



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

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

Dundigal, Hyderabad - 500 043, Telangana

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

BACHELOR OF TECHNOLOGY INFORMATION TECHNOLOGY

**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**

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“Take up one idea.

Make that one idea your life-think of it, dream of it, live on that idea. Let the brain muscles, nerves, every part of your body be full of that idea and just leave every other idea alone.

This is the way to success”

Swami Vivekananda

PRELIMINARY DEFINITIONS AND NOMENCLATURES

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 stake holders is requested for the successful implementation of the autonomous system in the larger interests of the institute and brighter prospects of engineering graduates.

PRINCIPAL



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

ACADEMIC REGULATIONS

B.Tech. Regular Four Year Degree Program
(for the batches admitted from the academic year 2018 - 19)
&
B.Tech. (Lateral Entry Scheme)
(for the batches admitted from the academic year 2019 - 20)

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 ($\geq 90\%$) 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 1: Academic Calendar

FIRST SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Exams			2 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation & Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Summer Vacation, Supplementary Semester and Remedial Exams			8 weeks

- 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 2: Group of Courses

S. No	Branch	Code
1	Aeronautical Engineering	AE
2	Computer Science and Engineering	CS
3	Information Technology	IT
4	Electronics and Communication Engineering	EC
5	Electrical and Electronics Engineering	EE
6	Mechanical Engineering	ME
7	Civil Engineering	CE

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

S. No	Course	Hours	Credits
1	Theory Course	1 / 2 / 3 / 4	1 / 2 / 3 / 4
2	Elective Courses	3	3
3	MOOC Courses	-	2
4	Laboratory Courses	2 / 3 / 4	1 / 1.5 / 2
5	Audit Course / Mandatory Course	-	0
6	Project / Research based learning	-	4
7	Full Semester Internship (FSI) / Project Work	-	11

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

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

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.

- Full Semester Internship (FSI) Model and
- 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:

50 %	To test the objectiveness of the concept
50 %	To test the analytical skill of the concept OR to test the application skill of the concept

8.1.2 Continuous Internal Assessment (CIA):

For each theory course the CIA shall be conducted by the faculty / teacher handling the course as given in Table 5. CIA is conducted for a total of 30 marks, with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 5: Assessment pattern for Theory Courses

COMPONENT	THEORY			TOTAL MARKS
Type of Assessment	CIE Exam	Quiz	AAT	
Max. CIA Marks	20	05	05	30

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 student's project activity is spread over in VII semester and in VIII semesters. A student shall carry out the project work under the supervision of a faculty member or in collaboration with an Industry, R&D organization or another academic institution/University where sufficient facilities exist to carry out the project work.

Project work (phase-I) starts in VII semester as it takes a vital role in campus hiring process. Students shall select project titles from their respective logins uploaded by the supervisors at the beginning of VII semester. Three reviews are conducted by department review committee (DRC) for 10 marks each. Student must submit a project report summarizing the work done up to design phase/prototype by the end of VII semester. The semester end examination for project work (phase-I) is evaluated based on the project 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.

Project Work (phase-II) starts in VIII semester, shall be evaluated for 100 marks out of which 30 marks towards continuous internal assessment and 70 marks for semester end examination. Three reviews are to be conducted by DRC on the progress of the project for 30 marks. The semester end examination shall be based on the final 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-6: Grade Points Scale (Absolute Grading)

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

- 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,

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

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

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

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

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

16.0 ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA

16.1 Illustration for SGPA

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

$$\text{Thus, } SGPA = 139 / 20 = 6.95$$

16.2 Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit: 20 SGPA: 6.9	Credit: 22 SGPA: 7.8	Credit: 25 SGPA: 5.6	Credit: 26 SGPA: 6.0
Semester 5	Semester 6		
Credit: 26 SGPA: 6.3	Credit: 25 SGPA: 8.0		

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

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) upto III semester **or** 50% of the total credits (rounded to the next lowest integer) upto 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) upto V semester **or** 50% of the total credits (rounded to the next lowest integer) upto 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) upto 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) upto V semester **or** 50% of the total credits (rounded to the next lowest integer) upto 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 5.0, 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 5.0, 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:

CGPA \geq 8.0	CGPA \geq 6.5 and < 8.0	CGPA \geq 5.5 and < 6.5	CGPA \geq 5.0 and < 5.5	CGPA < 5.0
First Class with Distinction	First Class	Second Class	Pass Class	Fail

21.2 A student with final CGPA (at the end of the under graduate programme) \geq 8.00, and fulfilling the following conditions - shall be placed in '**first class with distinction**'. However,

- Should have passed all the courses in '**first appearance**' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.
- Should have secured a CGPA \geq 8.00, at the end of each of the 8 sequential semesters, starting from I year I semester onwards.
- Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA $>$ 8 shall be placed in '**first class**'.

21.3 Students with final CGPA (at the end of the B.Tech program) \geq 6.50 but $<$ 8.00 shall be placed in '**first class**'.

21.4 Students with final CGPA (at the end of the B.Tech program) \geq 5.50 but $<$ 6.50, shall be placed in '**second class**'.

21.5 All other students who qualify for the award of the degree (as per item 19), with final CGPA (at the end of the B.Tech program) \geq 5.0 but $<$ 5.50, shall be placed in '**pass class**'.

21.6 A student with final CGPA (at the end of the B.Tech program) $<$ 5.00 will not be eligible for the award of the degree.

21.7 Students fulfilling the conditions listed under item 21.2 alone will be eligible for award of '**Gold Medal**'.

21.8 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.

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

21 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:

S. No	Department	Honours scheme
1	Aeronautical Engineering	Aerospace Engineering / Space Science etc.
2	Computer Science and Engineering / Information Technology	Big data and Analytics / Cyber Physical Systems, Information Security / Cognitive Science / Internet of Things (IoT) etc.
3	Electronics and Communication Engineering	Digital Communication / Signal Processing / Communication Networks / VLSI Design / Embedded Systems etc.
4	Electrical and Electronics Engineering	Renewable Energy systems / Energy and Sustainability / IoT Applications in Green Energy Systems etc.
5	Mechanical Engineering	Industrial Automation and Robotics / Manufacturing Sciences and Computation Techniques etc.
6	Civil Engineering	Structural Engineering / Environmental Engineering etc.

21.2 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)

INFORMATION TECHNOLOGY

COURSE STRUCTURE

I SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
AHSB02	Linear Algebra and Calculus	BSC	Foundation	3	1	0	4	30	70	100
AHSB03	Engineering Chemistry	BSC	Foundation	3	1	0	4	30	70	100
AEEB01	Fundamentals of Electrical Engineering	ESC	Foundation	3	1	0	4	30	70	100
PRACTICAL										
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

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
AHSB01	English	HSMC	Foundation	2	0	0	2	30	70	100
AHSB12	Probability and Statistics	BSC	Foundation	3	1	0	4	30	70	100
AHSB13	Semiconductor Physics	BSC	Foundation	3	1	0	4	30	70	100
ACSB01	Programming for Problem Solving	ESC	Foundation	3	0	0	3	30	70	100
PRACTICAL										
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

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
AECB05	Analog and Digital Electronics	ESC	Core	3	1	0	4	30	70	100
ACSB03	Data Structures	PCC	Core	3	0	0	3	30	70	100
ACSB04	Discrete Mathematical Structures	BSC	Core	3	1	0	4	30	70	100
AITB01	Object Oriented Programming through Python	PCC	Core	3	0	0	3	30	70	100
AHSB14	Business Economics and Financial Analysis	PCC	Core	3	0	0	3	30	70	100
PRACTICALS										
ACSB05	Data Structures Laboratory	PCC	Core	0	0	3	1.5	30	70	100
ACSB06	C++ Standard Template Library	PCC	Core	0	0	3	1.5	30	70	100
AITB02	IT Workshop	PCC	Core	1	0	2	2	30	70	100
Total				16	02	08	22	240	560	800

IV SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
ACSB07	Computer Organization and Architecture	PCC	Core	3	0	0	3	30	70	100
AITB03	Theory of Computation	PCC	Core	3	1	0	4	30	70	100
AITB04	Operating Systems	PCC	Core	3	0	0	3	30	70	100
AITB05	Design and Analysis of Algorithms	PCC	Core	3	1	0	4	30	70	100
ACSB08	Database Management Systems	PCC	Core	3	0	0	3	30	70	100
AHSB07	Environmental Sciences	MC-I	---	0	0	0	0	30	70	100
PRACTICALS										
AITB06	Object Oriented Programming through Java Laboratory	PCC	Core	1	0	2	2	30	70	100
AITB07	Design and Analysis of Algorithms Laboratory	PCC	Core	0	0	3	1.5	30	70	100
ACSB09	Database Management Systems Laboratory	PCC	Core	0	0	3	1.5	30	70	100
Total				16	02	08	22	270	630	900

V SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
ACSB10	Object Oriented Analysis and Design	PCC	Core	3	0	0	3	30	70	100
AITB09	Web Technologies	PCC	Core	2	1	0	3	30	70	100
AITB10	Computer Networks	PCC	Core	3	0	0	3	30	70	100
ACSB11	Compiler Design	PCC	Core	2	1	0	3	30	70	100
	Professional Elective - I	PEC	Elective	3	0	0	3	30	70	100
	Open Elective - I	OEC	Elective	3	0	0	3	30	70	100
AHSB15	Project Based Learning (Prototype / Design Building)	PCC	Core	2	0	0	2	30	70	100
PRACTICALS										
ACSB12	Case Tools Laboratory	PCC	Core	0	0	2	1	30	70	100
AITB11	Web Technologies Laboratory	PCC	Core	0	0	2	1	30	70	100
Total				18	02	04	22	270	630	900

VI SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
ACSB13	Principles of Artificial Intelligence	PCC	Core	3	0	0	3	30	70	100
AITB12	Linux Programming	PCC	Core	2	1	0	3	30	70	100
ACSB14	Data Ware Housing and Data Mining	PCC	Core	2	1	0	3	30	70	100
	Professional Elective - II	PEC	Elective	3	0	0	3	30	70	100
	Professional Elective-III	PEC	Elective	3	0	0	3	30	70	100
	Open Elective - II	OEC	Elective	3	0	0	3	30	70	100
AHSB16	Research Based Learning (Fabrication / Model Development)	PCC	Core	2	0	0	2	30	70	100
PRACTICALS										
AITB13	Linux Programming Laboratory	PCC	Core	0	0	2	1	30	70	100
ACSB15	Data Ware Housing and Data Mining Laboratory	PCC	Core	0	0	2	1	30	70	100
Total				18	02	04	22	270	630	900

VII SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
AITB14	Big Data Analytics	PCC	Core	3	0	0	3	30	70	100
AITB15	Cloud Computing	PCC	Core	3	0	0	3	30	70	100
	Professional Elective – IV	PEC	Elective	3	0	0	3	30	70	100
	Professional Elective –V	PEC	Elective	3	0	0	3	30	70	100
	Open Elective – III	OEC	Elective	3	0	0	3	30	70	100
AHSB17	Essence of Indian Traditional Knowledge	MC-II	---	-	-	-	-	30	70	100
PRACTICALS										
AITB16	Big Data Analytics Laboratory	PCC	Core	0	0	3	1.5	30	70	100
AITB17	Cloud Computing Laboratory	PCC	Core	0	0	3	1.5	30	70	100
AITB36	Project Work (phase – I)	PROJ	Project	0	0	10	5	30	70	100
Total				15	00	16	23	270	630	900

VIII SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
	Professional Elective –VI	PEC	Elective	3	0	0	3	30	70	100
	Open Elective - IV	OEC	Elective	3	0	0	3	30	70	100
PRACTICAL										
AITB37	Project Work (phase – II) / Full Semester Internship	PROJ	Project	0	0	12	6	30	70	100
TOTAL				06	00	12	12	90	210	300

PROFESSIONAL ELECTIVES

PROFESSIONAL ELECTIVES – I: THEORY AND ALGORITHMS

Course Code	Course Title
AITB18	Advanced Algorithms
AITB19	Information Theory
ACSB20	Fundamentals of Optimization Techniques
ACSB21	Machine Learning

PROFESSIONAL ELECTIVES – II: ARCHITECTURE AND SYSTEMS

Course Code	Course Title
ACSB22	Advanced Computer Architecture
ACSB23	Distributed Operating Systems
AITB20	Internet of Things
AITB21	Advanced Operating System

PROFESSIONAL ELECTIVES – III: SECURITY AND NETWORKS

Course Code	Course Title
AITB22	Information Security
ACSB24	High Speed Networks
ACSB25	Mobile Computing
AITB23	Cyber Security

PROFESSIONAL ELECTIVES – IV: DATABASES AND DESIGN

Course Code	Course Title
ACSB26	Advanced Databases
ACSB27	Database Security
AITB24	Distributed Databases
AITB25	Design Patterns

PROFESSIONAL ELECTIVES – V: SOFTWARE ENGINEERING

Course Code	Course Title
AITB26	Software Engineering
AITB27	Software Testing Methodologies
ACSB28	Software Process and Project Management
ACSB29	Software Quality Management

PROFESSIONAL ELECTIVES – VI: MACHINE INTELLIGENCE

Course Code	Course Title
ACSB30	Soft Computing
ACSB31	Neural Networks and Deep Learning
AITB28	Pattern Recognition
AITB29	Natural Language Processing

OPEN ELECTIVE - I

Course Code	Course Title
AECB55	Microprocessors and Interfacing
AECB56	Principles of Communication
AECB57	Image Processing
AEEB55	Electrical Engineering Materials
AEEB56	Non Conventional Energy Sources
AEEB57	Nanotechnology

OPEN ELECTIVES – II

Course Code	Course Title
AHSB18	Soft Skills and Interpersonal Communication
AHSB19	Cyber Law and Ethics
AHSB20	Economic Policies in India
AHSB21	Global Warming and Climate Change
AHSB22	Intellectual Property Rights
AHSB23	Entrepreneurship

OPEN ELECTIVE - III

Course Code	Course Title
AITB33	Virtual Reality
AITB34	Human Computer Interaction
AITB35	E-commerce
ACSB35	Fundamentals of Blockchain Technology
ACSB36	Parallel Computing
ACSB37	Information Retrieval Systems

OPEN ELECTIVE - IV

Course Code	Course Title
ACEB52	Energy from Waste
ACEB53	Disaster Management
AAEB55	Elements of Aeronautics
AAEB28	Aviation Management
AMEB56	Introduction to Robotics
AMEB57	Rapid Prototyping

MANDATORY COURSES

Course Code	Course Title
AHSB07	Environmental Sciences
AHSB17	Essence of Indian Traditional Knowledge
AHSB24	Gender Sensitivity

SYLLABUS

LINEAR ALGEBRA AND CALCULUS

I Semester: AE / CSE / IT / ECE / EEE / ME / CE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB02	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			
OBJECTIVES: The course should enable the students to: I. 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	Classes: 09
<p>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.</p> <p>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.</p>		
Text Books:		
<ol style="list-style-type: none"> 1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 36th Edition, 2010. 2. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, Reprint, 2008. 3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2010. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006. 2. Veerarajan T., "Engineering Mathematics" for first year, Tata McGraw-Hill, New Delhi, 2008. 3. D. Poole, "Linear Algebra A Modern Introduction", 2nd Edition, Brooks/Cole, 2005. 4. Dr. M Anita, "Engineering Mathematics-I", Everest Publishing House, Pune, First Edition, 2016. 		
Web References:		
<ol style="list-style-type: none"> 1. http://www.efunda.com/math/math_home/math.cfm 2. http://www.ocw.mit.edu/resources/#Mathematics 3. http://www.sosmath.com/ 4. http://www.mathworld.wolfram.com/ 		
E-Text Books:		
<ol style="list-style-type: none"> 1. http://www.e-booksdirectory.com/details.php?ebook=10166 2. http://www.e-booksdirectory.com/details.php?ebook=7400re 		

ENGINEERING CHEMISTRY

I Semester: CSE / IT/ EEE II Semester: AE / ECE / ME / CE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB03	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			
OBJECTIVES: The course should enable the students to: I. 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	Classes: 12
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 SN^1 , SN^2 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 $KMnO_4$ and chromic acid; Reduction reactions: Reduction of carbonyl compounds using $LiAlH_4$ & $NaBH_4$; Hydroboration of olefins; Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.		
MODULE –V	FUELS AND COMBUSTION	Classes: 08
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:		
<ol style="list-style-type: none"> 1. P. C. Jain, Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, 16th Edition, 2017. 2. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 2017. 2. R.T. Morrison, RN Boyd and SK Bhattacharya "Organic Chemistry", Pearson, 7th Edition, 2011. 3. K.F. Purcell and J.C. Kotz, "Inorganic Chemistry", Cengage learning, 2017. 		
Reference Books:		
<ol style="list-style-type: none"> 1. K.P.C. Volhardt and N. E. Schore, "Organic Chemistry Structure and Functions", Oxford Publications, 7th Edition. 2. B. H. Mahan, "University Chemistry", Narosa Publishers, 4th Edition, 2009. 		
Web References:		
<ol style="list-style-type: none"> 1. Engineering Chemistry (NPTEL Web-book), by B.L.Tembe, Kamaluddin and M.S.Krishnan. 		

