary key constraint and not null constraint to the employee table.
   d. Insert null values to the employee table and verify the result.
2. a. Create a user and grant all permissions to the user.
   b. Insert values in the department table and use commit.
   c. Add constraints like unique and not null to the department table.
   d. Insert repeated values and null values into the table.
3. a. Create a user and grant all permissions to the user.
   b. Insert values into the table and use commit.
   c. Delete any three records in the department table and use rollback.
   d. Add constraint primary key and foreign key to the table.
4. a. Create a user and grant all permissions to the user.
   b. Insert records in the sailor table and use commit.
   c. Add save point after insertion of records and verify save point.
   d. Add constraints not null and primary key to the sailortable.
5. a. Create a user and grant all permissions to the user.
   b. Use revoke command to remove user permissions.
   c. Change password of the user created.
   d. Add constraint foreign key and not null.
6. a. Create a user and grant all permissions to the user.
   b. Update the table reserves and use savepoint and rollback.
   c. Add constraint primary key , foreign key and not null to the reservestable
   d. Delete constraint not null to the table column.

### Week 3: QUERIES USING AGGREGATE FUNCTIONS

1. a. By using the group by clause, display the enames who belongs to deptno 10 along with average salary.
   b. Display lowest paid employee details under each department.
   c. Display number of employees working in each department and their department number.
   d. Using built in functions, display number of employees working in each department and their department name from dept table. Insert deptname to dept table and insert deptname for each row, do the required thing specified above.
   e. List all employees which start with either B or C.
   f. Display only these ename of employees where the maximum salary is greater than or equal to 5000.
2. a. Calculate the average salary for each different job.
   b. Show the average salary of each job excluding manager.
   c. Show the average salary for all departments employing more than three people.
   d. Display employees who earn more than the lowest salary in department 30
   e. Show that value returned by sign (n) function.
   f. How many days between day of birth to current date.
3. a. Show that two substring as single string.
   b. List all employee names, salary and 15% rise in salary.
   c. Display lowest paid emp details under each manager
   d. Display the average monthly salary bill for each deptno.
   e. Show the average salary for all departments employing more than two people.
   f. By using the group by clause, display the eid who belongs to deptno 05 along with average salary.

4. a. Count the number of employees in department 20
   b. Find the minimum salary earned by clerk.
   c. Find minimum, maximum, average salary of all employees.
   d. List the minimum and maximum salaries for each job type.
   e. List the employee names in descending order.
   f. List the employee id, names in ascending order by empid.

5. a. Find the sids ,names of sailors who have reserved all boats called “INTERLAKE
   Find the age of youngest sailor who is eligible to vote for each rating level with at least two such sailors.
   b. Find the sname , bid and reservation date for each reservation.
   c. Find the ages of sailors whose name begin and end with B and has at least 3 characters.
   d. List in alphabetic order all sailors who have reserved red boat.
   e. Find the age of youngest sailor for each rating level.

6. a. List the Vendors who have delivered products within 6 months from order date.
   b. Display the Vendor details who have supplied both Assembled and Sub parts.
   c. Display the Sub parts by grouping the Vendor type (Local or Non Local).
   d. Display the Vendor details in ascending order.
   e. Display the Sub part which costs more than any of the Assembled parts.
   f. Display the second maximum cost Assembled part.

**Week - 4** PROGRAMS ON PL/SQL

1. a. Write a PL/SQL program to swap twonumbers.
   b. Write a PL/SQL program to find the largest of threenumbers.

2. a. Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
   b. Write a PL/SQL program to find the sum of digits in a given number.

3. a. Write a PL/SQL program to display the number in reverse order.
   b. Write a PL / SQL program to check whether the given number is prime or not.

4. a. Write a PL/SQL program to find the factorial of a given number.
   b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius and area.

5. a. Write a PL/SQL program to accept a string and remove the vowels from the string.
   (When ‘hello’ passed to the program it should display ‘Hll’ removing e and o from the word Hello).
   b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to 10. Else display an error message. Otherwise Display the remainder in words.
**Week -5  PROCEDURES AND FUNCTIONS**

1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.
2. Accept year as parameter and write a Function to return the total net salary spent for a given year.
3. Create a function to find the factorial of a given number and hence find NCR.
4. Write a PL/SQL block o pint prime Fibonacci series using local functions.
5. Create a procedure to find the lucky number of a given birth date.
6. Create function to the reverse of given number.

**Week-6  TRIGGERS**

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values:

CUSTOMERS table:

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>AGE</th>
<th>ADDRESS</th>
<th>SALARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alive</td>
<td>24</td>
<td>Khammam</td>
<td>2000</td>
</tr>
<tr>
<td>2</td>
<td>Bob</td>
<td>27</td>
<td>Kadappa</td>
<td>3000</td>
</tr>
<tr>
<td>3</td>
<td>Catri</td>
<td>25</td>
<td>Guntur</td>
<td>4000</td>
</tr>
<tr>
<td>4</td>
<td>Dena</td>
<td>28</td>
<td>Hyderabad</td>
<td>5000</td>
</tr>
<tr>
<td>5</td>
<td>Eeshwar</td>
<td>27</td>
<td>Kurnool</td>
<td>6000</td>
</tr>
<tr>
<td>6</td>
<td>Farooq</td>
<td>28</td>
<td>Nellur</td>
<td>7000</td>
</tr>
</tbody>
</table>

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.

    Passenger( Passport_id INTEGER PRIMARY KEY, Name VARCHAR (50) Not NULL,
               Age   Integer Not NULL, Sex Char, Address VARCHAR (50) Not NULL);

   a. Write a Insert Trigger to check the Passport_id is exactly six digits or not.
   b. Write a trigger on passenger to display messages ‘1 Record is inserted’, ‘1 record is deleted’, ‘1 record is updated’ when insertion, deletion and updation are done on passenger respectively.

3. Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETE occurs.

4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.

5. Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and time of delete.

6. Create a transparent audit system for a table CUST_MSTR. The system must keep track of the records that are being deleted or updated.
**Week-7 | PROCEDURES**

1. Create the procedure for palindrome of given number.
2. Create the procedure for GCD: Program should load two registers with two Numbers and then apply the logic for GCD of two numbers. GCD of two numbers is performed by dividing the greater number by the smaller number till the remainder is zero. If it is zero, the divisor is the GCD if not the remainder and the divisors of the previous division are the new set of two numbers. The process is repeated by dividing greater of the two numbers by the smaller number till the remainder is zero and GCD is found.
3. Write the PL/SQL programs to create the procedure for factorial of given number.
4. Write the PL/SQL programs to create the procedure to find sum of N natural number.
5. Write the PL/SQL programs to create the procedure to find Fibonacci series.
6. Write the PL/SQL programs to create the procedure to check the given number is perfect or not.

**Week-8 | CURSORS**

1. Write a PL/SQL block that will display the name, dept no, salary of first highest paid employees.
2. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item master table.
3. Write a PL/SQL block that will display the employee details along with salary using cursors.
4. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
5. To write a Cursor to find employee with given job and deptno.
6. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the ‘employee’ table are updated. If none of the employee’s salary are updated we get a message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in ‘employee’ table.

**Week-9 | CASE STUDY: BOOK PUBLISHING COMPANY**

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications. A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with one editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do the following:
1. Analyze the data required.
2. Normalize the attributes.
3. Create the logical data model using E-R diagrams.

**Week-10 | CASE STUDY GENERAL HOSPITAL**

A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP...
and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study, do the following.
1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams.

### Week -11 CASE STUDY: CAR RENTAL COMPANY

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details such as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do the following:
1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams.

### Week-12 CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM

A database is to be designed for a college to monitor students’ progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre- requisites modules and some degree programmes have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance i.e. modules taken and examination results. For the above case study, do the following:
1. Analyze the data required.
2. Normalize the attributes.
3. Create the logical data model i.e., ER diagrams.
4. Comprehend the data given in the case study by creating respective tables with primary keys and foreign keys wherever required.
5. Insert values into the tables created (Be vigilant about Master- Slave tables).
6. Display the Students who have taken M.Sc course.
7. Display the Module code and Number of Modules taught by each Lecturer.
8. Retrieve the Lecturer names who are not Module Leaders.
9. Display the Department name which offers ‘English’ module.
10. Retrieve the Prerequisite Courses offered by every Department (with Department names).
11. Present the Lecturer ID and Name who teaches ‘Mathematics’.
12. Discover the number of years a Module is taught.
13. List out all the Faculties who work for ‘Statistics’ Department.
14. List out the number of Modules taught by each Module Leader.
15. List out the number of Modules taught by a particular Lecturer.
16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and its name).
17. Update the credits of all the prerequisite courses to 5. Delete the Module ‘History’ from the Module table.

Reference Books:

Web References:
http://www.scoopworld.in

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 24 STUDENTS:

HARDWARE: Desktop Computer Systems: 24 nos

SOFTWARE: Oracle 11g.
# OBJECT ORIENTED ANALYSIS AND DESIGN

**V Semester: CSE / IT**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
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<tr>
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</tr>
</tbody>
</table>

**Contact Classes:** 45  
**Tutorial Classes:** Nil  
**Practical Classes:** Nil  
**Total Classes:** 45

## OBJECTIVES:

The course should enable the students to:

I. Develop the skills to analyze and design object-oriented problems.

II. Specify, analyze and design the use case driven requirements for a particular system.

III. Understand the various processes and techniques for building object-oriented software systems.

IV. Identify and analyze the subsystems for various components and collaborate them interchangeably.

### MODULE-I

**INTRODUCTION TO UML**  
Classes: 10

Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, architecture, software development life cycle; Classes, relationships, common mechanisms and diagrams.

### MODULE-II

**ADVANCED BEHAVIORAL MODELING**  
Classes: 09

Advanced classes, advanced relationships, interfaces, types and roles, packages, terms, concepts; Class and Object Diagrams: Terms, concepts, common modeling techniques for class and object diagrams.

### MODULE-III

**ARCHITECTURAL MODELING**  
Classes: 08


Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams.

### MODULE-IV

**ADVANCED BEHAVIORAL MODELING**  
Classes: 09

Events and signals, state machines, processes and threads, time and space, state chart and state chart diagrams. Case study: The next gen POS system.

### MODULE-V

**ARCHITECTURAL MODELING**  
Classes: 09

Component, Component diagrams, Deployment, Deployment diagrams; Case Study: The Unified Library Application.

## Text Books:

**Reference Books:**


**Web References:**

2. https://www.utdallas.edu/~chung/OOAD/M03_1_StructuralDiagrams.ppt

**E-Text Books:**

1. https://www.utdallas.edu/UML2.0/Rumbaugh
## WEB TECHNOLOGIES

### V Semester: CSE / IT

<table>
<thead>
<tr>
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<th>Credits</th>
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</table>

- **Contact Classes:** 30
- **Tutorial Classes:** 15
- **Practical Classes:** Nil
- **Total Classes:** 45

### OBJECTIVES:
The course should enable the students to:

I. Design static and dynamic webpages using HTML, CSS and JavaScript.
II. Apply tools to retrieve the information from the database.
III. Understand a well-formed XML schema for developing web applications
IV. Design and implement web services from the server and client side.

### MODULE-I
**INTRODUCTION TO WEB TECHNOLOGIES**

Classes: 10

Introduction to html, fundamentals of HTML elements, document body, text, hyperlink, lists, tables, Color and Images, frames, cascading style Sheets: Introduction, defining your own styles, properties and values in styles, style sheets, formatting blocks, and layers; JavaScript: JavaScript basics, variables, string manipulation, mathematical functions, statements, operators, arrays and functions.

### MODULE-II
**OBJECTS IN JAVASCRIPT AND XML**

Classes: 08

Objects in JavaScript: Data and objects in JavaScript, regular expressions, exception handling, built-in objects, events; Dynamic HTML with JavaScript: Data validation, opening a new window, Rollover buttons, moving images, multiple pages in a single download, floating logos; XML: Basics XML, document type definition, xml schemas, Document Object Model, presenting XML.

### MODULE-III
**SERVLETS AND JSP**

Classes: 08

Servlet: Lifecycle of a Servlet, a simple Servlet, the servlet API, the javax.servlet package, reading Servletparameters, the javax.servlet. HTTP package, Handling HTTP requests and responses, using cookies and sessions.

JSP: The anatomy of a JSP page, JSP processing, declarations, directives, expressions, code snippets, implicit objects, using beans in JSP pages, connecting to database in JSP.

### MODULE-IV
**INTRODUCTION TO PHP**

Classes: 10

Introduction to PHP: Basics of PHP, downloading, installing, configuring PHP, programming in a web environment and the anatomy of a PHP page; Overview of PHP data types and concepts: Variables and data types, operators, expressions and statements, strings, arrays and functions.

### MODULE-V
**PHP AND DATABASE ACCESS**

Classes: 09

PHP and database access: Basic database concepts, connecting to a MySQL database, retrieving and displaying results, modifying, updating and deleting data; MVC architecture: PHP and other web technologies: PHP and XML, PHP and AJAX.

### Text Books:

**Reference Books:**


**Web References:**

1. https://www.vidyarthiplus.com/vp/thread-16509.html#.WFzQvVMrLDc
2. http://www.bdu.ac.in/centers/uic/docs/courseware/NME2-Notes/Unit1.pdf

**E-Text Books:**

COMPUTER NETWORKS

V Semester: CSE / IT

<table>
<thead>
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</table>

Contact Classes: 45  
Tutorial Classes: Nil  
Practical Classes: Nil  
Total Classes: 45

OBJECTIVES:

The course should enable the students to:

I. Develop an understanding of 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. Understand the operation of the protocols that are used inside the Internet.

MODULE-I   INTRODUCTION  
Classes: 10

Introduction: Networks, network types, internet history, standards and administration; Network models; Protocol layering, TCP/IP protocol suite, the OSI model Transmission media: Introduction, guided media, unguided media; Switching: Introduction, circuit switched networks, packet switching.

MODULE-II  DATA LINK LAYER  
Classes: 10

Introduction: Link layer addressing; Error detection and correction: Cyclic codes, checksum, forward error correction; Data link control: DLC services, data link layer protocols, media access control: Random access, virtual LAN.

MODULE-III NETWORK LAYER  
Classes: 09

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), IP (Internet Protocol)

MODULE-IV  TRANSPORT LAYER  
Classes: 08


MODULE-V   APPLICATION LAYER  
Classes: 08

Introduction, client server programming, WWW (World Wide Web) and HTTP (Hyper Text Transfer Protocol), FTP (File Transfer Protocol), E-mail, telnet, DNS (Domain Naming System), SNMP (Simple Network Management Protocol).

Text Books:

**Reference Books:**


**Web References:**


**E-Text Books:**


**MOOC Course**

# COMPILER DESIGN

## V Semester: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / WEEK</th>
<th>Credits</th>
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<td>2  1  -  3  30  70  100</td>
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</table>

Contact Classes: 30  Tutorial Classes: 15  Practical Classes: Nil  Total Classes:45

## OBJECTIVES:
The course should enable the students to:

I. Understand and list the different stages in the process of compilation.
II. Identify different methods of lexical analysis.
III. Understand various parsers and develop appropriate parser to produce parse tree representation of the input.
IV. Analyze problems related to the stages in the translation process.
V. Exercise and reinforce prior programming knowledge with a non-trivial programming project to construct a compiler.

## MODULE-I  INTRODUCTION TO COMPILERS
Classes: 08

Introduction to compilers: Definition of compiler, interpreter and its differences, the phases of a compiler; Lexical Analysis: Role of lexical analyzer, input buffering, recognition of tokens, finite automata, regular Expressions, from regular expressions to finite automata, pass and phases of translation, bootstrapping, LEX-lexical analyzer generator.

## MODULE-II  SYNTAX ANALYSIS
Classes: 09

Syntax Analysis: Parsing, role of parser, context free grammar, derivations, parse trees, ambiguity, elimination of left recursion, left factoring, eliminating ambiguity from dangling-else grammar; Types of parsing: Top-down parsing, backtracking, recursive-descent parsing, predictive parsers, LL (1) grammars. Bottom-up parsing: Definition of bottom-up parsing, handles, handle pruning, stack implementation of shift-reduce parsing, conflicts during shift-reduce parsing, LR grammars, LR parsers-simple LR, canonical LR and Look Ahead LR parsers, YACC-automatic parser generator.

## MODULE-III  SYNTAX-DIRECTED TRANSLATION AND INTERMEDIATE CODE GENERATION
Classes: 10

Syntax-Directed Translation: Syntax directed definitions, construction of syntax trees, S-attributed and L-attributed definitions; Syntax Directed Translation schemes.

Intermediate code generation: Intermediate forms of source programs– abstract syntax tree, polish notation and three address code, types of three address statements and its implementation, syntax directed translation into three-address code, translation of simple statements, Boolean expressions and flow-of-Control statements.