FUNDAMENTALS OF ELECTRICAL ENGINEERING

I Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEEB01	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			
OBJECTIVES: The course should enable the students to: I. Understand the basic 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: 1. A Chakrabarthy, “Electric Circuits”, Dhanipat Rai& Sons, 6 th Edition, 2010. 2. A Sudhakar, Shyammohan S Palli, “Circuits and Networks”, Tata McGraw-Hill, 4 th Edition, 2010. 3. M E Van Valkenberg, “Network Analysis”, PHI, 3 rd Edition, 2014.								

Reference Books:

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

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:

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

ENGINEERING CHEMISTRY LABORATORY

I Semester: CSE / IT / EEE II Semester: AE / ECE / ME / CE								
Course Code	Category	Hours / Week			Credit	Maximum Marks		
AHSB09	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 42			Total Classes: 42			
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:			
1. Vogel’s, “Quantitative Chemical Analysis”, Prentice Hall, 6 th Edition, 2000. 2. Gary D. Christian, “Analytical Chemistry”, Wiley India, 6 th Edition, 2007.			
Web References:			
http://www.iare.ac.in			
LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS:			
S. No	Name of the Apparatus	Apparatus Required	Quantity
1	Analytical balance	04	100 gm
2	Beaker	30	100 ml
3	Burette	30	50 ml
4	Burette Stand	30	Metal
5	Clamps with Boss heads	30	Metal
6	Conical Flask	30	250 ml
7	Conductivity cell	10	K=1
8	Calomel electrode	10	Glass
9	Digital Potentiometer	10	EI
10	Digital Conductivity meter	10	EI
11	Digital electronic balance	01	RI
12	Distilled water bottle	30	500 ml

13	Funnel	30	Small
14	Glass rods	30	20 cm length
15	Measuring Cylinders	10	10 ml
16	Oswald Viscometer	30	Glass
17	Pipette	30	20 ml
18	Platinum Electrode	10	PP
19	Porcelain Tiles	30	White
20	Reagent bottle	30	250 ml
21	Standard Flask	30	100 ml
22	Stalagmo meter	30	Glass
23	TLC Plates	40	--
24	UV Chamber	02	--

FUNDAMENTALS OF ELECTRICAL ENGINEERING LABORATORY

I Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEEB05	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
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 , KIRCHOFF’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.								

Expt. 10	CHOKE COIL PARAMETERS
Determination of internal resistance and inductance of choke coil.	
Expt. 11	THEVENIN'S THEOREM
Reform conversion of complex network into simple series circuit.	
Expt. 12	NORTON'S THEOREM
Reform conversion of complex network into simple parallel circuit.	
Reference Books:	
1. A Chakrabarti, "Circuit Theory", Dhanpat Rai Publications, 6 th Edition, 2006. 2. William Hayt, Jack E Kemmerly S.M. Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill, 7 th Edition, 2010. 3. K S Suresh Kumar, "Electric Circuit Analysis", Pearson Education, 1 st Edition, 2013.	
Web References:	
1. 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								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEB01	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
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.								

Week-8	WELDING
Batch I: Arc welding & Gas Welding. Batch II: Gas welding & Arc Welding.	
Week-9	MOULD PREPARATION
Batch I: Prepare a wheel flange mould using a given wooden pattern. Batch II: Prepare a bearing housing using an aluminum pattern.	
Week-10	MOULD PREPARATION
Batch I: Prepare a bearing housing using an aluminum pattern. Batch II: Prepare a wheel flange mould using a given wooden pattern.	
Week-11	BLACKSMITHY- I, TINSMITHY- I,
Batch I: Prepare S-bend & J-bend for given MS rod using open hearth furnace. Batch II: Prepare the development of a surface and make a rectangular tray and a round tin.	
Week-12	TINSMITHY- I, BLACKSMITHY- I
Batch I: Prepare the development of a surface and make a rectangular tray and a round tin. Batch II: Prepare S-bend & J-bend of given MS rod using open hearth furnace.	
Week-13	PLASTIC MOULDING, INJECTION MOULDING, GLASS CUTTING
Batch I: Plastic Moulding and Glass cutting. Batch II: Plastic Moulding and Glass cutting.	
Week-14	BLOW MOULDING
Batch I& II: Blow Moulding.	
Reference Books:	
1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai. 2. Kalpakjian S, Steven S. Schmid, “Manufacturing Engineering and Technology”, Pearson Education India Edition, 4 th Edition, 2002. 3. Gowri P. Hariharan, A. Suresh Babu,” Manufacturing Technology – I”, Pearson Education, 2008. 4. Roy A. Lindberg, “Processes and Materials of Manufacture”, Prentice Hall India, 4 th Edition, 1998. 5. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGraw-Hill House, 2017.	
Web References:	
http://www.iare.ac.in	

ENGLISH

I Semester: ECE / EEE /CE II Semester: AE / CSE / IT / ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB01	Foundation	L	T	P	C	CIA	SEE	Total
		2	-	-	2	30	70	100
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.								

Text Books:
Handbook of English for Communication (Prepared by Faculty of English, IARE)
Reference Books:
<ol style="list-style-type: none"> 1. Sanjay Kumar and Pushp Lata. "Communications Skills". Oxford University Press. 2011. 2. Michael Swan. "Practical English Usage ", Oxford University Press, 1995. 3. F.T. Wood. "Remedial English Grammar", Macmillan. 2007. 4. William Zinsser. "On Writing Well". Harper Resource Book, 2001. 5. Raymond Murphy, "Essential English Grammar with Answers", Cambridge University Press, 2nd Edition.
Web References:
<ol style="list-style-type: none"> 1. www.edufind.com 2. www.myenglishpages.com 3. http://grammar.ccc.comment.edu 4. http://owl.english.prudue.edu
E-Text Books:
<ol style="list-style-type: none"> 1. http://bookboon.com/en/communication-ebooks-zip 2. http://www.bloomsbury-international.com/images/ezone/ebook/writing-skills-pdf.pdf 3. https://americanenglish.state.gov/files/ae/resource_files/developing_writing.pdf 4. http://learningenglishvocabularygrammar.com/files/idiomsandphraseswithmeaningsandexamplespdf.pdf 5. http://www.robinwood.com/Democracy/General Essays/CriticalThinking.pdf

PROBABILITY AND STATISTICS

II Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB12	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			
OBJECTIVES: The course should enable the students to: I. 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:
<ol style="list-style-type: none"> 1. Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons Publishers, 9th Edition, 2014. 2. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 42nd Edition, 2012.
Reference Books:
<ol style="list-style-type: none"> 1. S. C. Gupta, V. K. Kapoor, “Fundamentals of Mathematical Statistics”, S. Chand & Co., 10th Edition, 2000. 2. N. P. Bali, “Engineering Mathematics”, Laxmi Publications, 9th Edition, 2016. 3. Richard Arnold Johnson, Irwin Miller and John E. Freund, “Probability and Statistics for Engineers”, Prentice Hall, 8th Edition, 2013.
Web References:
<ol style="list-style-type: none"> 1. http://www.efunda.com/math/math_home/math.cfm 2. http://www.ocw.mit.edu/resources/#Mathematics 3. http://www.sosmath.com 4. http://www.mathworld.wolfram.com
E-Text Books:
<ol style="list-style-type: none"> 1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html 2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks

SEMICONDUCTOR PHYSICS

II Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB13	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes:45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			
OBJECTIVES: The course should enable the students to: I. 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.								

Text Books:

1. Dr. K Vijay Kumar and Dr. S Chandralingam, "Modern Engineering Physics" Volume-1&2, S Chand.Co, 2018.
2. Dr. M. N. Avadhanulu, Dr. P. G. Kshirsagar, "A Text Book of Engineering Physics", S. Chand.
3. B. K Pandey and S. Chaturvedi, "Engineering physics", Cengage learning.

Reference Books:

1. J. Singh, "Semiconductor Optoelectronics: Physics and Technology", McGraw-Hill Inc. (1995).
2. P. Bhattacharya, "Semiconductor Optoelectronic Devices", Prentice Hall of India (1997).
3. Monica Katiyar and Deepak Gupta on NPTEL.Online course: "Optoelectronic Materials and Devices".

Web References:

1. <http://link.springer.com/book>
2. <http://www.thphys.physics.ox.ac.uk>
3. <http://www.sciencedirect.com/science>
4. <http://www.e-booksdirectory.com>

E-Text Books:

1. <http://www.peaceone.net/basic/Feynman/>
2. <http://physicsdatabase.com/free-physics-books/>
3. <http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf>
4. <http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html>

PROGRAMMING FOR PROBLEM SOLVING

I Semester: AE / ME II Semester: CSE / IT / ECE / EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB01	Foundation	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Learn adequate knowledge by problem solving techniques. II. Understand programming skills using the fundamentals and basics of C Language. III. Improve problem solving skills using arrays, strings, and functions. IV. Understand the dynamics of memory by pointers. V. Study files creation process with access permissions.								
MODULE - I	INTRODUCTION						Classes: 10	
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						Classes: 08	
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						Classes: 10	
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						Classes: 09	
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:		
1. Byron Gottfried, "Programming with C", Schaum's Outlines Series, McGraw Hill Education, 3 rd Edition, 2017. 2. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education, 6 th Edition, 2012.		
Reference Books:		
1. W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2 nd Edition, 1988. 2. Yashavant Kanetkar, "Exploring C", BPB Publishers, 2 nd Edition, 2003. 3. Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4 th Edition, 2014. 4. R. S. Bichkar, "Programming with C", Universities Press, 2 nd Edition, 2012. 5. Dey Pradeep, Manas Ghosh, "Computer Fundamentals and Programming in C", Oxford University Press, 2 nd Edition, 2006. 6. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4 th Edition, 2014.		
Web References:		
1. https://www.bfoit.org/itp/Programming.html 2. https://www.khanacademy.org/computing/computer-programming 3. https://www.edx.org/course/programming-basics-iitbombayx-cs101-1x-0 4. https://www.edx.org/course/introduction-computer-science-harvardx-cs50x		
E-Text Books:		
1. http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download.htm 2. http://www.imada.sdu.dk/~svalle/courses/dm14-2005/mirror/c/ 3. http://www.enggnotebook.weebly.com/uploads/2/2/7/1/22718186/ge6151-notes.pdf		
MOOC Course		
1. https://www.alison.com/courses/Introduction-to-Programming-in-c 2. http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s096-effective-programming-in-c-and-c-january-iap-2014/index.htm		

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

I Semester: ECE / EEE /CE II Semester: AE / CSE / IT / ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB08	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 24			Total Classes: 24			
OBJECTIVES: The course enables the students to: I. Improve their ability to listen and comprehend a given text. II. Upgrade the fluency and acquire a functional knowledge of English Language. III. Enrich thought process by viewing a problem through multiple angles.								
LIST OF ACTIVITIES								
Week-1	LISTENING SKILL							
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.								
Week-2	LISTENING SKILL							
a. Listening to films of short duration and monologues for taking notes; Listening to answer multiple choice questions. b. Listening to telephonic conversations; Listening to native Indian: Abdul Kalam, British: Helen Keller and American: Barrack Obama speakers to analyze intercultural differences – Testing.								
Week-3	SPEAKING SKILL							
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.								
Week-4	SPEAKING SKILL							
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.								
Week-5	SPEAKING SKILL							
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.								
Week-6	READING SKILL							
a. Intonation. b. Reading newspaper and magazine articles; Reading selective autobiographies for critical commentary.								

Week-7	READING SKILL
a. Improving pronunciation through tongue twisters. b. Reading advertisements, pamphlets; Reading comprehension exercises with critical and analytical questions based on context.	
Week-8	WRITING SKILL
a. Listening to inspirational short stories. b. Writing messages, leaflets, Notice; Writing tasks; Flashcards – Exercises.	
Week-9	WRITING SKILL
a. Write the review on a video clipping of short duration (5 to 10minutes). b. Write a slogan related to the image; Write a short story of 6-10 lines based on the hints given.	
Week-10	WRITING SKILL
a. Minimizing Mother Tongue Influence to improve fluency through watching educational videos. b. Writing practices – précis writing; Essay writing.	
Week-11	THINKING SKILL
a. Correcting common errors in day to day conversations. b. Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms, proverbs.	
Week-12	THINKING SKILL
a. Correcting common errors in day to day conversations. b. Making pictures and improvising diagrams to form English words, phrases and proverbs.	
Reference Books:	
1. Meenakshi Raman, Sangeetha Sharma, “Technical Communication Principles and Practices”, Oxford University Press, New Delhi, 3 rd Edition, 2015. 2. Rhirdion, Daniel, “Technical Communication”, Cengage Learning, New Delhi, 1 st Edition, 2009.	
Web References:	
1. http://learnenglish.britishcouncil.org 2. http://www.esl-lab.com/ 3. http://www.elllo.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								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB10	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
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.								

Week-10	PLANK'S CONSTANT
Determination of Plank's constant using LED.	
Week-11	LIGHT EMITTING DIODE
Studying V-I characteristics of LED	
Week-12	NEWTONS RINGS
Determination of radius of curvature of a given plano-convex lens.	
Week-13	SINGLE SLIT DIFFRACTION
Determination of width of a given single slit.	
Manuals:	
1. C. L. Arora, "Practical Physics", S. Chand & Co., New Delhi, 3 rd Edition, 2012. 2. Vijay Kumar, Dr. T. Radhakrishna, "Practical Physics for Engineering Students", S M Enterprises, 2 nd Edition, 2014.	
Web Reference:	
http://www.iare.ac.in	

PROGRAMMING FOR PROBLEM SOLVING LABORATORY

I Semester: AE / ME II Semester: CSE / IT / ECE / EEE / CE																		
Course Code	Category	Hours / Week			Credits	Maximum Marks												
ACSB02	Foundation	L	T	P	C	CIA	SEE	Total										
		-	-	4	2	30	70	100										
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 of computing problems in real world.																		
LIST OF EXPERIMENTS																		
Week-1	OPERATORS AND EVALUATION OF EXPRESSIONS																	
a. Write a C program to check whether a number is even or odd using ternary operator.																		
b. Write a C program to perform the addition of two numbers without using +operator.																		
c. Write a C program to evaluate the arithmetic expression ((a + b / c * d - e) * (f - g)). Read the values a, b, c, d, e, f, g from the standard input device.																		
d. Write a C program to find the sum of individual digits of a 3 digit number.																		
e. Write a C program to read the values of x and y and print the results of the following expressions in one line:																		
i. (x + y) / (x -y)																		
ii. (x + y)(x - y)																		
Week-2	CONTROL STRUCTURES																	
a. Write a C program to find the sum of individual digits of a positive integer.																		
b. A Fibonacci sequence is defined as follows: The first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of 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><tr><td>Characters</td><td>ASCII values</td></tr><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></table>									Characters	ASCII values	A–Z	65 –90	a – z	97 –122	0 – 9	48 – 57	Special symbols	0 – 47, 58 – 64, 91 – 96, 123 –127
Characters	ASCII values																	
A–Z	65 –90																	
a – z	97 –122																	
0 – 9	48 – 57																	
Special symbols	0 – 47, 58 – 64, 91 – 96, 123 –127																	
e. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Write a C program to determine how much profit or loss incurred in percentage.																		

Week-3	CONTROL STRUCTURES
<p>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).</p> <p>b. Write a C program to calculate the following sum: $\text{sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$</p> <p>c. Write a C program to find the roots of a quadratic equation.</p> <p>d. Write a C program to check whether a given 3 digit number is Armstrong number or not.</p> <p>e. Write a C program to print the numbers in triangular form</p> <pre> 1 1 2 1 2 3 1 2 3 4 </pre>	
Week-4	ARRAYS
<p>a. Write a C program to find the second largest integer in a list of integers.</p> <p>b. Write a C program to perform the following:</p> <ol style="list-style-type: none"> Addition of two matrices Multiplication of two matrices <p>c. Write a C program to count and display positive, negative, odd and even numbers in an array.</p> <p>d. Write a C program to merge two sorted arrays into another array in a sorted order.</p> <p>e. Write a C program to find the frequency of a particular number in a list of integers.</p>	
Week-5	STRINGS
<p>a. Write a C program that uses functions to perform the following operations:</p> <ol style="list-style-type: none"> To insert a sub string into a given main string from a given position. To delete n characters from a given position in a given string. <p>b. Write a C program to determine if the given string is a palindrome or not.</p> <p>c. Write a C program to find a string within a sentence and replace it with another string.</p> <p>d. Write a C program that reads a line of text and counts all occurrence of a particular word.</p> <p>e. Write a C program that displays the position or index in the string S where the string T begins, or 1 if S doesn't contain T.</p>	
Week-6	FUNCTIONS
<p>a. Write C programs that use both recursive and non-recursive functions</p> <ol style="list-style-type: none"> To find the factorial of a given integer. To find the greatest common divisor of two given integers. <p>b. Write C programs that use both recursive and non-recursive functions</p> <ol style="list-style-type: none"> To print Fibonacci series. To solve towers of Hanoi problem. <p>c. Write a C program to print the transpose of a given matrix using function.</p> <p>d. Write a C program that uses a function to reverse a given string.</p>	
Week-7	POINTERS
<p>a. Write a C program to concatenate two strings using pointers.</p> <p>b. Write a C program to find the length of string using pointers.</p> <p>c. Write a C program to compare two strings using pointers.</p> <p>d. Write a C program to copy a string from source to destination using pointers.</p> <p>e. Write a C program to reverse a string using pointers.</p>	