## MODULE-IV  TYPE CHECKING AND RUN TIME ENVIRONMENT
Classes: 09

Type checking: Definition of type checking, type expressions, type systems, static and dynamic checking of types, specification of a simple type checker; Run time environments: Source language issues, Storage organization, storage-allocation strategies, access to nonlocal data on the stack, garbage collection, symbol tables.
<table>
<thead>
<tr>
<th>MODULE-V</th>
<th>CODE OPTIMIZATION AND CODE GENERATION</th>
<th>Classes: 09</th>
</tr>
</thead>
</table>

**Text Book:**


**Reference Books:**


**Web References:**

1. www.vssut.ac.in/lecture_notes/lecture1422914957.pdf
4. https://www.vidyarthiplus.com/vp/thread-37033.html#.WF0PhILMrLDc

**E-Text Books:**

CASE TOOLS LABORATORY

V Semester: CSE | IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
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<td>Core</td>
<td>L T P C CIA SEE Total</td>
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<td>30 70 100</td>
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</table>

Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 24 | Total Classes: 24

OBJECTIVES:
The course should enable the students to:
I. Understand the concept of modeling and mechanism involved in UML.
II. Learn the classes and different types of relationships in classes, objects and terms related to diagrams.
III. Examine fundamental object-oriented analysis and design techniques.
IV. Apply design patterns for viewing a system as a set of procedures.
V. Prepare case studies for analyzing modeling techniques.

LIST OF EXPERIMENTS

Week-1 | INTRODUCTION TO UML
Study Of UML

Week-2 | ON LINE PURCHASE SYSTEM
Create a UML model for Online Purchase System

Week-3 | LIBRARY MANAGEMENT SYSTEM
Create a UML model for Library Management System

Week-4 | E-TICKETING
Create a UML model for E-Ticketing

Week-5 | QUIZ SYSTEM
Create a UML model for Quiz System

Week-6 | STUDENT MARK ANALYZING SYSTEM
Create a UML model for Student Mark Analyzing System

Week-7 | E-MAIL CLIENT SYSTEM
Create a UML model for E-Mail Client System

Week-8 | TELEPHONE PHONE DIALING
Create a UML model for Telephone Phone Dialing
### Week-9 | POINT OF SALE

Create a UML model for Point of sale

### Week-10 | WORKING COMPANY

Create a UML model for a Working Company

### Week-11 | ATM TRANSACTIONS

Create a system to design Bank ATM Transactions and generate code by using MS-Access as back end and VB as the front end.

### Week-12 | STUDENT MARK ANALYSIS

Create a system to design Student mark analysis system and generate code by using MS-Access as back end and VB as the front end.

### Reference Books:


### Web References:

1. www.uml.org
2. www.holub.com/goodies/uml/
3. www.uml-diagrams.org/
4. https://www.utdallas.edu/.../UML.../Rumbaugh--UML_2.0_Reference_C...

### Course Home Page:

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

**HARDWARE:** Desktop Computer Systems: 36 (nos)

**SOFTWARE:** Application Software: Rational Rose
WEB TECHNOLOGIES LABORATORY

V Semester: CSE | IT

<table>
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<th>Course Code</th>
<th>Category</th>
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<td>- - 2 1</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>

Contact Classes: Nil    Tutorial Classes: Nil    Practical Classes: 30    Total Classes: 30

OBJECTIVES:
The course should enable the students to:
I. Demonstrate the ability to retrieve data from a database and present it in a web page.
II. Demonstrate competency using FTP to transfer web pages to a server.
III. Construct pages that meet guidelines for efficient download and needs of an identified audience.
IV. Evaluate the functions of specific types of web pages in relationship to an entire web site.
V. Create web pages that meet accessibility needs of those with physical disabilities and the effects of CSS in web page creation.

LIST OF EXPERIMENTS

Week -1 INSTALLATIONS

Installation of XAMPP and WAMP servers.

Week-2 HTML

1. Create a table to show your class time table.
2. Use tables to provide layout to your HTML page describing your college infrastructure.
3. Use <span> and <div> tags to provide a layout to the above page instead of a table layout.

Week-3 HTML

1. Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.
2. Embed Audio and Video into your HTML web page.

Week -4 HTML

1. Create a webpage with HTML describing your department use paragraph and list tags.
2. Apply various colors to suitably distinguish key words, also apply font styling like italics, underline and two other fonts to words you find appropriate, also use header tags.
3. Create links on the words e.g. “Wi-Fi” and “LAN” to link them to Wikipedia pages.
4. Insert an image and create a link such that clicking on image takes user to other page.
5. Change the background color of the page; At the bottom create a link to take user to the top of the page.

Week -5 HTML

Develop static pages (using only HTML) of an online book store, the pages should resemble: www.amazon.com, the website should consist the following pages, home page, registration and user login, user profile page, books catalog, shopping cart, payment by credit card, order confirmation.
<table>
<thead>
<tr>
<th>Week -6</th>
<th>CASCADING STYLE SHEET</th>
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</thead>
<tbody>
<tr>
<td>Write an HTML page that contains a selection box with a list of 5 countries, when the user selects a country, its capital should be printed next to the list; Add CSS to customize the properties of the font of the capital (color, bold and font size).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week -7</th>
<th>CASCADING STYLE SHEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Let your visitors change the style sheet on your web site, this script will let your visitors choose between five style sheets, which can create yourself or use the one's included.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week -8</th>
<th>JAVASCRIPT</th>
</tr>
</thead>
</table>
| 1. Write a Java Script program to test the first character of a string is uppercase or not.  
2. Write a pattern that matches e-mail addresses.  
3. Write a Java Script function to print an integer with commas as thousands separators. |

<table>
<thead>
<tr>
<th>Week-9</th>
<th>JAVASCRIPT</th>
</tr>
</thead>
</table>
| 1. Write a Java Script program to sort a list of elements using quick sort.  
2. Write a Java Script for loop that will iterate from 0 to 15 for each iteration, it will check if the current number is odd or even, and display a message to the screen.  
3. Write a Java Script function which will take an array of numbers stored and find the second lowest and second greatest numbers, respectively. |

<table>
<thead>
<tr>
<th>Week-10</th>
<th>JAVASCRIPT</th>
</tr>
</thead>
</table>
| 1. Write a Java Script program which compute, the average marks of the following students then this average is used to determine the corresponding grade.  
2. Write a Java Script program to sum the multiples of 3 and 5 under 1000.  
3. To design the scientific calculator and make event for each button using java script. |

<table>
<thead>
<tr>
<th>Week-11</th>
<th>PHP</th>
</tr>
</thead>
</table>
| 1. A simple calculator web application that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands.  
2. Write php program how to send mail using PHP. |

<table>
<thead>
<tr>
<th>Week-12</th>
<th>PHP</th>
</tr>
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</table>
| 1. Write php program to convert a string, lower to upper case and upper case to lower case or capital case.  
2. Write php program to change image automatically using switch case. |

<table>
<thead>
<tr>
<th>Week-13</th>
<th>PHP</th>
</tr>
</thead>
</table>
| 1. Write php program to calculate current age without using any pre-define function.  
2. Write php program to upload image to the server using html and PHP. |

<table>
<thead>
<tr>
<th>Week-14</th>
<th>PHP</th>
</tr>
</thead>
</table>
| 1. Write php program to upload registration form into database.  
2. Write php program to display the registration form from the database. |
### Week-I5 PHP

1. Write php program to update the registration form present in database.
2. Write php program to delete the registration form from database

### Reference Books:


### Web References:

1. http://www.scoopworld.in
2. http://www.sxecw.edu.in

### SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

**HARDWARE:** Desktop Computer Systems: 36 nos

**SOFTWARE:** Application Software: XAMPP Server, WAMP 3.0.6.
ARTIFICIAL INTELLIGENCE

VI Semester: CSE / IT

<table>
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<th>Course Code</th>
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Contact Classes: 45 Tutorial Classes: Nil Practical Classes: Nil Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Study the 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.

MODULE-I INTRODUCTION Classes: 08
Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

MODULE-II SEARCH ALGORITHMS Classes: 10
Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm.

MODULE-III ADVERSARIAL SEARCH AND CSP Classes: 08
Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

MODULE-IV LOGIC AND KNOWLEDGE REPRESENTATION Classes: 10
Propositional Logic: Knowledge-Based Agents, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic; First-Order Logic: Representation, Syntax and Semantics, Inference in First-Order Logic, Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution; Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

MODULE-V PLANNING Classes: 09

Textbooks:
### Reference Books:


### Web References:


### E-Text Books:

LINUX PROGRAMMING

VI Semester: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Maximum Marks</th>
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Contact Classes: 30  Tutorial Classes: 15  Practical Classes: NIL  Total Classes: 45

OBJECTIVES:
The course should enable the students to:

I. Familiarize students with the Linux environment, and able to run commands on a standard Linux operating system.
II. Provide the skills needed to develop and customize Linux shell programs and to make effective use of a wide range of standard Linux programming and development tools.
III. Able to write moderate C programs utilizing common system calls.
IV. Develop the skills necessary for system programming and inter and intra process communication programming.

MODULE-I  INTRODUCTION AND LINUX UTILITIES  Classes: 10

Introduction to Linux operating system: History of Linux, features of Linux, architecture of Unix/Linux, Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities;Applications: Shell programming with Bourne again shell(bash)- Introduction, shell responsibilities, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

MODULE-II  FILES AND DIRECTORIES SYSTEM CALLS  Classes: 08

Files and Directories: File Concept, File types, File System Structure, File metadata- Inodes, kernel support for files, System calls for file I/O operations- open, create, read, write, close, lseek, dup2, file status information- stat family, file and record locking- fcntl function, permission- chmod, fchmod, file ownership- chown, lchown, links- soft links & hard links- symlink, link, unlink; Directories: creating, removing and changing directories- mkdir, rmdir, chdir, obtaining current working directory- getcwd, directory contents, scanning directories- opendir, readdir, closedir, rewinddir functions.

MODULE-III  PROCESS AND SIGNALS  Classes: 10

Process – Process concept, Layout of a C program, image in main memory, process environment- environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control - process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management- fork, vfork, exit, wait, waitpid, exec family, process groups, sessions & controlling terminal, differences between threads & processes.

Signals– Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

MODULE-IV  INTERPROCESS COMMUNICATION  Classes: 9

Interprocess Communication: Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs- creation, IPC between unrelated processes using FIFOs(named pipes), differences between unnamed
and named pipes. Message Queues- Kernel support for messages, APIs for message queues, client/server example; Semaphores-Kernel support for semaphores, APIs for semaphores, file locking with Semaphores.

<table>
<thead>
<tr>
<th>MODULE-V</th>
<th>SHARED MEMORY AND SOCKETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Classes: 08</strong></td>
</tr>
<tr>
<td>Shared Memory-</td>
<td>Kernel support for shared memory, APIs for shared memory, shared memory example.</td>
</tr>
<tr>
<td>Sockets:</td>
<td>Introduction to Berkeley Sockets, IPC over a network, client/server model, Socket Address structures (UNIX domain &amp; internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs- single client/server connection, Multiple simultaneous clients..</td>
</tr>
</tbody>
</table>

**Text Books:**


**Reference Books:**


**Web References:**

1. https://www.edx.org/course/introduction-linux-linuxfoundationx-lfs101x-0
2. http://www.tutorialspoint.com/listtutorials/linux/1

**E-Text Books:**


**MOOC Course**

1. https://training.linuxfoundation.org/free-linux-training
DATA WAREHOUSING AND DATA MINING

VI Semester: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
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</table>

Contact Classes: 30 Tutorial Classes: 15 Practical Classes: Nil Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand data warehouse and online analytical processing technology for data mining.
II. Make mining association with rules in large databases, do classification and prediction with different techniques.
III. Conceptualize the architecture of a data warehouse and the need for pre-processing.
IV. Develop and understand data mining applications and trends of data mining.
V. Analyze the major techniques of preprocessing for different types of data.

MODULE-I DATAWAREHOUSING Classes: 08
Introduction to Data warehouse, A Multi-dimensional data model- Star, Snow flake and Fact constellation schemas, Measures, Concept hierarchy, Data warehouse architecture- A three tier Data warehouse architecture, types of OLAP servers, Data warehouse Implementation, Data Marts, Differences between OLAT and OLTP.

MODULE-II DATA MINING Classes: 10
Introduction, What is Data Mining, Definition, Knowledge Discovery in Data (KDD), Kinds of data bases, Data mining functionalities, Classification of data mining systems, Data mining task primitives, Data Preprocessing: Data cleaning, Data integration and transformation, Data reduction, Data discretization and Concept hierarchy.

MODULE-III ASSOCIATION RULE MINING Classes: 10
Association Rules: Problem Definition, Frequent item set generation, The APRIORI Principle, support and confidence measures, association rule generation; APRIORI algorithm.

FP-Growth Algorithms, Compact Representation of Frequent item Set-Maximal Frequent item set, closed frequent item set.

MODULE-IV CLASSIFICATION AND PREDICTION Classes: 10
Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.

MODULE-V CLUSTERING Classes: 07
Types of data, categorization of major clustering methods, K-means partitioning methods, hierarchical methods, density based methods, grid based methods, model based clustering methods, outlier analysis. Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.

Text Books:

Reference Books:


Web References:

1. http://www.anderson.ucla.edu
2. https://www.smartzworld.com
3. http://iiscs.wssu.edu

E-Text Books:


MOOC Course

https://3ca1513rbm.wordpress.com
LINUX PROGRAMMING LABORATORY

VI Semester: CSE / IT

<table>
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<th>Course Code</th>
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<td>-  -  2  1</td>
<td>30</td>
<td>70</td>
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</tbody>
</table>

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 24  Total Classes: 24

OBJECTIVES:
The course should enable the students to:
I. Familiar with the Linux command-line environment.
II. Understand system administration processes by providing a hands-on experience.
III. Understand Process management and inter-process communications techniques.

LIST OF EXPERIMENTS

<table>
<thead>
<tr>
<th>Week-1</th>
<th>BASIC COMMANDS I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study and Practice on various commands like man, passwd, tty, script, clear, date, cal, cp, mv, ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, unmask, ulimit, ps, who, w.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Week-2</th>
<th>BASIC COMMANDS II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study and Practice on various commands like cat, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, tar, cpio.</td>
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</table>

<table>
<thead>
<tr>
<th>Week-3</th>
<th>SHELL PROGRAMMING, I</th>
</tr>
</thead>
</table>
| a) Write a Shell Program to print all .txt files and .c files.  
 b) Write a Shell program to move a set of files to a specified directory.  
 c) Write a Shell program to display all the users who are currently logged in after a specified time.  
 d) Write a Shell Program to wish the user based on the login time. |

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<thead>
<tr>
<th>Week-4</th>
<th>SHELL PROGRAMMING II</th>
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</table>
| a) Write a Shell program to pass a message to a group of members, individual member and all.  
 b) Write a Shell program to count the number of words in a file.  
 c) Write a Shell program to calculate the factorial of a given number.  
 d) Write a Shell program to generate Fibonacci series. |

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<thead>
<tr>
<th>Week-5</th>
<th>SIMULATING COMMANDS I</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Simulate cat command  b) Simulate cp command</td>
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<tr>
<th>Week-6</th>
<th>SIMULATING COMMANDS II</th>
</tr>
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<tbody>
<tr>
<td>a) Simulate tail command  b) Simulate head command</td>
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<tr>
<th>Week-7</th>
<th>SIMULATING COMMANDS III</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Simulate mv command  b) Simulate nl command</td>
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<tr>
<th>Week-8</th>
<th>SIGNAL HANDLING</th>
</tr>
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Write a program to handle the signals like SIGINT, SIGDFL, SIGIGN

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<tr>
<th>Week-9</th>
<th>INTERPROCESS COMMUNICATIONS</th>
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</table>
| Implement the following IPC forms  
  a) FIFO  
  b) PIPE |

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<thead>
<tr>
<th>Week-10</th>
<th>MESSAGE QUEUES</th>
</tr>
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</table>
| 1. Write a C program (sender.c) to create a message queue with read and write permissions to write 3 messages to it with different priority numbers.  
  2. Write a C program (receiver.c) that receives the messages (from the above message queue as specified and displays them. |

<table>
<thead>
<tr>
<th>Week-11</th>
<th>SHARED MEMORY</th>
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<tbody>
<tr>
<td>Implement shared memory form of IPC.</td>
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<table>
<thead>
<tr>
<th>Week-12</th>
<th>SOCKET PROGRAMMING</th>
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</thead>
</table>
| 1. Write client and server programs (using c) for interaction between server and client processes using TCP Elementary functions.  
  2. Write client and server programs (using c) for interaction between server and client processes using UDP Elementary functions. |

**Reference Books:**


**Web References:**

1. [http://spoken-tutorial.org/tutorial search/?search_foss=Linux&search_language=English](http://spoken-tutorial.org/tutorial search/?search_foss=Linux&search_language=English)  
4. [http://cse09-iiith.virtual-labs.ac.in/](http://cse09-iiith.virtual-labs.ac.in/)

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

**HARDWARE:** Desktop Computer Systems: 36nos  

**SOFTWARE:** System Software: Linux Operating System
DATA WAREHOUSING AND DATA MINING LABORATORY

VI Semester: CSE / IT

<table>
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<tr>
<th>Course Code</th>
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</table>

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 24  Total Classes: 24

OBJECTIVES:
The course should enable the students to:
I. Understand the need of Data Warehouses over Databases, and the difference between usage of operational and historical data repositories.
II. Able to differentiate between RDBMS schemas & Data Warehouse Schemas.
III. Get a clear idea of various classes of Data Mining techniques, their need, scenarios (situations) and scope of their applicability.
IV. Implement association rule for mining and also implement the clustering technique.