Week-8	STRUCTURES AND UNIONS
<p>a. Write a C program that uses functions to perform the following operations:</p> <ol style="list-style-type: none"> Reading a complex number Writing a complex number Addition and subtraction of two complex numbers Multiplication of two complex numbers. Note: represent complex number using a structure. <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	
Week-9	ADDITIONAL PROGRAMS
<p>a. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\dots+x^n$. For example: if n is 3 and x is 5, then the program computes $1+5+25+125$. Print x, n, the sum. Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if $n < 0$, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.</p> <p>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.</p> <p>c. Write a C program to convert a Roman numeral to its decimal equivalent. E.g. Roman number CD is equivalent to 400.</p>	
Week-10	PREPROCESSOR DIRECTIVES
<p>a. Define a macro with one parameter to compute the volume of a sphere. Write a C program using this macro to compute the volume for spheres of radius 5, 10 and 15 meters.</p> <p>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.</p> <p>c. Write symbolic constants for the binary arithmetic operators +, -, *, and /. Write a C program to illustrate the use of these symbolic constants.</p>	
Week-11	FILES
<p>a. Write a C program to display the contents of a file.</p> <p>b. Write a C program to copy the contents of one file to another.</p> <p>c. Write a C program to reverse the first n characters in a file, where n is given by the user.</p> <p>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.</p> <p>e. Write a C program to count the no. of characters present in the file.</p>	

Week-12	COMMAND LINE ARGUMENTS AND NUMERICAL METHODS
a. Write a C program to read two numbers at the command line and perform arithmetic operations on it. b. Write a C program to read a file name at the command line and display its contents. c. Write a C program to solve numerical methods problems (root finding, numerical differentiation and numerical integration)	
Reference Books:	
1. Yashavant Kanetkar, “Let Us C”, BPB Publications, New Delhi, 13 th Edition, 2012. 2. Oualline Steve, “Practical C Programming”, O’Reilly Media, 3 rd Edition, 1997. 3. King KN, “C Programming: A Modern Approach”, Atlantic Publishers, 2 nd Edition, 2015. 4. Kochan Stephen G, “Programming in C: A Complete Introduction to the C Programming Language”, Sam’s Publishers, 3 rd Edition, 2004. 5. Linden Peter V, “Expert C Programming: Deep C Secrets”, Pearson India, 1 st Edition, 1994.	
Web References:	
1. http://www.sanfoundry.com/c-programming-examples 2. http://www.geeksforgeeks.org/c 3. http://www.cprogramming.com/tutorial/c 4. http://www.cs.princeton.edu	

ENGINEERING GRAPHICS AND DESIGN LABORATORY

I Semester: ECE / EEE / CE II Semester: AE / ME / CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEB02	Foundation	L	T	P	C	CIA	SEE	Total
		1	-	4	3	30	70	100
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 ofPrism, 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	
1. N. D. Bhatt (2012), “Engineering Drawing”, Charotar Publications, New Delhi, 49 th Edition, 2010. 2. C.M. Agarwal, Basant Agarwal, “Engineering Drawing”, Tata McGrawHill, 2 nd Edition, 2013.	
Reference Books:	
1.K. Venugopal, “Engineering Drawing and Graphics”. New Age Publications, 2 nd Edition, 2010. 2.Dhananjay. A. Johle, “Engineering Drawing”, Tata McGraw Hill, 1 st Edition, 2008. 3.S.Trymbaka Murthy, “Computer Aided Engineering Drawing”, I.K. International Publishers, 3 rd Edition, 2011. 4.A. K. Sarkar, A.P Rastogi, “Engineering graphics with Auto CAD”, PHI Learning, 1 st Edition, 2010.	
Web References:	
1. http://nptel.ac.in/courses/112103019 2. http://www.autocadtutorials.net/ 3. http://gradcab.com/questions/tutorial-16-for -beginner-engineering-drawing-I	
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								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AECB05	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		
OBJECTIVES: The course should enable the students to: I. 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					Classes: 09		
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)					Classes: 09		
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					Classes: 09		
Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code. Boolean Algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.								
MODULE-IV	MINIMIZATION OF BOOLEAN FUNCTIONS					Classes: 09		
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					Classes: 09		
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:
<ol style="list-style-type: none"> 1. Electronic Devices and Circuits - Jacob Millman, McGraw Hill Education, 2017 2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, Pearson, 2009. 3. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge, 2010. 4. Modern Digital Electronics – R. P. Jain, 3rd Edition, Tata McGraw-Hill, 2007.
Reference Books:
<ol style="list-style-type: none"> 1. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 Ed., McGraw Hill, 2008. 2. Electronic Devices and Circuits, S. Salivahanan, N.Suresh Kumar, A Vallvaraj, 2nd Edition, TMH. 3. Digital Design- Morris Mano, PHI, 4th Edition,2006 4. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed,John Wiley & Sons Inc.
Web References:
<ol style="list-style-type: none"> 1. http://www-mdp.eng.cam.ac.uk/web/library/enginfo/electrical/hong1.pdf 2. https://archive.org/details/ElectronicDevicesCircuits 3. http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASIC ELECTRONICS/home_page.htm 4. mcsbzu.blogspot.com 5. http://books.askvenkat.com 6. http://worldclassprogramme.com
E-Text Books:
<ol style="list-style-type: none"> 1. http://services.eng.uts.edu.au/pmcl/ec/Downloads/LectureNotes.pdf 2. http://nptel.ac.in/courses/122106025/ 3. http://www.freebookcentre.net/electronics-ebooks-download/Electronic-Devices-and-Circuits-(PDF-313p).html 4. https://books.google.co.in/books/about/Switching_Theory_and_Logic_Design 5. https://www.smartzworld.com/notes/switching-theory-and-logic-design-stld 6. https://www.researchgate.net/.../295616521_Switching_Theory_and_Logic_Design

DATA STRUCTURES

III Semester: CSE / IT / ECE / ME / CE IV Semester: AE / EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB03	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The students will try to learn: I. To provide students with skills needed to understand and analyze performance trade-offs of different algorithms / implementations and asymptotic analysis of their running time and memory usage. II. To provide knowledge of basic abstract data types (ADT) and associated algorithms: stacks, queues, lists, tree, graphs, hashing and sorting, selection and searching. III. The fundamentals of how to store, retrieve, and process data efficiently. IV. To provide practice by specifying and implementing these data structures and algorithms in Python. V. Understand essential for future programming and software engineering courses.								
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; Algorithm Specification, Recursive algorithms, Data Abstraction, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big O, Omega, and Theta notations. Introduction to Linear and Non Linear data structures, Searching techniques: Linear and Binary search; Sorting techniques: Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort and comparison of sorting algorithms.								
MODULE - II	LINEAR DATA STRUCTURES					Classes: 09		
Stacks: Stack ADT, definition and operations, Implementations of stacks using array, 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, linked list representation and operations of 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, threaded binary trees, application of trees, Graphs: Basic concept, graph terminology, Graph Representations - Adjacency matrix, Adjacency lists, graph implementation, Graph traversals – BFS, DFS, Application of graphs, Minimum spanning trees – Prims and Kruskal algorithms.								
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:

1. Rance D. Necaie, “Data Structures and Algorithms using Python”, Wiley Student Edition.
2. Benjamin Baka, David Julian, “Python Data Structures and Algorithms”, Packt Publishers, 2017.

Reference Books:

1. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition, 2008.
2. D. Samanta, “Classic Data Structures”, PHI Learning, 2nd Edition, 2004.

Web References:

1. https://www.tutorialspoint.com/data_structures_algorithms/algorithms_basics.htm
2. <https://www.codechef.com/certification/data-structures-and-algorithms/prepare>
3. https://www.cs.auckland.ac.nz/software/AlgAnim/ds_ToC.html
4. <https://online-learning.harvard.edu/course/data-structures-and-algorithms>

DISCRETE MATHEMATICAL STRUCTURES

III Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB04	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			
OBJECTIVES:								
The course should enable the students to:								
I. 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						Classes: 10	
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						Classes: 09	
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						Classes: 09	
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						Classes: 09	
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						Classes: 08	

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:

1. J. P. Tremblay, R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, India, 1st Edition, 1997.
2. Joe L. Mott, Abraham Kandel, Theodore P. Baker, –Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall of India Learning Private Limited, New Delhi, India, 2nd Edition, 2010.

Reference Books:

1. Kenneth H. Rosen, –Discrete Mathematics and Its Applications, Tata McGraw-Hill, New Delhi, India, 6th Edition, 2012.
2. C. L. Liu, D. P. Mohapatra, –Elements of Discrete Mathematics, Tata McGraw-Hill, India, 3rd Edition, 2008.
3. Ralph P. Grimaldi, B. V. Ramana, –Discrete and Combinatorial Mathematics - An Applied Introduction, Pearson Education, India, 5th Edition, 2011.
4. D. S. Malik, M. K. Sen, –Discrete Mathematical Structures: Theory and Applications, Thomson Course Technology, India, 1st Edition, 2004.

Web References:

1. <http://www.web.stanford.edu/class/cs103x>
2. http://www.cs.odu.edu/~cs381/cs381content/web_course.html
3. <http://www.cse.iitd.ernet.in/~bagchi/courses/discrete-book>
4. <http://www.saylor.org/course/cs202/>
5. <http://www.nptel.ac.in/courses/106106094/>
6. http://www.tutorialspoint.com/discrete_mathematics
7. <http://www.dmtcs.org/dmtcs-ojs/index.php/dmtcs>

E-Text Books:

1. <https://people.eecs.berkeley.edu/~daw/teaching/cs70-s05/>
2. <http://home.anadolu.edu.tr/~eakyar/dersler/ayrik/kitap/kitap.pdf>
3. <http://45.63.83.30/graph-theory-keijo-ruohonen-pdf-tut.pdf>
4. <http://www.zib.de/groetschel/teaching/WS1314/BondyMurtyGTWA.pdf>

OBJECT ORIENTED PROGRAMMING THROUGH PYTHON

III Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB01	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the 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:								
1. R Nageswara Rao, “Core Python Programming”, Dreamtech press, 2017 Edition.								
2. Dusty Philips, “Python 3 Object Oriented Programming”, PACKT Publishing, 2 nd Edition, 2015.								

Reference Books:
1. Michael H. Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1 st Edition, 2007.
Web References:
1 https://realpython.com/python3-object-oriented-programming/ 2 https://python.swaroopch.com/oop.html 3 https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html 4 https://www.programiz.com/python-programming/

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

III Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB14	HSMC	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the 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:

1. Aryasri, “Managerial Economics and Financial Analysis”, TMH publications, 4th Edition, 2012.
2. M. Kasi Reddy, Saraswathi, “Managerial Economics and Financial Analysis”, PHI Publications, New Delhi, 2nd Edition, 2012.
3. Varshney, Maheswari, “Managerial Economics”, Sultan Chand Publications, 11th Edition, 2009.

Reference Books:

1. S. A. Siddiqui, A. S. Siddiqui, “Managerial Economics and Financial Analysis”, New Age International Publishers, Hyderabad, Revised 1st Edition, 2013.
2. S. N. Maheswari, S. K. Maheswari, “Financial Accounting”, Vikas publications, 3rd Edition, 2012.
3. J. V. Prabhakar Rao, P. V. Rao, “Managerial Economics and Financial Analysis”, Maruthi Publishers, Reprinted Edition, 2011.
4. Vijay Kumar, Appa Rao, “Managerial Economics and Financial Analysis”, Cengage Publications, 1st Edition, Paperback, 2011.

Web References:

1. [https:// www.slideshare.net/glory1988/managerial-economics-and- financial analysis](https://www.slideshare.net/glory1988/managerial-economics-and-financial-analysis)
2. [https:// thenthata.web4kurd.net/mypdf/managerial-economics-and- financial analysis](https://thenthata.web4kurd.net/mypdf/managerial-economics-and-financial-analysis)
3. [https:// bookshallcold.link/pdfread/managerial-economics-and-financial analysis](https://bookshallcold.link/pdfread/managerial-economics-and-financial-analysis)
4. [https:// www.gvpce.ac.in/syllabi/Managerial Economics and financial analysis](https://www.gvpce.ac.in/syllabi/Managerial%20Economics%20and%20financial%20analysis)

E-Text Book:

1. [https:// books.google.co.in/books/about/Managerial economics and financial analysis](https://books.google.co.in/books/about/Managerial_economics_and_financial_analysis)
2. [http://www. ebooktake.in/pdf/title/managerial-economics-and-financial analysis](http://www.ebooktake.in/pdf/title/managerial-economics-and-financial-analysis)
3. [http://all4ryou.blogspot.in/2012/06/mefa-managerial-economics and financial analysis](http://all4ryou.blogspot.in/2012/06/mefa-managerial-economics-and-financial-analysis)
4. [http://books.google.com/books/about/Managerial economics and financial analysis](http://books.google.com/books/about/Managerial_economics_and_financial_analysis)
5. <http://www.scribd.com/doc/37684926>

DATA STRUCTURES LABORATORY

III Semester: ME / CSE / IT / ECE / CE IV Semester AE / EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB05	Core	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
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: a. To find the biggest of given n numbers using control statements and lists b. To print the Fibonacci series using functions c. 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. a. Linear search b. Binary search								
Week -3	SORTING TECHNIQUES							
Write Python programs for implementing the following sorting techniques to arrange a list of integers in ascending order. a. Bubble sort b. Insertion sort c. Selection sort								
Week -4	IMPLEMENTATION OF STACK AND QUEUE							
Write Python programs to for the following: a. Design and implement Stack and its operations using List. b. Design and implement Queue and its operations using List.								
Week -5	APPLICATIONS OF STACK							
Write Python programs for the following: a. Uses Stack operations to convert infix expression into postfix expression. b. Uses Stack operations for evaluating the postfix expression.								

Week-6	IMPLEMENTATION OF SINGLE LINKED LIST
Write Python programs for the following operations on Single Linked List. (i) Creation (ii) insertion (iii) deletion (iv) traversal	
Week -7	IMPLEMENTATION OF CIRCULAR SINGLE LINKED LIST
Write Python programs for the following operations on Circular Linked List. (i) Creation (ii) insertion (iii) deletion (iv) traversal	
Week -8	IMPLEMENTATION OF DOUBLE LINKED LIST
Write Python programs for the following operations on Double Linked List. (i) Creation (ii) insertion (iii) deletion (iv) traversal in both ways.	
Week -9	IMPLEMENTATION OF STACK USING LINKED LIST
Write a Python program to implement Stack using linked list.	
Week -10	IMPLEMENTATION OF QUEUE USING LINKED LIST
Write a Python program to implement Linear Queue using linked list.	
Week -11	GRAPH TRAVERSAL TECHNIQUES
Write Python programs to implement the following graph traversal algorithms: a. Depth first search. b. Breadth first search.	
Week -12	IMPLEMENTATION OF BINARY SEARCH TREE
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.	
LIST OF REFERENCE BOOKS:	
1. Rance D. Necaise, "Data Structures and Algorithms using Python", Wiley, John Wiley & Sons, INC., 2011. 2. Benjamin Baka, David Julian, "Python Data Structures and Algorithms", Packt Publishing Ltd., 2017.	
WEB REFERENCES:	
1. https://docs.python.org/3/tutorial/datastructures.html 2. http://interactivepython.org/runestone/static/pythonds/index.html 3. http://www.tutorialspoint.com/data_structures_algorithms 4. http://www.geeksforgeeks.org/data-structures/ 5. http://www.studytonight.com/data-structures/ 6. http://www.coursera.org/specializations/data-structures-algorithms 7. http://cse01-iiith.vlabs.ac.in/	

C++ STANDARD TEMPLATE LIBRARY

III Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB06	Core	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
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.								
II. 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								
4 3 3 3 3 3 4								
4 3 2 2 2 3 4								
4 3 2 1 2 3 4								
4 3 2 2 2 3 4								
4 3 3 3 3 3 4								
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								