LIST OF EXPERIMENTS

Week-1  PREPROCESSING
Simulate preprocessing methods dataset student and labor in weka.

Week-2  ASSOCIATION RULE
1. Simulate association rule process on dataset contact lenses. arff using apriori algorithm in weka.
2. Simulate Association rule process on dataset test. arff using apriori algorithm in weka.

Week-3  CLASSIFICATION RULE BY J48
Simulate of classification rule process on dataset student. arff using j48 algorithm in weka.

Week-4  CLASSIFICATION RULE BY J48
Demonstration of classification rule process on dataset employee. arff using j48 algorithm.

Week-5  CLASSIFICATION RULE BY ID3
Demonstration of classification rule process on dataset employee. arff using id3 algorithm.

Week-6  CLASSIFICATION RULE BY NAÏVE BAYES
Demonstration of classification rule process on dataset employee. arff using naïve bayes.

Week-7  CLASSIFICATION RULE BY K-MEANS
Demonstration of clustering rule process on dataset iris. arff using simple k-means.
Week-8 | CLUSTERING
---|---
Demonstration of clustering rule process on dataset student.arff using simple k-means this macro to print the elements of the array.

Week-9 | CLUSTERING BY K-MEANS
---|---
Implement k-means algorithm.

Week-10 | DECISION TREE
---|---
Implement decision tree classification algorithm.

Week-11 | ASSOCIATION RULE MINING BY APRIORI ALGORITHM.
---|---
Implement Apriori algorithm.

Week-12 | ASSOCIATION RULE MINING BY FP-GROWTH ALGORITHM.
---|---
Implement FP-growth algorithm.

Reference Books:

Web References:
1. https://www.tutorialspoint.com
2. http://www.anderson.ucla.edu
3. https://www.smartzworld.com

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

**HARDWARE:** Intel Desktop Systems: 36 nos

**SOFTWARE:** Application software: Weka
**VII Semester: CSE**

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**Contact Classes: 45**  
**Tutorial Classes: Nil**  
**Practical Classes: Nil**  
**Total Classes: 60**

**COURSE OBJECTIVES:**
The course should enable the students to:
I. Optimize business decisions and create competitive advantage with Big data analytics
II. Understand several key big data technologies used for storage, analysis and manipulation of data.
III. Recognize the key concepts of Hadoop framework, map reduce.
IV. Demonstrate the concepts in Hadoop for application development.

**MODULE - I**  
**INTRODUCTION TO BIG DATA**  
Classes: 09

Introduction to Big data: Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, Traditional Business Intelligence (BI) versus Big Data.
Big data analytics: Classification of Analytics, Importance and challenges facing big data, Terminologies Used in Big Data Environments, The Big Data Technology Landscape.

**MODULE - II**  
**INTRODUCTION TO HADOOP**  
Classes: 09

Introducing Hadoop, RDBMS versus Hadoop, Distributed Computing Challenges, History and overview of Hadoop, Use Case of Hadoop, Hadoop Distributors, Processing Data with Hadoop, Interacting with Hadoop Ecosystem.

**MODULE - III**  
**THE HADOOP DISTRIBUTED FILESYSTEM**  
Classes: 09


**MODULE - IV**  
**UNDERSTANDING MAP REDUCE FUNDAMENTALS**  
Classes: 09

Map Reduce Framework: Exploring the features of Map Reduce, Working of Map Reduce, Exploring Map and Reduce Functions, Techniques to optimize Map Reduce jobs, Uses of Map Reduce.
Controlling MapReduce Execution with InputFormat, Reading Data with custom RecordReader, Reader, Writer, Combiner, Partitioners, Map Reduce Phases, Developing simple MapReduce Application.

**MODULE - V**  
**INTRODUCTION TO PIG and HIVE**  
Classes: 09

Introducing Pig: Pig architecture, Benefits, Installing Pig, Properties of Pig, Running Pig. Getting started with Pig Latin, Working with operators in Pig, Working with functions in Pig.
Introducing Hive: Getting started with Hive, Hive Services, Data types in Hive, Built-in functions in Hive, Hive DDL.

**Text Books:**
**Reference Books:**


**Web References:**

3. https://www.webopedia.com

**E-Text Books:**

1. https://www.books.google.co.in/books?id=rkWPojgfeM8C&printsec=frontcover&dq=HIGH+PERFORMANCE+COMPUTING.
CLOUD APPLICATION DEVELOPMENT

VII Semester: CSE

<table>
<thead>
<tr>
<th>Course Code</th>
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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 cloud computing for developing the cloud applications.
II. Understand task scheduling algorithms and virtualization.
III. Analyze the security issues in cloud environments.
IV. Gain knowledge in the broad perceptive of cloud architecture and model
V. Analyze and understand the importance of various applications of cloud computing.

MODULE -I INTRODUCTION AND CLOUD APPLICATION DEVELOPMENT Classes: 08
Introduction: Definition, Characteristics, Benefits, challenges of cloud computing, cloud models: serviceIaaS(infrastructure as service),PaaS(platform as a service),SaaS(software as a service), deployment models-public, private, hybrid, community; Types of cloud computing: Grid computing utility computing, cluster; computing Cloud services: Amazon, Google, Azure, online services, open source private clouds, SLA; Applications of cloud computing: Healthcare, energy systems, transportation, manufacturing, education, government, mobile communication, application development

MODULE -II CLOUD ARCHITECTURE, PROGRAMMING MODEL Classes: 09
Cloud Architecture, programming model: NIST reference architecture, architectural styles of cloud applications, single, multi, hybrid cloud site, redundant, non redundant, 3 tier, multi tier architectures;
Programming model: Compute and data intensive.

MODULE -III CLOUD RESOURCE VIRTUALIZATION Classes: 09
Cloud resource virtualization: Basics of virtualization, types of virtualization techniques, merits and demerits of Virtualization.

Full vs Para - virtualization, virtual machine monitor/hypervisor; Virtual machine basics, taxonomy of virtual machines, process vs system virtual machines.

MODULE -IV CLOUD RESOURCE MANAGEMENT AND SCHEDULING Classes: 10
Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, resource bundling, combinatorial , fair queuing, start time fair queuing, borrowed virtual time, cloud scheduling subject to deadlines, scheduling map reduce applications subject to deadlines, resource management and application scaling.

MODULE -V CLOUD SECURITY Classes: 09
Cloud Security: Risks, privacy and privacy impacts assessments; Multi-tenancy issues, security in VM, OS, virtualization system security issues and vulnerabilities; Virtualization system-specific attacks: Technologies for virtualization-based security enhancement, legal.
<table>
<thead>
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<th><strong>Text Books:</strong></th>
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<th><strong>Reference Books:</strong></th>
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<th><strong>Web References:</strong></th>
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<tbody>
<tr>
<td>1. <a href="https://www.oracle.com/in/cloud/application-development">https://www.oracle.com/in/cloud/application-development</a></td>
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BIG DATA AND BUSINESS ANALYTICS LABORATORY

VII Semester: CSE

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<tr>
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<td>- - 3 1.5 30 70 100</td>
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Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 36  Total Classes: 36

COURSE OBJECTIVES:
The course should enable the students to:
I. Optimize business decisions and create competitive advantage with Big data analytics
II. Practice java concepts required for developing map reduce programs.
III. Impart the architectural concepts of Hadoop and introducing map reduce paradigm.
IV. Practice programming tools PIG and HIVE in Hadoop eco system.
V. Implement best practices for Hadoop development.

Week-1 INSTALL VMWARE
Installation of VMWare to setup the Hadoop environment and its ecosystems.

Week-2 HADOOP MODES
a. Perform setting up and Installing Hadoop in its three operating modes.
i. Standalone. ii. Pseudo distributed. iii. Fully distributed.
b. Use web based tools to monitor your Hadoop setup.

Week-3 USING LINUX OPERATING SYSTEM
Implementing the basic commands of LINUX Operating System – File/Directory creation, deletion, update operations.

Week-4 FILE MANAGEMENT IN HADOOP
a. Implement the following file management tasks in Hadoop:
i. Adding files and directories ii. Retrieving files iii. Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Week-5 MAPREDUCE PROGRAM 1
Run a basic word count Map Reduce program to understand Map Reduce Paradigm.

Week-6 MAPREDUCE PROGRAM 2
Write a Map Reduce program that mines weather data. Hint: Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

Week-7 MAPREDUCE PROGRAM 3
Implement matrix multiplication with Hadoop Map Reduce.

Week-8 PIG LATIN LANGUAGE - PIG
Installation of PIG.

Week-9 PIG COMMANDS
Write Pig Latin scripts sort, group, join, project, and filter your data.

Week-10 PIG LATIN MODES, PROGRAMS
a. Run the Pig Latin Scripts to find Word Count
b. Run the Pig Latin Scripts to find a max temp for each and every year.
<table>
<thead>
<tr>
<th>Week-11</th>
<th>HIVE</th>
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<tbody>
<tr>
<td></td>
<td>Installation of HIVE.</td>
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<thead>
<tr>
<th>Week-12</th>
<th>HIVE OPERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.</td>
</tr>
</tbody>
</table>

**Reference Books:**

1. Jay Liebowitz, —Big Data And Business Analytics Laboratory, CRC Press.
Course Code | Category | Hours / Week | Credits | Maximum Marks |
---|---|---|---|---|
ACSB19 | Core | - | 3 | 1.5 |
| | | | CIA | SEE | Total |
| | | 30 | 70 | 100 |

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 45  Total Classes: 45

COURSE OBJECTIVES:
The course should enable the students to:
I. Learn to run virtual machines of different configuration.
II. Develop Big data application using Hadoop.
III. Exposed to tool kits for cloud environment.
IV. Developing web services/Applications in cloud framework.

**Week-1** VIRTUALIZATION
Install Oracle Virtual box and create two VMs on your laptop

**Week-2** VIRTUALIZATION
Install Turbo C in guest OS and execute C program.

**Week-3** VIRTUALIZATION
Test ping command to test the communication between the guest OS and Host OS.

**Week-4** HADOOP
Install Hadoop single node setup.

**Week-5** HADOOP
Develop a simple hadoop application called Word Count. It counts the number of occurrences of each word in a given input set.

**Week-6** HADOOP
Develop hadoop application to count no of characters, no of words and each character frequency.

**Week-7** HADOOP
Develop hadoop application to process given data and produce results such as finding the year of maximum usage, year of minimum usage.

**Week-8** HADOOP
Develop hadoop application to process given data and produce results such as how many female and male students in both schools the results should be in following format.

GP-F #number
GP-M
#numbers MS-F
#number
MS-M #number

**Week-9** CLOUD PROGRAMMING
Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it.

**Week-10** CLOUD PROGRAMMING
Design a protocol and use Simple Queue Service(SQS) to implement the barrier synchronization after the first phase.

**Week-11** CLOUD PROGRAMMING
Use the Zookeeper to implement the coordination model in Problem 10.
<table>
<thead>
<tr>
<th>Week-12</th>
<th>CLOUD PROGRAMMING</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Develop a Hello World application using Google App Engine.</td>
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</table>

<table>
<thead>
<tr>
<th>Week-13</th>
<th>CLOUD PROGRAMMING</th>
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<tbody>
<tr>
<td></td>
<td>Develop a Guestbook Application using Google App Engine.</td>
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</table>

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<tr>
<th>Week-14</th>
<th>WINDOWS AZURE</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Develop a Windows Azure Hello World application using.</td>
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<table>
<thead>
<tr>
<th>Week-15</th>
<th>PIPES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Create a Mashup using Yahoo! Pipes.</td>
</tr>
</tbody>
</table>

**Reference Books:**


**Web References:**

3. [https://aws.amazon.com/](https://aws.amazon.com/)  
5. [https://cloud.google.com/appengine/docs/java/gettingstarted/creating-guestbook](https://cloud.google.com/appengine/docs/java/gettingstarted/creating-guestbook)  
6. [https://www.google.co.in/?gfe_rd=cr&ei=SZIJWOOnplqbufgTQjDwAw&gws_rd=ssl#q=yahoo+pipes+mashup+tutorial](https://www.google.co.in/?gfe_rd=cr&ei=SZIJWOOnplqbufgTQjDwAw&gws_rd=ssl#q=yahoo+pipes+mashup+tutorial)

**Course Home Page:**

**SOFTWARE AND HARDWARE REQUIREMENTS FOR 36 STUDENTS:**

**HARDWARE:** Desktop systems: 36 nos.

**SOFTWARE:** Globus Toolkit or equivalent Eucalyptus or Open Nebula.
PROJECT WORK - I

VII Semester: Common for all branches

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
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<td>- - 10 5 30 70 100</td>
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</table>

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 150  Total Classes: 150

The object of Project Work I is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis / Modelling / Simulation/Experiment/Design/Feasibility;
4. Preparing a Written Report on the Study conducted for presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental committee.

PROJECT WORK - II

VIII Semester: Common for all branches

<table>
<thead>
<tr>
<th>Course Code</th>
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<td>0 0 12 6 30 70 100</td>
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</table>

Contact Classes: Nil  Tutorial Classes: Nil  Practical Classes: 180  Total Classes: 180

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under EEP1;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis / Modelling / Simulation / Design / Problem Solving / Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar Presentation before a Departmental Committee.
ADVANCED ALGORITHMS

PE – I: CSE / IT

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<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
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</table>

Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Learn adequate knowledge with the most Amortized analysis techniques.
II. Be exposed to the number theoretic algorithms – RSA, FFT.
III. Learn adequate knowledge with DFT, FFT, Graph algorithms.
IV. Understand the Geometric data structures
V. Understand the Geometric functions.

MODULE-I  ANALYSIS TECHNIQUES  Classes: 10
Growth functions, Recurrences and solution of recurrence equations; Amortized analysis: Aggregate, Accounting, and Potential methods, String Matching Algorithms: Naive Algorithm; Robin-Karp Algorithm, String matching with Finite Automata, Knuth-Morris-Pratt and Boyer-Moore Algorithms

MODULE-II  NUMBER THEORETIC ALGORITHMS  Classes: 10
Elementary notions, GCD, Modular arithmetic, Solving modular linear equations, The Chinese remainder theorem, Powers of an element RSA Cryptosystem, Primality testing, Integer factorization, - Huffman Codes, Polynomials. FFT-Huffman codes: Concepts, construction, Proof correctness of Huffman's algorithm; Representation of polynomials

MODULE-III  DFT and FFT  Classes: 09
Efficient implementation of FFT, Graph Algorithms, Bellman-Ford Algorithm Shortest paths in a DAG.

Johnson’s Algorithm for sparse graphs, Flow networks and the Ford-Fulkerson Algorithm, Maximum bipartite matching

MODULE-IV  COMPUTATIONAL GEOMETRY-I  Classes: 08
Geometric data structures using C, Vectors, Points, Polygons, Edges Geometric objects in space; Finding the intersection of a line and a triangle, Finding star-shaped polygons using incremental insertion

MODULE-V  COMPUTATIONAL GEOMETRY-II  Classes: 08
Generating functions Clipping: Cyrus-Beck and Sutherland-Hodman Algorithms; Triangulati, monotonic polygons; Convex hulls, Gift wrapping and Graham Scan; Removing hidden surfaces.
### Text Books:


### Reference Books:


### Web References:

1. [http://cs.lth.se/edan55/](http://cs.lth.se/edan55/)
INFORMATION THEORY

PE – I: CSE / IT

<table>
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<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Acquire knowledge about information and entropy.
II. Understand Hamming weight, minimum distance decoding and different types of codes. Be exposed to the number theoretic algorithms – RSA, FFT.
III. Learn adequate knowledge about convolution coding, sequential search and Viterbi algorithm.
IV. Understand text compression techniques
V. Understand the image compression, graphics interchange format, JPEG and MPEG standards.

MODULE-I  CODING FOR RELIABLE DIGITAL TRANSMISSION AND STORAGE  Classes: 10

MODULE-II  LINEAR BLOCK CODES  Classes: 10
Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system.

MODULE-III  CYCLIC CODES  Classes: 09
Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection.
Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

MODULE-IV  CONVOLUTIONAL CODES  Classes: 08
Convolutional Codes : Encoding of Convolutional Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding. Applications of Convolutional codes in ARQ system.

MODULE-V  BCH CODES  Classes: 08
BCH Codes: Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction.

Text Books:

**Reference Books:**


**Web References:**

1. https://nptel.ac.in/courses/117101053/
# FUNDAMENTALS OF OPTIMIZATION TECHNIQUES

## PE – I: CSE / IT

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<th>Course Code</th>
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</table>

| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | Total Classes: 45 |

**OBJECTIVES:**

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

I. Learn fundamentals of linear programming through optimization.

II. Understand and apply optimization techniques to industrial applications.

III. Apply the dynamic programming and quadratic approximation to electrical and electronic problems and applications.

## MODULE-I  
**LINEAR PROGRAMMING**  
Classes: 09

Definition, characteristics and phases, types of models, operations research models, applications, linear programming problem formulation, graphical solution, simplex method; Artificial variables techniques: Two-phase method, Big-M method.

## MODULE-II  
**TRANSPORTATION AND ASSIGNMENT PROBLEMS**  
Classes: 09


## MODULE-III  
**SEQUENCING AND THEORY OF GAMES**  
Classes: 09

Sequencing: Introduction, flow-shop sequencing, n jobs through two machines, n jobs through three machines, job shop sequencing, two jobs through m machines.

Theory of games: Introduction, terminology, solution of games with saddle points and without saddle points, 2 x 2 games, dominance principle, m x 2 and 2 x n games, graphical method.

## MODULE-IV  
**DYNAMIC PROGRAMMING**  
Classes: 09

Introduction: Terminology, Bellman’s principle of optimality, applications of dynamic programming shortest path problem, linear programming problem.

## MODULE-V  
**QUADRATIC APPROXIMATION**  
Classes: 09


**Text Books:**

**Reference Books:**


**Web References:**

1. http://www2.informs.org/Resources/

**E-Text Books:**

MACHINE LEARNING

PE – I: CSE / IT

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
<th>Credits</th>
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</table>

Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Define machine learning and problems relevant to machine learning.
II. Differentiate supervised, unsupervised and reinforcement learning
III. Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in machine learning.
IV. Perform statistical analysis of machine learning techniques.

MODULE-I  TYPES OF MACHINE LEARNING


MODULE-II  DECISION TREE LEARNING

Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

MODULE-III  ARTIFICIAL NEURAL NETWORKS

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Back propagation algorithm.

MODULE-IV  BAYESIAN LEARNING

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm

MODULE-V  INSTANCE BASED AND REINFORCEMENT LEARNING


Textbooks:
<table>
<thead>
<tr>
<th><strong>Reference Books:</strong></th>
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</table>

<table>
<thead>
<tr>
<th><strong>Web References:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <a href="Http://www.udemy.com/MachineLearning/Online_Course">Http://www.udemy.com/MachineLearning/Online_Course</a></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>E-Text Books:</strong></th>
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</table>
**ADVANCED COMPUTER ARCHITECTURE**

**PE – II: CSE / IT**

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<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
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<th>Maximum Marks</th>
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</table>

Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

**OBJECTIVES:**

The course should enable the students to:

I. Understand the concept of micro-architectural design of processors.
II. Analyze performance improvement and power savings in current processors.
III. Study the different multiprocessor architectures and related issues.
IV. Improve the knowledge on performance issues of memory and I/O systems.

**MODULE – I  FUNDAMENTALS OF COMPUTER DESIGN**  Classes: 08

Fundamentals of computer design: Defining computer architecture, trends in technology, power in integrated circuits and cost, measuring and reporting performance, quantitative principles of computer design; Instruction set principles: Classifying ISA, design issues.

**MODULE-II  INSTRUCTION -LEVEL PARALLELISM**  Classes: 09

ILP concepts: Pipelining overview, compiler techniques for exposing ILP; Dynamic branch prediction; Dynamic scheduling; Multiple instructions issue; Hardware based speculation; Static scheduling; Limitations of ILP; Case studies of contemporary microprocessors.

**MODULE-III  DATA-LEVEL PARALLELISM**  Classes: 09

ILP software approach: Compiler techniques, static branch protection, VLIW approach, hardware support for more ILP at compile time, hardware verses software solutions.

Multi vector and SIMD computers: Vector processing principles, multi vector multiprocessors, compound vector processing, SIMD computer organizations, the connection machine CM-5; Loop level parallelism.

**MODULE-IV  MEMORY AND I/O**  Classes: 09

Introduction; cache performance: Reducing cache miss penalty and miss rate, Reducing hit time, Main memory and performance, Memory technology; Types of storage devices: Buses, RAID, Reliability, availability and dependability; Virtual memory; I/O performance measures: Designing an I/O system.

**MODULE-V  MULTIPROCESSORS AND THREAD -LEVEL PARALLELISM**  Classes: 10

Introduction; Symmetric shared-memory architectures; Performance of Symmetric shared-memory architectures; Distributed shared memory and directory-based coherence; Basics of synchronization; Models of memory consistency; Multithreading

**Text Books:**

### Reference Books:


### Web References:


### E-Text Books:

## DISTRIBUTED OPERATING SYSTEM

### PE – II: CSE / IT

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<th>Course Code</th>
<th>Category</th>
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<th>Credits</th>
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<td>3 - - 3 30 70 100</td>
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</table>

**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 resource sharing, multitasking, multiprocessing in distributed environment.

II. Explore on various internals of operating system.

III. Describe contrast and compare differing structures for operating systems.

IV. Understand and analyze theory and implementation of processes, resource control, physical and virtual memory, scheduling, I/O and files.

### MODULE-I  
**INTRODUCTION**  

**Classes: 09**

Introduction: Introduction to distributed System, goals of distributed system, hardware and software concepts, design issues; Communication in distributed system: Layered protocols, ATM networks, client – server model, remote procedure calls and group communication; Middleware and Distributed Operating Systems.

### MODULE-II  
**MUTUAL EXCLUSION AND DEADLOCK IN DISTRIBUTED SYSTEMS**  

**Classes: 09**

Synchronization in Distributed System: Clock synchronization, mutual exclusion, election algorithm, the bully algorithm, ring algorithm, atomic transactions, deadlock in distributed systems, distributed deadlock prevention, distributed deadlock detection.

### MODULE-III  
**PROCESSES AND PROCESSORS**  

**Classes: 09**

Processes and Processors in distributed systems: Threads, System models, Processors Allocation, Scheduling in Distributed System; Real Time Distributed Systems.

Distributed file system design, distributed file system implementation, trends in distributed file systems.

### MODULE-IV  
**DISTRIBUTED SHARED MEMORY**  

**Classes: 09**

Distributed shared memory: what is shared memory, consistency models, page based distributed shared memory, shared variables and distributed shared memory.

### MODULE-V  
**MACH**  

**Classes: 09**

Case study MACH: Introduction to MACH, process management in MACH, communication in MACH, UNIX emulation in MACH.

### Text Books:


**Reference Books:**


**Web References:**

1. https://www.youtube.com/watch?v=sK9MC5GREXg
2. http://nptel.ac.in/syllabus/106106107/

**E-Text Books:**

# INTERNET OF THINGS

## PE – II: CSE / IT

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<th>Course Code</th>
<th>Category</th>
<th>Hours / Week</th>
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</table>

Contact Classes: 45  
Tutorial Classes: Nil  
Practical Classes: Nil  
Total Classes: 45

## 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.

## MODULE-I  
**INTRODUCTION TO INTERNET OF THINGS (IOT)**

Classes: 08

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT enabling technologies, IoT levels and deployment, domain specific IotTs.

## MODULE-II  
**IOT AND M2M**

Classes: 10

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.

## MODULE-III  
**IOT ARCHITECTURE AND TOOLS**

Classes: 10


IoT Reference model-IoT ecosystem and Business models- Introduction to Protocols of IoT: D2D, D2S, S2S, Introduction to simulation tools.

## MODULE-IV  
**IOT PHYSICAL DEVICES AND ENDPOINTS**

Classes: 08

Introduction to Raspberry Pi interfaces (Serial, SPI, I2C), programming Raspberry PI with Python, other IoT devices.

## MODULE-V  
**IOT PHYSICAL SERVERS AND CLOUD OFFERINGS**

Classes: 09

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:

## Reference Books:

## Web References:

**E-Text Books:**

ADVANCED OPERATING SYSTEM

KEY DETAILS:

**Course Code**: AITB21
**Category**: Elective
**Hours / Week**:
- L: 3
- T: -
- P: -
- C: 3
**Credits**: 3
**Maximum Marks**:
- CIA: 30
- SEE: 70
- Total: 100
**Contact Classes**: 45
**Tutorial Classes**: Nil
**Practical Classes**: Nil
**Total Classes**: 45

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

I. Understand the fundamentals of operating systems.
II. Gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols.
III. Gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols.
IV. Know the components and management aspects of real time, mobile operating systems.

**MODULE-I PROCESS SYNCHRONIZATION**
Classes: 10
Overview: Introduction why advanced operating systems, synchronization mechanisms; Processes and threads: Process scheduling; Deadlocks: Detection, prevention and recovery; Models of resources; Memory management techniques.

**MODULE-II DISTRIBUTED OPERATING SYSTEMS**
Classes: 10
Introduction, issues in distributed operating system; Architecture; Communication networks; Communication primitives: message passing mode, remote procedure calls, design issues in RPC;

**MODULE-III DISTRIBUTED RESOURCE MANAGEMENT**
Classes: 09
Distributed file systems; Design issues; Distributed shared memory algorithms for implementing distributed shared memory; Issues in load distributing.
Scheduling algorithms; Synchronous and asynchronous check pointing and recovery; Fault tolerance, two phase commit protocol, non blocking commit protocol; Security and protection.

**MODULE-IV REALTIME AND MOBILE OPERATING SYSTEMS**
Classes: 08
Basic model of real time systems: Characteristics, applications of real time systems; Real time task scheduling; Handling resource sharing; Mobile operating systems: Micro kernel design; Client server resource access; Processes and threads; Memory management.

**MODULE-V CASE STUDIES**
Classes: 08
Linux system: Design principles; Kernel modules; Process management scheduling; Memory management; Input output management; File system; Interprocess communication; IoS and android: Architecture and sdk framework; Media layer, services layer, core oslayer

**Text Books:**
**Reference Books:**


**Web References:**

2. lib.ewubd.edu/vufind/Record/3488/TOC.

**E-Text Books:**

1. https://groups.google.com/d/msg/me-cse-2013-batch/.../q_R5aHACK3kJ.

**MOOC Course**

# INFORMATION SECURITY

## PE – III: CSE / IT

<table>
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<th>Category</th>
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**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.

## MODULE-I  
**ATTACKS ON COMPUTERS AND COMPUTER SECURITY**  
**Classes: 08**

Attacks on computers and computer security: Introduction, the need for security, security approaches, principles of security, types of security attacks, security services, security mechanism, a model for network security; Cryptography concepts and techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

## MODULE-II  
**SYMMETRIC KEY CIPHERS**  
**Classes: 10**

Symmetric key ciphers: Block cipher principles and algorithms (DES, AES, Blowfish), differential and linear cryptanalysis, block cipher modes of operation, stream ciphers, RC4 location, and placement of encryption function, key distribution; Asymmetric key ciphers: Principles of public key cryptosystems, algorithms (RSA, Diffie-Hellman, ECC) key distribution.

## MODULE-III  
**MESSAGE AUTHENTICATION ALGORITHM AND HASH FUNCTIONS**  
**Classes: 08**

Message authentication algorithm and hash functions: Authentication requirements, functions, message, authentication codes, hash functions, secure hash algorithm, whirlpool, HMAC, CMAC, digital signatures, knapsack algorithm.

Authentication application: Kerberos, X.509 authentication service, public – key infrastructure, biometric authentication.

## MODULE-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.

## MODULE-V  
**WEB SECURITY**  
**Classes: 09**

Web security: Web security considerations, secure socket layer and transport layer security, secure electronic transaction intruders; Virus and firewalls: Intruders, intrusion detection password management, virus and related threats, countermeasures, firewall design principles; Types of firewalls Case Studies on Cryptography and security: Secure inter-branch payment transactions, cross site scripting vulnerability, virtual electronics.
## Text Books:


## Reference Books:


## Web References:

2. [https://books.google.co.in/books/about/Cryptography_Network_Security_Sie_2E.html?id=Kokjwdf0E7QC](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](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](https://books.google.co.in/books/about/Information_Security.html)

## Course Home Page:
HIGH SPEED NETWORKS

PE – III: CSE / IT

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand the basis of ATM and Frame Relay concepts.
II. Explore the concept of queuing analysis, behind traffic management and congestion control.
III. Knowledge on TCP flow and congestion control in ATM.
I. Study on different levels of quality of service (QOS) to different applications

MODULE-I  HIGH SPEED NETWORKS  Classes: 08
Frame relay networks, asynchronous transfer mode, ATM protocol architecture, ATM logical connection, ATM cell, ATM service categories, AAL; High speed LANs: Fast ethernet, gigabit ethernet, fiber channel; wireless LANs: Applications, requirements, architecture of 802.11.

MODULE-II  CONGESTION TRAFFIC MANAGEMENT  Classes: 10
Queuing analysis, queuing models, single server queues, effects of congestion, congestion control, traffic management, congestion control in packet switching networks, frame relay congestion control.

MODULE-III  TCP AND ATM CONGESTION CONTROL  Classes: 08
TCP flow control, TCP congestion control, retransmission, timer management, exponential RTO back off KARN’s Algorithm, window management, performance of TCP over ATM.
Traffic and congestion control in ATM: Requirements attributes, traffic management frame work, traffic control, ABR traffic management, ABR rate control, RM cell formats, ABR Capacity allocations, GFR traffic management.

MODULE-IV  INTEGRATED AND DIFFERENTIAL SERVICES  Classes: 10
Integrated services architecture: Approach, components, services, queuing discipline, FQ, PS, BRFQ, GPS, WFQ, random early detection, differentiated services.

MODULE-V  PROTOCOLS FOR QOS SUPPORT  Classes: 09
RSVP: Goals & characteristics, data flow, RSVP operations, protocol mechanisms, multiprotocol label switching, operations, label stacking, protocol details, RTP, protocol architecture, data transfer protocol, RTCP.

Text Books:
**Reference Books:**


**Web References:**

1. www.iospress.nl/journal/journal-of-high-speed-networks/
2. http://whatis.techtarget.com/glossary/High-Speed-Networks

**E-Text Books:**

1. https://books.google.co.in/books/about/High_speed_networks_and_internets.html?id
2. www.amazon.in/High-Speed-Networks-Internets-2e-STALLINGS/dp/817758569X
# MOBILE COMPUTING

## PE – III: CSE / IT

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Contact Classes: 45  
Tutorial Classes: Nil  
Practical Classes: Nil  
Total Classes: 45

## OBJECTIVES:
The course should enable the students to:

I. Understand the concept of wireless transmission Protocols.
II. Learn the typical mobile networking infrastructure through a popular GSM protocol Architecture.
III. Illustrate the various layers of mobile networks for location management.
IV. Estimate the database issues in mobile environments and data delivery models.
V. Learn the platforms and protocols used in mobile environment.

## MODULE-I  INTRODUCTION  Classes: 08

Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices. GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

## MODULE-II  MEDIA ACCESS LAYER AND MOBILE NETWORK LAYER  Classes: 10

Motivation for a specialized MAC (Hidden and exposed terminals. Near and far terminals), SDMA, FDMA, TDMA, CDMA, wireless LAN (IEEE802.11) system and protocol architecture. Mobile network layer: Packet delivery and handover management, location management, registration, tunneling and encapsulation, route optimization, DHCP.

## MODULE-III  MOBILE TRANSPORT LAYER  Classes: 08

Conventional TCP/IP protocols, indirect TCP, snooping TCP, mobile TCP, other transport layers protocols for mobile networks;

Database issues: Database hoarding & caching techniques, C-S computing and adaptation, transactional models, query processing, data recovery process and QoS issues.

## MODULE-IV  DATA DISSEMINATION AND SYNCHRONIZATION  Classes: 10

Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods.

## MODULE-V  MOBILE ADHOC NETWORKS(MANET’S)  Classes: 09

Introduction, applications and challenges of a MANET, routing, classification of routing algorithms, algorithms such as DSR, AODV, DSDV; Mobile Agents, Service Discovery.

## Text Books:
### Reference Books:


### Web References:


### E-Text Books:

1. https://books.google.co.in/books?id=HoFdSmH77wsC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q=false
2. https://books.google.co.in/books?id=LSqPLwEACAAJ&source=gbs_book_other_versions
## CYBER SECURITY

### Course Details

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

### OBJECTIVES:
The course should enable the students to:
I. Understand the core information assurance principles in n-tier web applications.
II. Identify the key components of cyber security network architecture.
III. Study on digital certificates, signatures and digital forensics for cyber crime investigation.
IV. Determine the elements of web hacking, cyber crime investigation process and tools.

### MODULE-I  INTRODUCTION

Classes: 08

A web security forensic lesson, web languages, introduction to different web attacks, overview of n-tier web applications; Web servers: Apache, IIS, database servers.

### MODULE-II  REVIEW OF COMPUTER SECURITY AND CYBER CRIMES ISSUES

Classes: 10

Public key cryptography, RSA, online shopping, payment gateways, unauthorized access to computers, computer intrusions, white collar crimes, viruses and malicious code, internet hacking and cracking, virus attacks, pornography, software piracy, intellectual property, mail bombs, exploitation, stalking and obscenity in internet, digital laws and legislation, law enforcement roles and responses.