5 4
1 2 3 4 5
Sample Output
5 1 2 3 4

- 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
- ```
26
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
<p>a. You will be given Q queries. Each query is of one of the following three types:</p> <ol style="list-style-type: none"> 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). <p>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.</p> <p>Sample Input</p> <pre>8 1 9 1 6 1 10 1 4 3 6 3 14 2 6 3 6</pre> <p>Sample Output</p> <pre>Yes No No</pre> <p>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.</p>	
Week -5	SORTINGS AND PAIRS
<p>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.</p> <p>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.</p>	
Week-6	ARRAYS AND LISTS
<p>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).</p> <p>Input:</p> <pre>6 3 1 0 0 5 5</pre> <p>Output:</p> <pre>4</pre>	

Week -7	MULTISET AND MULTIMAPS
<p>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".</p> <p>Input: 4 11 12 13 14 Output: NOT READY</p>	
Week -8	UNORDERED SETS
<p>a. You are given two lists of N distinct numbers. Sort both the list and print them alternatively starting with list one.</p> <p>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</p>	
Week -9	SET UNION AND INTERSECTION
<p>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.</p> <p>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</p>	
Week -10	IMPLEMENTATION OF QUEUE USING LINKED LIST
<p>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.</p> <p>Input: 4 "John", "Bob", "Mary", "Serena" 4 "Jim", "Mary", "John", "Bob" Output: Attending First subject but not second: Serena Attending Second subject but not first: Jim</p>	

Week -11	PERMUTATIONS
<p>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.</p> <p>For example: a team contains 'ab' java programmers and 'cde' python programmers</p> <p>(a, b) (c, d, e) (b,a) (c, e, d) (d, c, e) (d, e, c) (e, c, d) (e, d, c)</p> <p>So, total ways are = 12</p> <p>Sample Input: ab cde</p> <p>Sample Output:</p> <p>abcde abced abdce abdec abecd abedc bacde baced badce badec baecd baedc</p>	
Week -12	LEXICOGRAPHICAL
<p>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.</p> <p>For example: Input: 4 abacus apple car abba Output: abacus</p>	
Reference Books:	
<ol style="list-style-type: none"> 1. Bjarne Stroustrup , “Programming: Principles and Practice Using C++” 2nd Edition, 2014. 2. Herbert Schildt, “C++: The Complete Reference”, 4th Edition, 2017. 	

Web References:

1. <https://www.sanfoundry.com/cpp-programming-examples-stl/>
2. <https://www.geeksforgeeks.org/the-c-standard-template-library-stl/>
3. https://www.tutorialspoint.com/cplusplus/cpp_stl_tutorial.htm
4. <http://www.cplusplus.com/reference/stl/>

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 60 STUDENTS:**HARDWARE:**

Desktop systems: 30 nos

Printers: 02

SOFTWARE:

System Software: Windows 7.

Application Software's: MS Office.

Programming Languages: Borland C++ (open Source).

IT WORKSHOP

III Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB02	Core	L	T	P	C	CIA	SEE	Total
		1	0	2	2	30	70	100
Contact Classes: 12	Tutorial Classes: Nil	Practical Classes: 24			Total Classes: 36			
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							
preadsheet 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	
Week-8	WEBPAGES CREATION AND DESIGNING
HTML, creating simple web pages, images and links, design of web pages	
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.	
Week-9	WEB DESIGN FOR SAMPLE PROJECT
Create a webpage with HTML describing your department. Use paragraph and list tags.	
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.	
Create links on the words e.g. “Wi-Fi” and “LAN” to link them to Wikipedia pages.	
Insert an image and create a link such that clicking on image takes user to other page.	
Change the background color of the page.	
At the bottom create a link to take user to the top of the page.	
Week-10	NETWORK CONNECTIVITY
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.	
Week-11	SURFING THE WEB
Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers.	
Week-12	ROUTER CONFIGURATION
Cabling a network using CCNA, basic and challenge router configuration, subnetting, practical test router connections and settings, troubleshooting challenges	
Reference Books:	
1 Introduction to Information Technology, ITL Education Solutions limited, Pearson Education India, 2005 2 LaTeX Companion – Leslie Lamport, PHI/Pearson. 3 David Anfinson and Ken Quamme, IT Essentials: PC Hardware and Software Companion Guide, Third Edition, Cisco Press, 2008	
Web References:	
1 https://www.latex-tutorial.com/tutorials/ 2 https://tutorial.techaltum.com/webdesigning.html	
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								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB07	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the 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.								

Text Books:

1. M. Morris Mano, “Computer Systems Architecture”, Pearson, 3rd Edition, 2015.
2. John D. Carpinelli, “Computer Systems Organization and Architecture”, Pearson, 1st Edition, 2001.
3. Patterson, Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Morgan Kaufmann, 5th Edition, 2013.

Reference Books:

1. John. P. Hayes, “Computer System Architecture”, McGraw-Hill, 3rd Edition, 1998.
2. Carl Hamacher, Zvonko G Vranesic, Safwat G Zaky, “Computer Organization”, McGraw-Hill, 5th Edition, 2002.
3. William Stallings, “Computer Organization and Architecture”, Pearson Edition, 8th Edition, 2010.

Web References:

1. https://www.tutorialspoint.com/computer_logical_organization/
2. <https://www.courseera.org/learn/comparch>
3. <https://www.cssimplified.com/.../computer-organization-and-assembly-language-programming>

E-Text Books:

1. <https://www.groupe.polymtl.ca/inf2610/.../ComputerSystemBook.pdf>
2. <https://www.cse.hcmut.edu.vn/~vtphuong/KTMT/Slides/TextBookFull.pdf>

THEORY OF COMPUTATION

IV Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB03	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			
OBJECTIVES:								
The course should enable the students to:								
I. 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: 09	
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: 08	
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: 09	
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:
John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, “Introduction to Automata, Theory, Languages and Computation”, Pearson Education, 3 rd Edition, 2007.
Reference Books:
<ol style="list-style-type: none"> 1. John C Martin, “Introduction to Languages and Automata Theory”, Tata McGraw-Hill, 3rd Edition, 2017. 2. Daniel I.A. Cohen, “Introduction to Computer Theory”, John Wiley & Sons, 2nd Edition, 2004.
Web References:
<ol style="list-style-type: none"> 1. https://www.tutorialspoint.com/automata_theory/index.htm 2. https://www.iitg.ernet.in/dgoswami/Flat-Notes.pdf
E-Text Books:
<ol style="list-style-type: none"> 1. https://freefundkenotes.files.wordpress.com/2014/02/toc-klp-mishra.pdf
MOOC Course
<ol style="list-style-type: none"> 1. http://nptel.ac.in/courses/111103016/ 2. http://nptel.ac.in/courses/106106049/ 3. http://onlinevideolecture.com/?course_id=1312 4. http://www.nptelvideos.in/2012/11/theory-of-computation.html

OPERATING SYSTEMS

IV Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB04	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the 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	Classes: 08
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:		
<ol style="list-style-type: none"> 1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Principles”, Wiley Student Edition, 8th Edition, 2010. 2. William Stallings, “Operating System- Internals and Design Principles”, Pearson Education, 6th Edition, 2002. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Andrew S Tanenbaum, “Modern Operating Systems”, PHI, 3rd Edition, 2007. 2. D. M. Dhamdhare, “Operating Systems a Concept based Approach”, Tata McGraw-Hill, 2nd Edition, 2006. 		