### MODULE-III  WEB HACKING BASICS AND INVESTIGATION

Classes: 08

Web hacking basics HTTP and HTTPS URL, web under the cover overview of java security reading the HTML source, applet security, servlets security, symmetric and asymmetric encryptions, network security basics, firewalls and IDS.


### MODULE-IV  DIGITAL CERTIFICATES AND DIGITAL FORENSICS

Classes: 10

Digital certificates, hashing, message digest, and digital signatures; Digital forensics: Introduction to digital forensics, forensic software and hardware, analysis and advanced tools, forensic technology and practices.

### MODULE-V  SECURING DATABASES, LAWS AND ACTS

Classes: 09

Basics, secure JDBC, securing large applications, cyber graffiti; Laws and acts: Laws and ethics, digital evidence controls, evidence handling procedures; Basics of Indian Evidence Act IPC and CRPC: Electronic communication privacy act, legal policies.

### Text Books:
**Reference Books:**


**Web References:**


**E-Text Books:**

2. https://www.coursera.org/specializations/cyber-security
**ADVANCED DATABASES**

**PE – IV: CSE / IT**

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

**OBJECTIVES:**

The course should enable the students to:

I. Define entity relationship model and transaction processing system.
II. Understand various storage structures for database.
III. Describe the distributed and parallel database processing.
IV. Describe object oriented database concepts and models.
V. Understand various advancements in database technology.

**MODULE-I**

**ACTIVE DATABASES**

Syntax and Semantics (Starburst, Oracle, DB2): Taxonomy, applications, integrity management, workflow management, business rules, design principles, properties, rule modularization, rule debugging, IDEA methodology, open problems. Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications Design Principles for Active Rules

**MODULE-II**

**TEMPORAL AND OBJECT DATABASES**

Overview: Time domain, data types, associating facts with time, temporal query language; Transact-SQL (T-SQL): Time ontology, data model, language constructs; Implementation: System architecture, temporal support, support for TSQL2.

**MODULE-III**

**COMPLEX QUERIES AND REASONING**

Logic of Query Languages: Relational calculi, relational algebra, recursive rules, syntax and semantics of data log, fix point semantics.

Implementation Rules and Recursion: Rule rewriting methods, compilation and optimization, recursive queries in SQL, open issues.

**MODULE-IV**

**SPATIAL, TEXT AND MULTIMEDIA DATABASES**

Traditional Indexing Methods: Secondary keys, spatial access methods, text retrieval; Multimedia indexing: 1D time series, 2D color images, sub pattern matching.

**MODULE-V**

**UNCERTAINTY IN DATABASES AND KNOWLEDGE BASES**

Introduction: Uncertainty in image database, uncertainty in temporal database, uncertainty in null value; Models of uncertainty; Uncertainty in relational databases: Lattice based relational databases, probabilistic relational databases.

**Text Books:**

**Reference Books:**


**Web References:**

1. web.cs.wpi.edu/~cs561/s12/Lectures/activeDB/ActiveDB.pdf
2. www.cs.bu.edu/fac/gkollios/ada05/LectNotes/lect13-05.ppt
3. web.cs.ucla.edu/classes/cs240a/winter98/notes/node3.html
4. user.it.uu.se/~torer/kurser/mbd/2007/TermPapers/ErikZeitler.pdf
5. booksite.elsevier.com/9781558604438/slides/zanitem5.htm

**E-Text Books:**


**MOOC Course:**

# DATABASE SECURITY

**PE – IV: CSE / IT**

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**Contact Classes: 45**  **Tutorial Classes: Nil**  **Practical Classes: Nil**  **Total Classes: 45**

**OBJECTIVES:**

The course should enable the students to:

I. Understand the fundamentals of security related to database system.
II. Identify the security mechanisms to solve the problems.
III. Learn the essentials of secure software design.
IV. Understand various types of attacks and intruder detection system.
V. Identify the secure database model for new generations.

**MODULE-I**  **INTRODUCTION AND SECURITY MODEL-I**  **Classes: 10**

Introduction to databases security problems in databases security controls conclusions; Security models: Introduction access matrix model; Take-grant model; Acten model; PN model; Hartson and Hsiao's Model; Fernandez's model Bussolati and Martella's model for distributed databases.

**MODULE-II**  **SECURITY MODEL-II AND SECURITY MECHANISMS**  **Classes: 09**

Security models 2: Bell and LaPadula's model; Bib’s model; Dion's model; Sea view model; Jajodia and Sandhu's model; The lattice model for the flow control conclusion; Security mechanisms: User identification/authentication; Memory protection; Resource protection; Control flow mechanisms isolation security functionalities in some operating systems; Trusted computer system evaluation criteria.

**MODULE-III**  **SECURITY SOFTWARE DESIGN**  **Classes: 08**

Introduction: A methodological approach to security software design; Secure operating system.

Design secure DBMS; Design security packages database security design.

**MODULE-IV**  **STATISTICAL DATABASE PROTECTION AND INTRUSION DETECTION SYSTEMS**  **Classes: 09**

Discovery introduction statistics concepts and definitions; Types of attacks; Inference controls evaluation criteria for control comparison; Introduction IDES system; RETISS system; ASES system.

**MODULE-V**  **MODELS FOR THE PROTECTION OF NEW GENERATION DATABASE SYSTEMS-1&DATABASE SYSTEMS-2**  **Classes: 08**


**Text Books:**

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<td>2. <a href="https://docs.oracle.com/cd/B19306_01/network.102/b14266/apdvntr.htm#DBSEG12000">https://docs.oracle.com/cd/B19306_01/network.102/b14266/apdvntr.htm#DBSEG12000</a></td>
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<td>3. <a href="http://www.cse.msu.edu">http://www.cse.msu.edu</a></td>
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<td>4. <a href="http://cms.gcg11.ac.in/">http://cms.gcg11.ac.in/</a></td>
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<tr>
<td>4. <a href="https://www.datasunrise.com/download/">https://www.datasunrise.com/download/</a></td>
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<td>5. <a href="https://www.coursera.org/learn/information-security-data">https://www.coursera.org/learn/information-security-data</a></td>
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DISTRIBUTED DATABASES

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand the fundamental principles and architecture of distributed database systems.
II. Familiar with the different methods and techniques distributed query processing.
III. Develop the understanding of choosing the optimized query execution plan for distributed queries.
IV. Able to design a multi-database systems and can resolve problems of heterogeneous multi-database systems in database integration strategies.

MODULE-I  OVERVIEW AND PRINCIPLES OF DISTRIBUTED DATABASES  Classes: 10
Features of distributed versus centralized databases; Levels of distribution transparency: Reference architecture for distributed databases, types of data fragmentation; Distributed transparency: Read only application, update application; Distributed database access primitives; Integrity constraints in distributed databases.

MODULE-II  GLOBAL QUERIES TO FRAGMENT QUERIES  Classes: 10
Translation of global queries to fragment queries: Equivalence transformations for queries, transforming global queries into fragment queries, distributed grouping and aggregate function evaluation, parametric queries.

MODULE-III  OPTIMIZATION OF ACCESS STRATEGIES  Classes: 09
Optimization of access strategies: A framework for query optimization, join queries, general queries.
The management of distributed transactions: A framework for transaction management, supporting atomicity of distributed transactions, concurrency control for distributed transactions, architectural aspects of distributed transactions.

MODULE-IV  CONCURRENcy CONTROL  Classes: 08
Concurrency control: Foundation of distributed concurrency control, distributed deadlocks, and concurrency control based on timestamps, optimistic methods for distributed concurrency control.

MODULE-V  DISTRIBUTED DATABASE ADMINISTRATION  Classes: 08
Reliability: Basic concepts, non-blocking commitment protocols, reliability and concurrency control, determining a consistent view of the network, detection and resolution of inconsistency, checkpoints and cold restart; Distributed database administration: Catalog management in distributed databases, authorization and protection.
### Text Book:


### Reference Books:


### Web References:

1. www.cs.sjsu.edu/faculty/pollett/masters/Semesters/Fall06/Preethi/ddbms1.ppt

### E-Text Books:


### MOOC Course

3. https://www.coursera.org/learn/distributed-database
DESIGN PATTERNS

PC – IV: CSE / IT

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
1. Understand the principles of design pattern.
2. Understand the design patterns that are common in software applications.
3. Analyze and understand how these patterns are related to object-oriented design.
4. Identify appropriate design patterns for various problems.
5. Refactor poorly designed program by using appropriate design patterns.

MODULE-I  INTRODUCTION  Classes: 10
What is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design patterns, Organizing the Catalog, How Design patterns solve Design problems, How to select a Design Pattern, How to use a Design Pattern.

MODULE-II  CASE STUDY  Classes: 10
A Case Study: Designing a Document Editor, Design Problems, Document Structure, Formatting Embellishing the User Interface, Supporting Multiple Look and Feel Standards, Supporting Multiple Window systems, User Operations Spelling Checking and Hyphenation, Summary.

MODULE-III  CREATIONAL PATTERNS  Classes: 09
Abstract Factory, Builder, Factory Method,
Prototype, Singleton, Discussion of Creational Patterns.

MODULE-IV  STRUCTURAL PATTERNS  Classes: 08
Structural Patterns: Adaptor, Bridge, and Composite, Decorator, Facade, flyweight, proxy.

MODULE-V  BEHAVIOR PATTERNS  Classes: 08
Behavior Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, strategy, Template Method, Visitor, Discussion of Behavioral Patterns. Conclusion: What to Expect from Design Patterns, The Pattern Community.

Text Book:

Reference Books:
SOFTWARE ENGINEERING

PE – V: CSE / IT

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:

I. Learn how to elicitate requirements and develop software life cycles.
II. Understand the design considerations for enterprise integration and deployment.
III. Analyze quality assurance techniques and testing methodologies.
IV. Prepare a project plan for a software project that includes estimates of size and effort, a schedule, resource allocation, configuration control, and project risk.

MODULE-I  SOFTWARE PROCESS AND PROJECT MANAGEMENT  Classes: 08
Introduction to software engineering, software process, perspective and specialized process models; Software project management: Estimation: LOC and FP based estimation, COCOMO model; Project scheduling: Scheduling, earned value analysis, risk management

MODULE-II  REQUIREMENTS ANALYSIS AND SPECIFICATION  Classes: 09
Software requirements: Functional and nonfunctional, user requirements, system requirements, software requirements document; Requirement engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management; Classical analysis: Structured system analysis, petri nets, data dictionary.

MODULE-III  SOFTWARE DESIGN  Classes: 09
Design process: Design concepts, design mode, design heuristic, architectural design architectural styles, architectural design, and architectural mapping using data flow.
User interface design: Interface analysis, interface design; Component level design: Designing class based components, traditional components.

MODULE-IV  TESTING AND IMPLEMENTATION  Classes: 10
Software testing fundamentals: Internal and external views of testing, white box testing, basis path testing, control structure testing, black box testing, regression testing, MODULE testing, integration testing, validation testing, system testing and debugging; Software implementation techniques: Coding practices, refactoring.

MODULE-V  PROJECT MANAGEMENT  Classes: 09
Estimation: FP based, LOC based, make/buy decision; COCOMO II: Planning, project plan, planning process, RFP risk management, identification, projection; RMMM: Scheduling and tracking, relationship between people and effort, task set and network, scheduling; EVA: Process and project metrics.
### Text Books:

### Reference Books:

### Web References:

### E-Text Books:
SOFTWARE TESTING METHODOLOGY

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

I. Understand the concept of software testing objectives, process criteria, strategies and methods.
II. Demonstrate various software testing issues and solutions in software like MODULE test, integration, regression and system testing.
III. Demonstrate the techniques and skills on how to use modern software testing tools to support software testing projects.
IV. Understand important concepts of complexity metrics and object oriented metrics.

**MODULE-I**
**INTRODUCTION TO TESTING**

Classes: 10

Introduction: Purpose of testing, dichotomies, model for testing, consequences of bugs, taxonomy of bugs. Flow graphs and path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

**MODULE-II**
**TRANSACTION FLOW TESTING**

Classes: 08

Transaction flow testing: Transaction flows, transaction flow testing techniques, dataflow testing, basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

**MODULE-III**
**LEVELS OF TESTING**

Classes: 09

Domain testing: Domains and paths, nice and ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

Logic based testing: Overview, decision tables, path expressions, kv charts, and specifications.

**MODULE-IV**
**PATH PRODUCTS**

Classes: 08

Paths, path products and regular expressions: Path products and path expression, reduction procedure, applications, regular expressions and flow anomaly detection.

**MODULE-V**
**TRANSITION TESTING**

Classes: 10

State, state graphs and transition testing: State graphs, good and bad state graphs, state testing, testability tips.

**Text Book:**

**Reference Books:**
### Web References:

### E-Text Books:
4. https://onlinecourses.nptel.ac.in/noc16_cs16/preview

### MOOC Course
2. https://www.uteest.com/search-result/tag/Test%20Cycles
3. https://www.edureka.co/software-testing
SOFTWARE PROCESS AND PROJECT MANAGEMENT

PE – V: CSE / IT

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</tbody>
</table>

Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand overall software development life cycle and adopt suitable processes.
II. Analyze, prioritize, and manage both functional and quality requirements.
III. Estimate efforts required, plan, and track the plans.
IV. Understand and apply configuration and quality management techniques.

MODULE-I  DEVELOPMENT LIFE CYCLE PROCESSES  Classes: 10
Overview of Software Development Life Cycle, introduction to processes, Personal Software Process(PSP), Team Software Process(TSP), unified processes, agile processes, choosing the right process.

MODULE-II  REQUIREMENTS MANAGEMENT  Classes: 10
Functional requirements and quality attributes, elicitation techniques, Quality Attribute Workshop (QAW), analysis, prioritization, and trade off, Architecture Centric Development Method (ACDM), requirements, documentation, and specification, change management, traceability of requirements.

MODULE-III  ESTIMATION, PLANNING, AND TRACKING  Classes: 09
Identifying and prioritizing risks, risk mitigation plans, estimation techniques, use case points, function points, COCOMO II, top down estimation, bottom up estimation.
Work break down structure, macro and micro plans, planning poker, wideband Delphi, documenting the plan, tracking the plan, Earned Value Method (EVM).

MODULE-IV  CONFIGURATION AND QUALITY MANAGEMENT  Classes: 08
Identifying artifacts to be configured, naming conventions and version control, configuration control, quality assurance techniques, peer reviews, Fagan inspection, MODULE, registration, system, and acceptance testing, test data and test cases, bug tracking, casual analysis.

MODULE-V  SOFTWARE PROCESS DEFINITION AND MANAGEMENT  Classes: 08
Process elements, process architecture, relationship between elements, process modeling, process definition techniques, ETVX (Entry-Task-Validation-exit), process baselining, process assessment and improvement, CMMI, six sigma.

Text Books:
**Reference Books:**


**Web References:**

1. [http://www.cs.ox.ac.uk/people/michael.wooldridge/teaching/soft-eng/lect05.pdf](http://www.cs.ox.ac.uk/people/michael.wooldridge/teaching/soft-eng/lect05.pdf)

**E-Text Books:**

1. [https://cs.uwaterloo.ca/~apidduck/se362/Lectures/1intro.pdf](https://cs.uwaterloo.ca/~apidduck/se362/Lectures/1intro.pdf)
2. [http://www.londoninternational.ac.uk/sites/default/files/computing-samples/co3353_ch1-3.pdf](http://www.londoninternational.ac.uk/sites/default/files/computing-samples/co3353_ch1-3.pdf)

**MOOC Course**

2. [https://www.coursera.org/specializations/project-management](https://www.coursera.org/specializations/project-management)
3. [https://www.coursera.org/learn/reviews-and-metrics-for-software-improvements](https://www.coursera.org/learn/reviews-and-metrics-for-software-improvements)
4. [https://www.coursera.org/learn/process-improvement](https://www.coursera.org/learn/process-improvement)
### SOFTWARE QUALITY MANAGEMENT

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<thead>
<tr>
<th>Course Code</th>
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</table>

Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

**OBJECTIVES:**
The course should enable the students to:
I. Analyze software quality models and quality measurement and metrics.
II. Understand quality plan, implementation and documentation and quality tools including case tools.
III. Evaluate quality control and reliability of quality process.
IV. Understand quality management system models and complexity metrics and customer satisfaction.
V. Remember international quality standards ISO, CMM.

<table>
<thead>
<tr>
<th>MODULE-I</th>
<th>INTRODUCTION</th>
<th>Classes: 10</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Software process assessment overview, assessment phases, assessment principles, assessment conduct, implementation consideration, quality management, quality assurance plan, considerations, verification and validation.</td>
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<table>
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<tr>
<th>MODULE-II</th>
<th>CONFIGURATION MANAGEMENT</th>
<th>Classes: 10</th>
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<tbody>
<tr>
<td></td>
<td>Need for configuration management: Software product nomenclature, configuration management functions, baselines, responsibilities, need for automated tools, plan, SCM(Software Configuration Management) support functions, requirement phase design control, the implementation phase, test phase, SCM(Software Configuration Management) tools, configuration accounting and audit.</td>
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<tr>
<th>MODULE-III</th>
<th>SOFTWARE STANDARDS AND INSPECTION</th>
<th>Classes: 09</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Definitions, reason for software standards, benefits, establishing standards, guidelines, types of reviews. Inspection: inspection of objectives, basic inspection principles, the conduct of inspection, inspection training.</td>
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<tr>
<th>MODULE-IV</th>
<th>TESTING AND MANAGING SOFTWARE QUALITY</th>
<th>Classes: 08</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Testing: principles, types, planning, development, execution and reporting, tools and methods, real time testing, quality management paradigm, quality motivation, measurement criteria, establishing a software quality program, estimating software quality.</td>
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<tr>
<th>MODULE-V</th>
<th>DEFECT PREVENTION</th>
<th>Classes: 08</th>
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<tbody>
<tr>
<td></td>
<td>Principles of software defect prevention, process changes for defect prevention, defect prevention considerations, managements role, framework for software process change, managing resistance to software process change, case studies.</td>
<td></td>
</tr>
</tbody>
</table>

**Text Book:**
### Reference Books:


### Web References:

1. [http://www.win.tue.nl/~wstomv/edu/2ip30/references/#qualitymanagement](http://www.win.tue.nl/~wstomv/edu/2ip30/references/#qualitymanagement)
2. [http://www.rstonehouse.co.uk/old-site/biblio.html](http://www.rstonehouse.co.uk/old-site/biblio.html)

### E-Text Books:


### MOOC Course

2. [https://alison.com/learn/quality-management](https://alison.com/learn/quality-management)
## SOFT COMPUTING

### Course Code: ACQB30

<table>
<thead>
<tr>
<th>Category</th>
<th>Hours / Week</th>
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</table>

Contact Classes: 45  
Tutorial Classes: Nil  
Practical Classes: Nil  
Total Classes: 45

### OBJECTIVES:

The course should enable the students to:

I. Illustrate the improved techniques and methodologies of soft computing that differ from conventional artificial intelligence.
II. Able to design and analyze on real life problems using various neural learning algorithms.
III. Conceptualize fuzzy logic and its implementation for various real-world applications.
IV. Study the advantages and limitations of hybrid learning algorithms.

### MODULE-I  INTRODUCTION TO SOFT COMPUTING  Classes: 08

Characteristic behavior of intelligent systems, knowledge based systems, knowledge representation and processing, soft computing characteristics; Constitutes of soft computing: Fuzzy logic and computing, neural computing, evolutionary computing, rough sets, probabilistic reasoning and machine learning.

### MODULE-II  NEURAL NETWORKS  Classes: 10

Fundamental concepts and models of artificial neural systems: Biological neurons and their artificial models, models of artificial neural networks, neural processing, learning and adaptation, neural network learning rules and comparison; Linearly and non-linearly separable pattern classification; Perception convergence theorem; Multi-layer feed forward network: Delta learning rule for Multi perceptron layer, generalized delta learning rule, feed forward recall and error back propagation training, learning factors, character recognition application; Associative memory: Hopfield network, bidirectional associative memory, radial basis function networks.

### MODULE-III  FUZZY LOGIC AND FUZZY SYSTEMS  Classes: 10

Evolution of fuzzy logic, fuzzy sets, fuzzy logic operations, fuzzy relations, fuzzy arithmetic and fuzzy measures, fuzzy rules and reasoning.

Fuzzy inference systems mamdanifuzzy model, sugenofuzzy model, tsukamoto fuzzy model, fuzzy modeling and decision making, neuro-fuzzy modeling, input space partitioning and fuzzy modeling.

### MODULE-IV  HYBRID SYSTEMS  Classes: 08


### MODULE-V  APPLICATIONS OF SOFT COMPUTING TECHNIQUES  Classes: 09

Applications of fuzzy in pattern recognition: Printed character recognition, inverse kinematics problems, automobile fuel efficiency prediction, soft computing for color recipe prediction, applications of evolutionary computing in image processing and computer vision, soft computing in mobile ad-hoc networks, soft computing in information retrieval and semantic web, soft computing in software engineering.
# Text Books:


# Reference Books:


# Web References:

1. http://www.sctie.iitkgp.ernet.in/
3. http://www.sharbani.org/home2/soft-computing-

# E-Text Books:

1. https://www.books.google.co.in/books?id=bVbj9nhvHd4C
NEURAL NETWORKS AND DEEP LEARNING

PE – VI: CSE / IT

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</table>

Contact Classes: 45 Tutorial Classes: Nil Practical Classes: Nil Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand the foundations of Artificial Neural Networks.
II. Acquire the knowledge on Deep Learning Concepts.
III. Learn various types of Artificial Neural Networks.
IV. Gain knowledge to apply optimization strategies in applications.

MODULE I ARTIFICIAL NEURAL NETWORKS Classes: 10

MODULE II UNSUPERVISED LEARNING NETWORK Classes: 10

MODULE III DEEP LEARNING Classes: 08
Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks.

Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

MODULE IV REGULARIZATION FOR DEEP LEARNING Classes: 10
Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

MODULE V OPTIMIZATION FOR TRAIN DEEP MODELS Classes: 07

Text Books:

**Reference Books:**

PATTERN RECOGNITION

PE – VI: CSE / IT

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</table>

Contact Classes: 45 Tutorial Classes: Nil Practical Classes: Nil Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand basic concepts in pattern recognition.
II. Learn the fundamental algorithms for pattern recognition.
III. Gain knowledge about state-of-the-art algorithms used in pattern recognition research.
IV. Understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis.
V. Apply pattern recognition techniques in practical problems.

MODULE-I  PATTERN CLASSIFIER
Overview of pattern recognition: Discriminant functions, supervised learning, parametric estimation; Maximum likelihood estimation: Bayesian parameter estimation; Problems with bayes approach, pattern classification by distance functions, minimum distance pattern classifier.

MODULE-II  CLUSTERING
Unsupervised classification clustering for unsupervised learning and classification: Clustering concept, c means algorithm; Hierarchical clustering procedures: Graph theoretic approach to pattern clustering, validity of clustering solutions.

MODULE-III  STRUCTURAL PATTERN RECOGNITION
Structural pattern recognition elements of formal grammars: String generation as pattern description, recognition of syntactic description.
Parsing: Stochastic grammars and applications: Graph based structural representation.

MODULE-IV  FEATURE EXTRACTION
Feature extraction and selection entropy minimization: Karhunen-Loeve transformation, feature selection through functions approximation, binary feature selection.

MODULE-V  RECENT ADVANCES
Fuzzy logic: Fuzzy pattern classifiers; Pattern classification using genetic algorithms, case study using fuzzy pattern classifiers and perception.

Text Books:
**Reference Books:**


**Web References:**


**E-Text Books:**


**MOOC Course**

OBJECTIVES:
The course should enable the students to:
I. Knowledge of various levels of analysis involved in NLP.
II. Understand the concepts of word level and syntactic analysis.
III. Able to gain knowledge in automated natural language generation and machine translation.
IV. Study on design features of information retrieval systems and lexical resources.

MODULE-I
OVERVIEW AND LANGUAGE MODELING OVERVIEW
Classes: 08
Origins and challenges of NLP-language and grammar processing Indian languages NLP applications information retrieval; Language modeling: Introduction, various grammar based language models, statistical language model.

MODULE-II
WORD LEVEL AND SYNTACTIC ANALYSIS
Classes: 09
Word level analysis: introduction regular expressions, finite state automata morphological parsing, spelling error detection, correction words, word classes part-of speech tagging; Syntactic analysis: Introduction context free grammar constituency, parsing probabilistic parsing.

MODULE-III
SEMANTIC ANALYSIS AND DISCOURSE PROCESSING
Classes: 10
Semantic analysis: Introduction meaning, representation lexical semantics, ambiguity, word sense disambiguation.
Discourse processing: Introduction, cohesion, reference, resolution, discourse, coherence, structure.

MODULE-IV
NATURAL LANGUAGE GENERATION AND MACHINE TRANSLATION
Classes: 09
Natural language generation: Introduction, architecture of NLG systems generation tasks and representations, application of NLG; Machine translation: Introduction, problems in machine translation, characteristics of Indian languages, machine translation, approaches, translation involving Indian languages.

MODULE-V
INFORMATION RETRIEVAL AND LEXICAL RESOURCES
Classes: 09
Information retrieval: Introduction, design features of information retrieval systems, classical, non-classical, alternative models of information Retrieval evaluation; Lexical resources: Introduction, word net frame, net stemmers, POS tagger, research corpora.

Text Books:
### Reference Books:


### Web References:


### E-Text Books:

OBJECTIVES:
The course should enable the students to:
I. Understand the architecture of 8085 and 8086 microprocessors.
II. Analyze and develop the programming and interfacing techniques of 8086 microprocessor.
III. Understand the architecture of advanced microprocessors and microcontrollers.
IV. Analyze the basic concepts and programming of 8051 microcontroller.

MODULE -I
Introduction to 8 bit and 16 bit Microprocessors.
Classes: 08

MODULE -II
Operation of 8086 and Interrupts.
Classes: 09
Pin diagram of 8086-Minimum mode and maximum mode of operation with Timing diagrams. Interrupt structure of 8086: Vector interrupt table, Interrupt service routines. Introduction to DOS and BIOS interrupts.

MODULE -III
Interfacing with 8086.
Classes: 09
Memory interfacing to 8086 (Static RAM & EPROM). Need for DMA, DMA data transfer Method, Interfacing with 8237/8257. 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.
Serial data transfer schemes: Asynchronous and Synchronous data transfer schemes. 8251 USART architecture and interfacing. TTL to RS 232C and RS232C to TTL conversion.

MODULE -IV
ADVANCED MICRO PROCESSORS
Classes: 09
Introduction to 80286. Salient features of 80386, Real and Protected Mode Segmentation & Paging, Salient features of Pentium, Branch Prediction, and Overview of RISC Processors.

MODULE -V
8051 MICROCONTROLLER ARCHITECTURE
Classes: 10
8051 Microcontroller Architecture, Register set of 8051, Modes of timer operation, Serial port operation, Interrupt structure of 8051, Memory and I/O interfacing with 8051.

Text Books:

Reference Books:

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<tr>
<th>Web References:</th>
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<tr>
<td>1. <a href="http://www.nptel.ac.in/downloads/106108100/">http://www.nptel.ac.in/downloads/106108100/</a></td>
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<td>2. <a href="http://www.the8051microcontroller.com/web-references">http://www.the8051microcontroller.com/web-references</a></td>
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<td>3. <a href="http://www.iare.ac.in">http://www.iare.ac.in</a></td>
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<td>1. <a href="https://books.google.co.in/books">https://books.google.co.in/books</a></td>
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PRINCIPLES OF COMMUNICATION

OE - I

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</table>

Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
   I. Determine the performance of analog modulation schemes in time and frequency domains
   II. Determine the performance of analog communication systems
   III. Understand the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems.

MODULE -I  AMPLITUDE MODULATION  Classes: 08

MODULE -II  DOUBLE SIDE BAND-SUPPRESSED CARRIER MODULATION  Classes: 09
Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

MODULE -III  SINGLE SIDE–BAND AND VESTIGIAL SIDEBAND METHODS OF MODULATION  Classes: 09
SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television.

MODULE -IV  ANGLE MODULATION  Classes: 09

MODULE -V  DIGITAL REPRESENTATION OF ANALOG SIGNALS  Classes: 10

Text Books:

Reference Books:

**Web References:**

2. https://everythingvtu.wordpress.com  
3. http://nptel.ac.in/  
4. http://www.iare.ac.in

**E-Text Books:**

# IMAGE PROCESSING

**OE - I**

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**Contact Classes: 45**  **Tutorial Classes: Nil**  **Practical Classes: Nil**  **Total Classes: 45**

**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. Analyze the image compression procedures.

IV. Design the image segmentation and representation techniques.

**MODULE - I  DIGITAL IMAGE FUNDAMENTALS**  **Classes: 10**


**MODULE - II  IMAGE TRANSFORMS**  **Classes: 09**


**MODULE - III  IMAGE ENHANCEMENT**  **Classes: 08**

Point processing. Histogram processing. Spatial filtering.

Enhancement in frequency domain, Image smoothing, Image sharpening.

**MODULE - IV  IMAGE SEGMENTATION**  **Classes: 08**

Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation.

**MODULE - V  IMAGE COMPRESSION**  **Classes: 10**

Redundancies and their removal methods, Fidelity criteria, Image compression models, Source encoder and decoder, Error free compression, Lossy compression.

**Text Books:**


**Reference Books:**

### Web References:

1. https://imagingbook.com/

### E-Text Books:

# ELECTRICAL ENGINEERING MATERIALS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Category</th>
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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

## OBJECTIVES:
The course should enable the students to:
I. Learn the basics of materials used in electrical engineering.
II. Realize the dielectric properties of insulators in static and alternating fields.
III. Explain the importance of magnetic properties and superconductivity.
IV. Explain the behavior of conductivity of metals and classifications of semiconductor materials.

## MODULE-I  ELEMENTARY MATERIALS SCIENCE CONCEPTS
Classes: 06
Bonding and types of solids, crystalline state and their defects, classical theory of electrical and thermal conduction in solids, temperature dependence of resistivity, skin effect, hall effect.

## MODULE-II  DIELECTRIC PROPERTIES OF INSULATORS IN STATIC AND ALTERNATING FIELD
Classes: 06
Dielectric constant of mono-atomic gases, poly-atomic molecules and solids, internal field in solids and liquids, properties of Ferro-Electric materials, polarization, piezoelectricity, frequency dependence of electronic and Ionic polarizability, complex dielectric constant of non-dipolar solids, dielectric losses.

## MODULE-III  MAGNETIC PROPERTIES AND SUPER CONDUCTIVITY
Classes: 07
Magnetization of matter, magnetic material classification, ferromagnetic origin, curie-weiss law, soft and hard magnetic materials:
Superconductivity and its origin, zero resistance and Meissner effect, critical current density.

## MODULE-IV  CONDUCTIVITY OF MATERIALS
Classes: 08
Ohm’s law and relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.

## MODULE-V  SEMICONDUCTOR MATERIALS
Classes: 08
Classification of semiconductors, semiconductor conductivity, temperature dependence, carrier density and energy gap, trends in materials used in electrical equipment.

## Text Books:
### Reference Books:


### Web References:

1. [https://www.electrical4u.com/electrical-engineering-materials/](https://www.electrical4u.com/electrical-engineering-materials/)

### E-Text Books:

1. [https://www.books.google.co.in/books/about/A_Textbook_of_Electrical_Engineering_Mat.html?id=Ee8ruUXkJeMC](https://www.books.google.co.in/books/about/A_Textbook_of_Electrical_Engineering_Mat.html?id=Ee8ruUXkJeMC)
NON CONVENTIONAL ENERGY SOURCES

OE - I

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Contact Classes: 45 Tutorial Classes: Nil Practical Classes: Nil Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand the various types of renewable energy sources.
II. Analyze the principle and operation of direct energy conversion.
III. Understand and analyze the hybrid energy systems.
IV. Understand the renewable energy sources to real world electrical and electronics problems.

MODULE - I PRINCIPLES OF SOLAR RADIATION Classes: 08
Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

MODULE - II SOLAR ENERGY COLLECTION AND SOLAR ENERGY STORAGE AND APPLICATIONS Classes: 10
Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion

MODULE - III WIND ENERGY AND BIO-MASS Classes: 09
Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

MODULE - IV GEOTHERMAL ENERGY AND OCEAN ENERGY Classes: 10

MODULE - V DIRECT ENERGY CONVERSION Classes: 08
Need for DEC, Carnot cycle, limitations, principles of DEC.

Text Books:
<table>
<thead>
<tr>
<th>Reference Books:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Renewable Energy resources /Tiwari and Ghosal/Narosa</td>
</tr>
<tr>
<td>2. Renewable Energy Technologies /Ramesh &amp; Kumar /Narosa</td>
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</tbody>
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**NANOTECHNOLOGY**

<table>
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<tr>
<th>Course Code</th>
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**Contact Classes:** 45  
**Tutorial Classes:** Nil  
**Practical Classes:** Nil  
**Total Classes:** 45

**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.

**MODULE-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.

**MODULE-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.

**MODULE-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.

**MODULE-IV**  
**TOOLS TO CHARACTERIZE NANOMATERIALS**  

**MODULE-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:**


**Reference Books**


**Web References:**

3. https://libguides.northwestern.edu › LibGuides

**E-Text Book:**

SOFT SKILLS AND INTERPERSONAL COMMUNICATION

OE - II

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Contact Classes: 45    Tutorial Classes: Nil    Practical Classes: Nil    Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Communicate in a comprehensible English accent and pronunciation.
II. Use the four language skills i.e., Listening, Speaking, Reading and Writing effectively.
III. Develop the art of interpersonal communication skills to avail the global opportunities
IV. Enhances the understanding of soft skills resulting in an overall grooming of the skills

MODULE-I    SOFT SKILLS    Classes: 09
Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Application of Soft Skills, Discovering the Self; Setting Goals; Positivity and Motivation: Developing Positive Thinking and Attitude

MODULE -II    EFFECTIVENESS OF SOFT SKILLS    Classes: 09
Developing interpersonal relationships through effective soft skills; Define Listening, Speaking, Reading and Writing skills; Barriers to Listening, Speaking, Reading and Writing; Essential formal writing skills; Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking.

MODULE-III    ORAL AND AURAL SKILLS    Classes: 09
Vocabulary:
Sounds of English vowels sounds and constant sounds, Word Accent and connected speech- contractions, questions tags, Listening for information, Taking notes while listening to lectures (use of Dictionary).
Group Discussion: Importance, Planning, Elements, Skills, Effectively disagreeing, Initiating.

MODULE-IV    VERBAL AND NON-VERBAL COMMUNICATION    Classes: 09
Interpersonal communication-verbal and nonverbal etiquette; Body language, grapevine, Postures, Gestures, Facial expressions, Proximity; Conversation skills, Critical thinking, Teamwork, Group Discussion, Impact of Stress; Measurement and Management of Stress

MODULE-V    INTERPERSONAL COMMUNICATION    Classes: 09
Significance; Effectiveness of writing; Organizing principles of Paragraphs in documents; Writing introduction and conclusion; Techniques for writing precisely; Letter writing; Formal and Informal letter writing; E-mail writing, Report Writing.

Text Books:
Handbook of English for Communication (Prepared by Faculty of English, IARE)
**Reference Books:**


**Web References:**

1. www.edufind.com
2. www.myenglishpages.com

**E-Text Books:**

CYBER LAW AND ETHICS

### OE - II

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Contact Classes: 45  
Tutorial Classes: Nil  
Practical Classes: Nil  
Total Classes: 45

### OBJECTIVES:
The course should enable the students to:
I. Understand key terms and concepts in cyber society, cyber ethics.
II. Analyze fundamentals of Cyber Law
III. Learn the importance of nine P’s in ethics.
IV. Understand artificial intelligence and Blockchain ethics.

### MODULE-I  CYBER SOCIETY  
Classes: 09


### MODULE-II  CYBER LAW AND CYBER ETHICS  
Classes: 09

Cyber Law and Cyber Ethics  
The Importance of Cyber Law, The Significance of Cyber Ethics, Cyber Crime is Unethical and Illegal, Ethics Education has Positive Impact, The Need for Cyber Regulation Based on Cyber Ethics, Very Dangerous Times.

### MODULE-III  ETHICS IN THE INFORMATION SOCIETY, THE NINE P’S  
Classes: 09


### MODULE-IV  DISRUPTIVE CYBER TECHNOLOGIES AND AI ETHICS  
Classes: 09

Disruptive Cyber Technologies and Ethics -I  
**Artificial Intelligence Ethics:** Top Nine Ethical Issues in Artificial Intelligence, Five Core Principles to Keep AI Ethical, Ethics Should Inform AI – But Which Ethics?

### MODULE-V  DISRUPTIVE CYBER TECHNOLOGIES AND ETHICS -II  
Classes: 09

Disruptive Cyber Technologies and Ethics -II  
**BLOCKCHAIN ETHICS:**  
Blockchain Definition and Description, Blockchain Anonymity and Privacy: Ethical, No Possibility to Be Forgotten, Blockchain for Voting, Blockchain for Transparent Trade Tracing, Blockchain Energy: Environmental Impact, Decentralised or Majority-Owned, Ethically More Benefits or Dangers, future jobs in cyber society.
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<th><strong>Text Books:</strong></th>
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<tr>
<th><strong>Reference Books:</strong></th>
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<tbody>
<tr>
<td>1. Dr. Farooq Ahmad, Cyber Law in India, Allahbad Law Agency- Faridabad.</td>
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<tr>
<td>2. J.P. Sharma, SunainaKanojia, Cyber Laws</td>
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<tr>
<td>3. Harish Chander, Cyber Laws and IT Protection</td>
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## ECONOMIC POLICIES IN INDIA

### OE - II

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**Contact Classes: 45**  
**Tutorial Classes: Nil**  
**Practical Classes: Nil**  
**Total Classes: 45**

### OBJECTIVES:
The course should enable the students to:

I. Introduce the economic development elements and its measures  
II. Provide inside knowledge on monetary policy and its importance in economic development  
III. Communicate the importance of fiscal policies in promoting the economy  
IV. Explore the policies and practices in resource base infrastructure  
V. Discuss the industrial and exit policies related to the industries

### MODULE-I  
**INTRODUCTION TO ECONOMIC DEVELOPMENT AND ITS DETERMINANTS**  
CLASSES: 09

Approaches to economic development and its measurement – sustainable development; Role of State, market and other institutions; Indicators of development – PQLI, Human Development Index (HDI), gender development indices.

### MODULE-II  
**MONEY, BANKING AND PRICES**  
CLASSES: 09

Analysis of price behavior in India; Financial sector reforms; Interest rate policy; Review of monetary policy of RBI; Money and capital markets; Working of SEBI in India

### MODULE-III  
**FISCAL POLICY AND PUBLIC FINANCES**  
CLASSES: 09

Fiscal federalism – Centre-State financial relations; Finances of central government; Finances of state governments; Parallel economy; Problems relating to fiscal policy; Fiscal sector reforms in India.

### MODULE-IV  
**RESOURCE BASE AND INFRASTRUCTURE**  
CLASSES: 09

Energy; social infrastructure – education and health; Environment; Regional imbalance; Issues and policies in financing infrastructure development. Policies and Performance in Industry Growth; productivity; diversification; small scale industries; public sector; competition policy; foreign investment.

### MODULE-V  
**THE INDUSTRIAL AND EXIT POLICIES**  
CLASSES: 09

Industrial policy; Public Sector enterprises and their performance; Problem of sick units in India; Privatization and disinvestment debate; Growth and pattern of industrialization; Small-scale sector; Productivity in industrial sector; Exit policy – issues in labour market reforms; approaches for employment generation

### Text Books:

2. The Strength of Economic Development by Albert Hirschman.  
3. Money, Banking and Public Finance by Dr. V.C.Sinha  
## Reference Books:


## Web References:

GLOBAL WARMING AND CLIMATE CHANGE

**OE - II**

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**Contact Classes: 45**  **Tutorial Classes: Nil**  **Practical Classes: Nil**  **Total Classes: 45**

**OBJECTIVES:**

The course should enable the students to:

1. Understand the importance of Ozone layer in the atmosphere.
2. Comprehend composition of atmosphere.
3. Understand impacts of climate change on ecosystem.
4. Understand initiatives taken by different countries to reduce emission of greenhouse gases.

**MODULE - I**  **EARTH’S CLIMATE SYSTEM**  **Classes: 09**


**MODULE - II**  **ATMOSPHERE AND ITS COMPONENTS**  **Classes: 09**


**MODULE - III**  **IMPACTS OF CLIMATE CHANGE**  **Classes: 09**

Causes of Climate change: Changes of Temperature in the environment, Melting of ice pole, sea level rise, Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem, Water Resources, Human Health, Industry, Settlement and Society.

Methods and Scenarios, Projected Impacts for different regions, Uncertainties in the projected impacts of Climate Change, Risk of Irreversible Changes.

**MODULE - IV**  **OBSERVED CHANGES AND ITS CAUSES**  **Classes: 09**


**MODULE - V**  **CLIMATE CHANGE AND MITIGATION MEASURES**  **Classes: 09**


**Text Books:**

### Reference Books:


### E-Text Books:

INTELLECTUAL PROPERTY RIGHTS

OE: II

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Gain knowledge in world trade organization and agreements between nations.
II. Safeguard the intellectual property with international trade agreements.
III. Understand types of intellectual property rights.
IV. Apply different laws in protection of intellectual property rights and its implementation.

MODULE I  INTRODUCTION  Classes: 10
General agreement on tariffs and trade (GATT) eight rounds: Uruguay round, world trade organization: structure, technology transfer, dispute resolution mechanism, Doha declaration world trade organization agreements including trade related intellectual properties rights and trade related investment measures.

MODULE I  WORLD INTELLECTUAL PROPERTY ORGANIZATION  Classes: 08
Paris convention, Bern convention, Budapest treaty, Madrid agreement, huge agreement.

MODULE I  PATENTS  Classes: 09
Historical background of intellectual property rights, introduction, definition and classification of intellectual property, patents, patentable and non-patentable inventions. Legal requirements for patents, types of patent applications, patent document: specification and claims, important procedural aspects, management of intellectual property rights assets and intellectual property portfolio, commercial exploitation of intellectual property.

MODULE I  DESIGNS AND GEOGRAPHICAL INDICATIONS  Classes: 10
Designs: basic requirements, procedure, convention application term, date, geographical indication: definition, what can be registered, who can apply, rights, term, restrictions.

MODULE I  TRADEMARK AND COPYRIGHTS  Classes: 08
Definition, classification of trademarks, classifications of goods and services, Vienna classification, trademarks procedure, trademarks enforcement: infringement and passing off, remedies, copyrights, term of copyrights, and procedure of copyright assignment of copyright, copyright infringement remedies.

Text Books:

Reference Books:
<table>
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<tr>
<th>Web References:</th>
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<tr>
<td>2.  <a href="http://Campus">http://Campus</a> guides.lib.utah.edu</td>
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ENTREPRENEURSHIP

OE - II

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| Contact Classes: 45 | Tutorial Classes: Nil | Practical Classes: Nil | Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand the Entrepreneurial process and also inspire them to be Entrepreneurs.
II. Adopting of the key steps in the elaboration of business idea.
III. Understand the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures.

MODULE-I
UNDERSTANDING ENTREPRENEURIAL MINDSET
Classes: 09

MODULE-II
INDIVIDUAL ENTREPRENEURIAL MIND-SET AND PERSONALITY
Classes: 09

MODULE-III
LAUNCHING ENTREPRENEURIAL VENTURES
Classes: 09
Opportunities identification- Finding gaps in the market place – techniques for generating ideas-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- advantage and disadvantages of Franchising.

MODULE-IV
LEGAL CHALLENGES OF ENTREPRENEURSHIP
Classes: 09
Intellectual property protection - Patents, Copyrights - Trademarks and Trade secrets - Avoiding trademark pitfalls. Feasibility Analysis - Industry and competitor analysis - Formulation of the entrepreneurial Plan- The challenges of new venture start-ups, developing an effective business model – Sources of finance - Critical factors for new venture development - The Evaluation process

MODULE-V
STRATEGIC PERSPECTIVES IN ENTREPRENEURSHIP
Classes: 09
Strategic planning - Strategic actions strategic positioning- Business stabilization - Building the adaptive firms - Understanding the growth stage – Internal growth strategies and external growth strategies, Unique managerial concern of growing ventures. Initiatives by the Government of India to promote entrepreneurship, Social and women entrepreneurship.
### Text Books:


### Reference Books:

VIRTUAL REALITY

OE – III: CSE / IT

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Design a virtual environment and compelling virtual reality experience.
II. Comprehend and analyze the fundamental issues of virtual reality.
III. Study about Virtual Hardware and Software.
IV. Develop Virtual Reality applications.

MODULE-I  INTRODUCTION TO VIRTUAL REALITY  Classes: 08


MODULE-II  GEOMETRIC MODELLING  Classes: 09


MODULE-III  VIRTUAL ENVIRONMENT  Classes: 10

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system.


MODULE-IV  VR HARDWARE AND SOFTWARE  Classes: 09

Human factors: Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

MODULE-V  VR APPLICATIONS  Classes: 09

### Text Books:


### Reference Books:


### Web References:

1. http://www.vrac.iastate.edu/
HUMAN COMPUTER INTERACTION

OE – III: CSE / IT

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Determine the characteristics of good user interface designs.
II. Recognize how a computer system may be modified to include human diversity.
III. Develop user interface design tools.
IV. Investigate the automatic generation of user interface s from high-level specifications.
V. Evaluate user interfaces and applications using a variety of methods.

MODULE -I  INTRODUCTION
Human computer interface: Characteristics of graphics interface, direct manipulation graphical system; web user interface, popularity, characteristic and principles.

Classes: 10

MODULE -II  INTERFACE DESIGN PROCESS
User interface design process: Obstacles, usability, human characteristics in design, human interaction speed, business functions; Requirement analysis, direct , indirect methods, basic business functions, design standards, system timings; Human consideration in screen design structures of menus, functions of menus, contents of menu, formatting, phrasing the menu, selecting menu choice, navigating menus, graphical menus.

Classes: 10

MODULE -III  WINDOWS
Characteristics: Components, presentation styles, types, managements, organizations, operations.
Web systems: Device based controls characteristics, screen based controls, operate control, text boxes, selection control, combination control, custom control, presentation control.

Classes: 09

MODULE -IV  MULTIMEDIA
Text for web pages: Effective feedback, guidance and assistance, internationalization, accessibility; Icons, image, multimedia, coloring.

Classes: 08

MODULE -V  WINDOWS LAYOUT-TEST
Prototypes: Kinds of tests, retest, information search; Visualization, hypermedia; World wide web, software tools.

Classes: 08

Text Books:
### Reference Books:


### Web References:

2. https://www.edx.org/course/user-experience-ux-design-human-factors-tinghuax-70167012x-0

### E-Text Books:


### MOOC Course

1. https://www.coursera.org/specializations/interaction-design
3. https://www.edx.org/course/subject/design

### Course Home Page:
E-COMMERCE

**OE – III: CSE / IT**

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

**OBJECTIVES:**
The course should enable the students to:
I. Describe e-commerce framework.
II. Explain electronic system for payment.
III. Describe the use of e-commerce advertising and marketing.
IV. Understand business documents and digital library.
V. Understand the usage of multimedia systems for e-commerce.

**MODULE I**  **INTRODUCTION TO ELECTRONIC COMMERCE**  Classes: 10

Electronic Commerce: Framework, media coverage; anatomy of e-commerce applications: E-commerce consumer applications, E-commerce organization applications.

**MODULE II**  **ELECTRONIC PAYMENT SYSTEMS**  Classes: 10

Types of electronic payment systems; Digital token based electronic payment system: E-cash, properties of e-cash, electronic cash in action, business issues and electronic cash, operational risk and electronic cash, electronic checks; smart cards and electronic payment system; Credit card based electronic payment system; Risk and electronic payment system; Designing electronic payment system.

**MODULE III**  **INTER AND INTRA ORGANIZATIONAL COMMERCE**  Classes: 09

Inter organizational commerce: Electronic data interchange, electronic data interchange implementation, and value added networks; Intra organizational commerce: Work flow, automation customization and internal commerce, supply chain management.

Corporate digital library: Document library, digital document types, corporate data warehouses; Advertising and marketing: Information based marketing, advertising on internet, on-line marketing process, market research.

**MODULE IV**  **CONSUMER SEARCH AND RESOURCE DISCOVERY**  Classes: 08

Search and resource discovery paradigms, information search and retrieval, commerce catalogues, information filtering.

**MODULE V**  **MULTIMEDIA**  Classes: 08

Multimedia: key multimedia concepts, digital video and electronic commerce, desktop video processing, desktop video conferencing.

**Text Books:**
### Reference Books:


### Web References:

1. www.engr.sjsu.edu/gaojerry/course/cmpe296u/296z/introduction.pdf
2. https://www.tutorialspoint.com/e_commerce/e_commerce_payment_systems.htm

### E-Text Books:


### MOOC Course:


### Course Home Page:
FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY

OE – III: CSE/IT

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand the importance of Blockchain technology.
II. Familiarize the functional/operational aspects of cryptocurrency ECOSYSTEM.
III. Understand emerging abstract models for Blockchain Technology.
IV. Identify major research challenges and technical gaps existing between theory and practice in cryptocurrency domain.

MODULE-I  INTRODUCTION  Classes: 10


MODULE-II  CRYPTOGRAPHIC BASICS FOR CRYPTOCURRENCY  Classes: 10

Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

MODULE-III  BITCOIN  Classes: 09

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.


MODULE-IV  BLOCK CHAIN FOR ENTERPRISES  Classes: 08

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain-Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems, Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain.

MODULE-V  BLOCK CHAIN APPLICATION DEVELOPMENT  Classes: 08


216 | Page
### Text Books:


### Reference Books:


### Web References:

https://www.cse.iitm.ac.in/course_details.php?arg=MTQx
PARALLEL COMPUTING

OE – III: CSE / IT

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Contact Classes: 45 Tutorial Classes: Nil Practical Classes: Nil Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand the parallel computing.
II. Analyze the Parallel programming platforms.
III. Evaluate the Principles of parallel algorithm design.
IV. Understand the Shared address space platforms.

MODULE-I
INTRODUCTION AND HARDWARE TAXONOMY
Classes: 9

Introduction: Paradigms of parallel computing, synchronous, vector/array, SIMD (single instruction, multiple data), systolic, asynchronous, MIMD (multiple instruction, multiple data), reduction paradigm; Hardware taxonomy: Flynn's classifications, handler's classifications; software taxonomy: Kung's taxonomy, SPMD (single program, multiple data).

MODULE-II
ABSTRACT PARALLEL COMPUTATIONAL MODELS AND PERFORMANCE METRICS
Classes: 9

Abstract parallel computational models: Combinational circuits, sorting network, PRAM(parallel random-access machine) models, interconnection RAMs, parallelism approaches, data parallelism, control parallelism; performance metrics: Laws governing performance measurements, metrics speedups, efficiency, utilization, communication overheads, single/multiple program performances, bench marks.

MODULE-III
PARALLEL PROCESSORS AND PARALLEL PROGRAMMING
Classes: 9

Parallel Processors: Taxonomy and topology, shared memory multiprocessors, distributed memory networks, processor organization, static and dynamic interconnections, embeddings and simulations.
Parallel Programming: Shared memory programming, distributed memory programming, object oriented programming, data parallel programming, functional and dataflow programming.

MODULE-IV
PARALLELIZATION
Classes: 9

Scheduling and Parallelization: Scheduling parallel programs, loop scheduling, parallelization of sequential programs, parallel programming support environments.

MODULE-V
SCHEDULING
Classes: 9

Scheduling: Organizational features of processor arrays, multi processors and multicomputers, mapping and scheduling aspects of algorithms, coffman graham scheduling algorithm for parallel processors.
### Text Books:


### Reference Books:


### Web References:

3. https://www2.cisl.ucar.edu/user-support/parallel-computing-concepts

### E-Text Books:

2. http://larc.unt.edu/ian

### MOOC Course:

# INFORMATION RETRIEVAL SYSTEMS

## OE – III: CSE / IT

<table>
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<tr>
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**Contact Classes: 45**  
**Tutorial Classes: Nil**  
**Practical Classes: Nil**  
**Total Classes: 45**

**OBJECTIVES:**  
The course should enable the students to:  
I. Learn the important concepts and algorithms in IRS.  
II. Understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.  
III. Able to design different document clustering algorithms.

## MODULE-I  
**INTRODUCTION TO INFORMATION RETRIEVAL SYSTEMS**  
Classes: 9  

## MODULE-II  
**CATALOGING AND INDEXING**  
Classes: 9  

## MODULE-III  
**AUTOMATIC INDEXING, DOCUMENT AND TERM CLUSTERING**  
Classes: 9  
Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

## MODULE-IV  
**USER SEARCH TECHNIQUES AND INFORMATION VISUALIZATION**  
Classes: 9  

## MODULE-V  
**TEXT SEARCH ALGORITHMS**  
Classes: 9  
<table>
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# ENERGY FROM WASTE

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**Contact Classes:** 45  **Tutorial Classes:** Nil  **Practical Classes:** Nil  **Total Classes:** 60

## COURSE 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. Evaluate the main operational challenges in operating thermal and biochemical energy from waste facilities and device key processes involved in recovering energy from wastes.

### MODULE - 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.

### MODULE - 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.

### MODULE - 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.

### MODULE - 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.

### MODULE - 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:**


**Reference Books:**


**Web References:**

2. https://www.What is the impact of E-waste: Tamara Thompson

**E-Text Books:**

1. https://www.unep.org
2. https://www.outledge.com
3. https://www.bookdepository.com
DISASTER MANAGEMENT

OE - IV

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Contact Classes: 45 Tutorial Classes: Nil Practical Classes: Nil Total Classes: 45

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

MODULE - 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.

MODULE - 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.

MODULE - 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.

MODULE - 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
Emerging approaches in Disaster Management, Three Stages
1. Pre, disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage, Rehabilitation.

**Text Books:**

**Reference Books:**

**Web References:**
1. https://www.google.co.in/?gfe_rd=cr&ei=iAwWLIazv8we8_5LADA#q=disaster+management

**E-Text Books:**
1. https://www.google.co.in/?gfe_rd=cr&ei=iAwWLIazv8we8_5LADA#q=disaster+management+e+textbooks
ELEMENTS OF AERONAUTICS

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OBJECTIVES:
The course should enable the students to:

I. Get the knowledge of technical areas of aerospace engineering including mechanics and physics of fluids, structures and materials, instrumentation, control and estimation, humans and automation, propulsion and energy conversion, aeronautical and astronautical systems

II. Understand the methodology and experience of analysis, modeling, and synthesis

III. Understand the evolution of human space exploration with a brief introduction to the missions conducted by various countries

IV. Knowledge in satellite engineering and the systems involved in the operation of satellites.

MODULE -I HISTORY OF FLIGHT AND SPACE ENVIRONMENT

Balloons and dirigibles, heavier than air aircraft, commercial air transport; Introduction of jet aircraft, helicopters, missiles; Conquest of space, commercial use of space; Different types of flight vehicles, classifications exploring solar system and beyond, a permanent presence of humans in space; Earth’s atmosphere, the standard atmosphere; The temperature extremes of space, laws of gravitation, low earth orbit, microgravity, benefits of microgravity; Environmental impact on spacecraft, space debris; Planetary environments

MODULE -II INTRODUCTION TO AERODYNAMICS

Anatomy of the airplane, helicopter; Understanding engineering models; Aerodynamic forces on a wing, force coefficients; Generating lift, moment coefficients; Aerodynamic forces on aircraft – classification of NACA airfoils, aspect ratio, wing loading, mach number, centre of pressure and aerodynamic centre; Lift, drag curves; Different types of drag.

MODULE -III FLIGHT VEHIVLE PERFORMANCE AND STABILITY

Performance parameters, performance in steady flight, cruise, climb, range, endurance, accelerated flight symmetric maneuvers, turns, sideslips, takeoff and landing.

Flight vehicle Stability, static stability, dynamic stability; Longitudinal and lateral stability; Handling qualities of the airplanes.

MODULE -IV INTRODUCTION TO AIRPLANE STRUCTURES AND MATERIALS,POWER PLANT

General types of construction, monocoque, semi-monocoque; Typical wing and fuselage structure; Metallic & non-metallic materials, use of aluminum alloy, titanium, stainless steel and composite materials; Basic ideas about engines, use of propeller and jets for thrust production; Principles of operation of rocket, types of rockets.

MODULE -V SATELLITE SYSTEMS ENGINEERING HUMAN SPACE EXPLORATION

Satellite missions, an operational satellite system, elements of satellite, satellite bus subsystems; Satellite structures, mechanisms and materials; Power systems; Communication and telemetry; Propulsion and station keeping; Space missions, mission objectives. Goals of human space flight missions, historical background, the Soviet and US missions; The mercury, Gemini, Apollo (manned flight to the moon), Skylab, apollo-soyuz, space Shuttle; International space station, extravehicular activity; The space suit; The US and Russian
designs; Life support systems, flight safety; Indian effort in aviation, missile and space technology.

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<td>2. <a href="https://www.ne.nasa.gov/education/">https://www.ne.nasa.gov/education/</a></td>
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<td>3. <a href="https://nptel.ac.in">https://nptel.ac.in</a></td>
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<tr>
<td>3. <a href="https://www.academia.edu/7950378/Introduction_to_Flight_-_Anderson_5th_Ed">https://www.academia.edu/7950378/Introduction_to_Flight_-_Anderson_5th_Ed</a></td>
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AVIATION MANAGEMENT

OE – IV

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Understand about the history of aviation, major player’s airline industry, current trends and challenges.
II. Impart the knowledge on airport planning, airport operation and various authorities involved in airport management.
III. Understand and gain the knowledge on the meteorological services, environmental regulation and airport fee, rates and charges.
IV. Gain the in depth knowledge on safety regulation, economic regulation and aviation security.
V. Understand about the air traffic control, air space and navigational aid.

MODULE -I  INTRODUCTION  Classes: 10

History of Aviation- organization, global, social & ethical environment-history of aviation in India-Major players in Airline industry-Swot Analysis of different Airline companies in India- market potential of Airline industry in India- new airport development plans-current challenges in airline industry- competition in Airline industry- Domestic & International from an Indian perspective.

MODULE -II  AIRPORT INFRASTRUCTURE AND MANAGEMENT  Classes: 10

Airport planning – Terminal planning design & operation -Airport operations – Airport functions-organization structure in an Airline – Airport Authority of India- comparison of global & Indian Airport management- Role of AAI -Airline privatization – Full privatization- Gradual privatization- partial privatization.

MODULE -III  AIR TRANSPORT SERVICES  Classes: 9

Various Airport services- international air transport services – Indian Scenario- An overview of Airport in Delhi, Mumbai, Hyderabad & Bangalore. The role of private operators- Airport development fees, Rates & Tariffs.

MODULE -IV  INSTITUTIONAL FRAMEWORK  Classes: 8

Role of DGCA-Slot allocation -Methodology followed by ATC & DGCA – management of bi-laterals – economic Regulations.

MODULE -V  CONTROLLING  Classes: 8

Role of air traffic control- airspace & navigational aids- control process – case study in airline industry- Mumbai-Delhi airport privatization-Navi Mumbai airport tendering process- six cases in the airline industry.
### Text Books:


### Reference Books:


### Web References:

2. [https://books.google.co.in/books?id=RYR6cu4YSBcC&dq=Planning%20and%20Design%20of%20Airports&source=gbs_similarbooks](https://books.google.co.in/books?id=RYR6cu4YSBcC&dq=Planning%20and%20Design%20of%20Airports&source=gbs_similarbooks)

### E-Text Books:

2. [https://www.only4engineer.com/2014/10/planning-and-design-of-airports-by.html](https://www.only4engineer.com/2014/10/planning-and-design-of-airports-by.html)
INTRODUCTION TO ROBOTICS

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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.

MODULE-I INTRODUCTION TO ROBOTICS Classes: 09

Introduction: Automation and robotic, an overview 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.

MODULE-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.

MODULE-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.

MODULE-IV TRAJECTORY PLANNING AND ACTUATORS Classes: 09

Trajectory planning: Joint space scheme, cubic polynomial fit, and 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.

MODULE-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:

Reference Books:

Web References:

E-Text Book:
RAPID PROTOTYPING

OE – IV

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Contact Classes: 45  Tutorial Classes: Nil  Practical Classes: Nil  Total Classes: 45

OBJECTIVES:
The course should enable the students to:
I. Identify suitable time compression techniques for rapid product development.
II. Interpret the concept, process details with respect to different processes.
III. Describe the significance of each process parameter of various prototyping systems.
IV. Interpret the advantages, limitations and applications of various prototyping Systems.
V. Identify the various tooling required for rapid prototyping systems and reverse engineering & augmented reality.

MODULE -I  INTRODUCTION TO RAPID PRORTOTYPING


MODULE -II  LIQUID-BASED RAPID PROTOTYPING SYSTEMS

Liquid-Based Rapid Prototyping Systems: Principle, Process parameter, Process details, Advantages, Disadvantages and Applications of Stereolithography Apparatus (SLA), Solid Ground Curing (SGC), Solid Object Ultraviolet-Laser Printer (SOUP), Rapid Freeze Prototyping and Microfabrication

MODULE -III  SOLID-BASED RAPID PROTOTYPING SYSTEMS

Solid-Based Rapid Prototyping Systems: Principle, Process parameter, Process details, Advantages, Disadvantages and Applications of Laminated Object Manufacturing (LOM), Fused Deposition Modeling (FDM), Paper Lamination Technology (PLT), Multi-Jet Modeling System (MJM) and CAM-LEM.

MODULE -IV  POWDER-BASED RAPID PROTOTYPING SYSTEMS

Powder-Based Rapid Prototyping Systems: Principle, Process parameter, Process details, Advantages, Disadvantages and Applications of Selective Laser Sintering (SLS), Laser Engineered Net Shaping (LENS), Multiphase Jet Solidification (MJS), Electron Beam Melting (EBM) and Three-Dimensional Printing (3DP) – Hands on Session

MODULE -V  RAPID TOOLING

Rapid Tooling: Introduction to rapid tooling (RT), Indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, and 3D Keltool process, Direct rapid tooling methods: DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3D. Reverse engineering: Acquiring Point Data, Constructing 3D model and Applications. Virtual Augmented Reality: Requirement of devices and

**Text Books:**


**Reference Books:**


**Web References:**

1. [https://nptel.ac.in/courses/112102103/16](https://nptel.ac.in/courses/112102103/16)
2. [https://nptel.ac.in/courses/112107078/37](https://nptel.ac.in/courses/112107078/37)

**E-Text Book:**

COURSE 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.
IV. Understand the constitutional protection given for environment.

MODULE-I ENVIRONMENT AND ECOSYSTEMS
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

MODULE-II NATURAL RESOURCES
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.

MODULE-III BIODIVERSITY AND BIOTIC RESOURCES
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.

MODULE-IV ENVIRONMENTAL POLLUTION, POLLUTION CONTROL TECHNOLOGIES AND GLOBAL ENVIRONMENTAL PROBLEMS
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
## Module-V
### Environmental Legislations and Sustainable Development

Environmental legislations: Environmental protection act, air act 1981, water act, forest act, wildlife act, municipal solid waste management and handling rules, biomedical waste management and handling rules 2016, 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:


#### Reference Books:


#### Web References:

1. https://www.tndte.com
2. https://www.nptel.ac.in/downloads
4. https://www.cuiet.info
5. https://www.sbtebihar.gov.in
6. https://www.ritchennai.org
## ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

### Course Details

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Contact Classes: Nil  
Tutorial Classes: Nil  
Practical Classes: Nil  
Total Classes: Nil

### Course Objectives:

The course should enable the students to:
I. Understand the concept of Traditional knowledge and its importance
II. Know the need and importance of protecting traditional knowledge.
III. Know the various enactments related to the protection of traditional knowledge.
IV. Understand the concepts of Intellectual property to protect the traditional knowledge

### Modules

#### Module-I  INTRODUCTION TO TRADITIONAL KNOWLEDGE

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

#### Module-II  PROTECTION OF TRADITIONAL KNOWLEDGE

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

#### Module-III  LEGAL FRAME WORK AND TK

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);


#### Module-IV  TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

#### Module-V  TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS:

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK, 139.

### Text Books:

2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh Pratibha Prakashan 2012.

### Reference Books:

1. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2
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 DEPARTMENT

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEO’S)

A graduate of the Computer Science and Engineering Program should:

PEO – I: Students will establish themselves as effective professionals by solving real problems through the use of computer science knowledge and with attention to team work, effective communication, critical thinking and problem solving skills.

PEO – II: Students will develop professional skills that prepare them for immediate employment and for life-long learning in advanced areas of computer science and related fields.

PEO – III: Students will demonstrate their ability to adapt to a rapidly changing environment by having learned and applied new skills and new technologies.

PEO – IV: Students will be provided with an educational foundation that prepares them for excellence, leadership roles along diverse career paths with encouragement to professional ethics and active participation needed for a successful career.

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO – I: Professional Skills: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO – II: Problem-Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO – III: Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.
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 stakeholders know that we are an Autonomous College?
   Autonomous status, once declared, shall be accepted by all the stakeholders. 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 Program 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 program?
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.

\[
SGPA = \frac{\sum_{i=1}^{n} (C_i \times G_i)}{\sum_{i=1}^{n} C_i}
\]

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 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.
\[ CGPA = \frac{\sum_{j=1}^{m} (C_j S_j)}{\sum_{j=1}^{m} C_j} \]

Where, \( S_j \) is the SGPA of the \( j^{th} \) semester and \( C_j \) is the total number of credits up to the semester and \( m \) represent the number of semesters completed in which a student registered up to 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 SGPA 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 Board 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 Sheet 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 Programs also?
Yes, presently our PG programs also enjoying autonomous status.
### MALPRACTICES RULES
### DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

<table>
<thead>
<tr>
<th>S.No</th>
<th>Nature of Malpractices/Improper conduct</th>
<th>Punishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>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)</td>
<td>Expulsion from the examination hall and cancellation of the performance in that subject only.</td>
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<td></td>
<td>(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.</td>
<td>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.</td>
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<tr>
<td>2.</td>
<td>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.</td>
<td>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. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.</td>
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<tr>
<td>3.</td>
<td>Impersonates any other candidate in connection with the examination.</td>
<td>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.</td>
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<td>4.</td>
<td>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.</td>
<td>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.</td>
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<tr>
<td>5.</td>
<td>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.</td>
<td>Cancellation of the performance in that subject.</td>
</tr>
<tr>
<td>6.</td>
<td>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.</td>
<td>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.</td>
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<td>7.</td>
<td>Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.</td>
<td>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.</td>
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<td>8.</td>
<td>Possess any lethal weapon or firearm in the examination hall.</td>
<td>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.</td>
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<td>9.</td>
<td>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.</td>
<td>Student of the college's 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. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.</td>
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<tr>
<td>10.</td>
<td>Comes in a drunken condition to the examination hall.</td>
<td>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.</td>
</tr>
<tr>
<td>11.</td>
<td>Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.</td>
<td>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.</td>
</tr>
<tr>
<td>12.</td>
<td>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.</td>
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</tbody>
</table>
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 2018-2019 / 2019-2020 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/laboratory/project) 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 60% of theory courses in a semester 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 - R18 Academic Rules and Regulations, Syllabus copy and hence, I shall abide by all the rules specified in it.

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