Web References:		
<ol style="list-style-type: none"> 1. www.smartworld.com/notes/operatingsystems 2. www.technofest2u.blogspot.com 3. https://nptel.ac.in/courses/106106144/ 		
E-Text Books:		
<ol style="list-style-type: none"> 1. https://it325blog.files.wordpress.com/2012/09/operating-system-concepts-7-th-edition.pdf 2. http://mpathinveco.blog.com/2014/11/25/operating-systems-william-stalling-6th-edition/ 3. http://www.e-booksdirectory.com/details.php?ebook=10050 4. http://www.e-booksdirectory.com/details.php?ebook=9907 5. http://www.e-booksdirectory.com/details.php?ebook=9460 		

DESIGN AND ANALYSIS OF ALGORITHMS

IV Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB05	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			
OBJECTIVES: The course should enable the students to: I. 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.								

MODULE -V	NP-HARD AND NP-COMPLETE PROBLEMS	Classes:09
Basic concepts: Non-deterministic algorithms, the classes NP - Hard and NP, NP Hard problems, clique decision problem, chromatic number decision problem, Cook's theorem.		
Text Books:		
1. Ellis Horowitz, Satraj Sahni, Sanguthevar Rajasekharan, —Fundamentals of Computer Algorithms, Universities Press, 2nd Edition, 2015. 2. Alfred V. Aho, John E. Hopcroft, Jeffrey D, —The Design And Analysis Of Computer Algorithms, Pearson India, 1st Edition, 2013.		
Reference Books:		
1. Levitin A, —Introduction to the Design and Analysis of Algorithms, Pearson Education, 3rd Edition, 2012. 2. Goodrich, M. T. R Tamassia, —Algorithm Design Foundations Analysis and Internet Examples, John Wiley and Sons, 1st Edition, 2001. 3. Base Sara Allen Vangelder, —Computer Algorithms Introduction to Design and Analysis, Pearson, 3rd Edition, 1999.		
Web References:		
1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html 2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms 3. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html		
E-Text Books:		
1. http://ebook/com/item/introduction_to_the_design_and_analysis_of_algorithms_3rd_editionananylevitin/ 2. https://drive.google.com/file/d/0B_Y1VbyboEDBDVxVXpVbnk4TVE/edit?pref=2&pli=1 3. http://www.amazon.com/Computer-Algorithms-Introduction-Design-Analysis/dp/0201612445		
MOOC Course		
1. https://www.coursera.org/learn/algorithm-design-analysis 2. http://www.online.stanford.edu/course/algorithms-design-and-analysis-part-1 3. https://www.onlinecourses.nptel.ac.in/noc16_cs04/preview		

DATABASE MANAGEMENT SYSTEMS

IV Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB08	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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, Mata 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 st , 2 nd and 3rd normal forms, Basic definitions of MVDs and JDs, 4 th and 5 th normal forms								
MODULE -IV	TRANSACTION MANAGEMENT						Classes: 10	
Transaction processing: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability. Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity, Multiversion Schemes, Deadlock Handling. Recovery: Failure Classification, Storage Structure ,Recovery and Atomicity, Log-Based Recovery, Shadow Paging, Recovery With Concurrent Transactions Buffer Management								
MODULE -V	DATA STORAGE AND QUERY PROCESSING						Classes: 07	
Data storage: Overview of Physical Storage Media, Magnetic Disks, Storage Access, File Organization, Organization of Records in Files. Indexing and Hashing: Basic Concepts: Ordered Indices, B+-Tree Index Files, B-Tree Index Files, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing. Query Processing: Overview, Measures of Query Cost.								

Text Books:
1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill, 6 th Edition, 2017.
Reference Books:
1. Ramez Elmasri, Shamkant B. Navathe, "Fundamental Database Systems", Pearson Education, 6 th Edition, 2014. 2. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 3rd Edition, 2007. 3. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, "Database System Implementation", Pearson Education, United States, 1st Edition, 2000. 4. Peter Rob, Corlos Coronel, "Database System, Design, Implementation and Management", Thompson Learning Course Technology, 5th Edition, 2003
Web References:
1. https://www.youtube.com/results?search_query=DBMS+onlune+classes 2. http://www.w3schools.in/dbms/ 3. http://beginnersbook.com/2015/04/dbms-tutorial/
E-Text Books:
1. http://www.e-booksdirectory.com/details.php?ebook=10166 2. http://www.e-booksdirectory.com/details.php?ebook=7400re 3. https://docs.google.com/file/d/0B9aJA_iV4kHYM2dieHZhMHhyRVE/edit
MOOC Course
1. https://onlinecourses.nptel.ac.in/noc18_cs15/preview 2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/

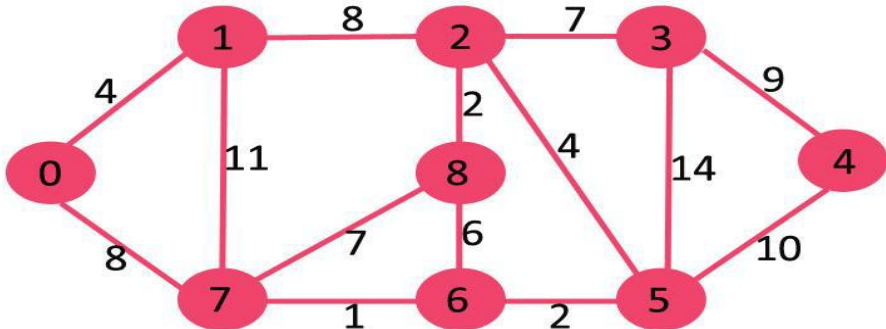
OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY

IV Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB06	Core	L	T	P	C	CIA	SEE	Total
		1	0	2	2	30	70	100
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								
Week-1	BASIC PROGRAMS							
a. 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.								
b. 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.								
c. 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.								
Week-2	MATRICES, OVERLOADING, OVERRIDING							
a. Write a java program to multiply two given matrices.								
b. Write a java program to implement method overloading and constructors overloading.								
c. Write a java program to implement method overriding.								
Week-3	PALINDROME, ABSTRACT CLASS							
a. Write a java program to check whether a given string is palindrome.								
b. Write a java program for sorting a given list of names in ascending order.								
c. 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.								
Week-4	INTERFACE							
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.								

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.	

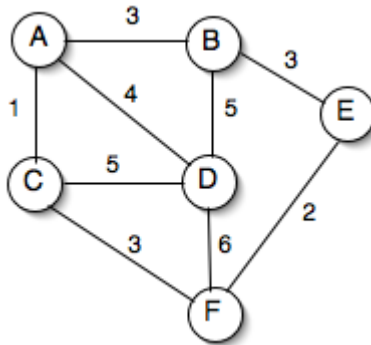
Week-13	APPLET
a. Develop an applet that displays a simple message. b. Develop an applet that receives an integer in one text field and computes its factorial value and returns it in another text field, when the button named –computell is clicked.	
Reference Books:	
1. P. J. Deitel, H. M. Deitel, –Java for Programmers, Pearson Education, PHI, 4 th Edition, 2007. 2. P. Radha Krishna, –Object Oriented Programming through Java, Universities Press, 2 nd Edition, 2007 3. Bruce Eckel, –Thinking in Java, Pearson Education, 4 th Edition, 2006. 4. Sachin Malhotra, Saurabh Chaudhary, –Programming in Java, Oxford University Press, 5 th Edition, 2010.	
Web References:	
1. www.niecdelhi.ac.in 2. https://www.linkedin.com/in/achin-jain-85061412 3. www.rank1infotech.com	
Course Home Page:	
<p>SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 24 STUDENTS:</p> <p>HARDWARE: Desktop Computer Systems: 24 nos.</p> <p>SOFTWARE: Java Development Kit (Open source)</p>	

DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

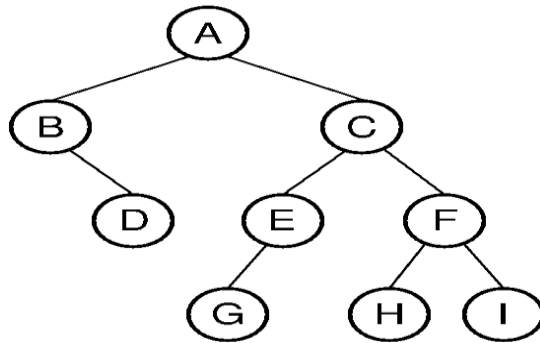
IV Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB07	Core	L	T	P	C	CIA	SEE	Total
		0	0	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36			Total Classes: 36			
OBJECTIVES:								
The course should enable the students to:								
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.								
								

Week-5**MINIMUM COST SPANNING TREE**

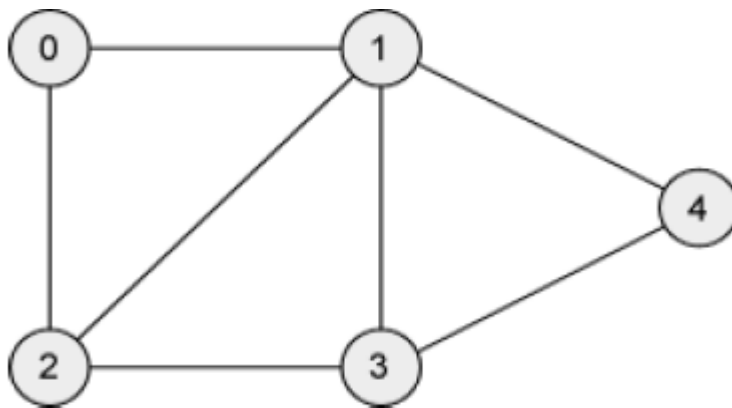
Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

**Week-6****TREE TRAVERSALS**

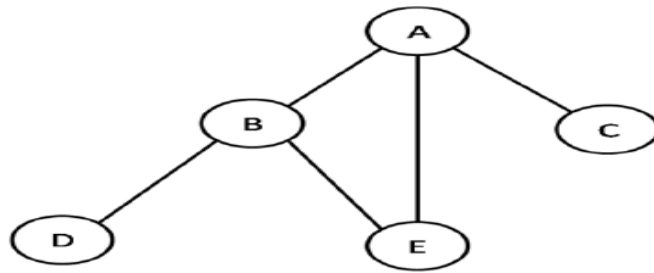
Perform various tree traversal algorithms for a given tree.

**Week-7****GRAPH TRAVERSALS**

a. Print all the nodes reachable from a given starting node in a digraph using BFS method.



b. Check whether a given graph is connected or not using DFS method.



Week-8 SUM OF SUB SETS PROBLEM

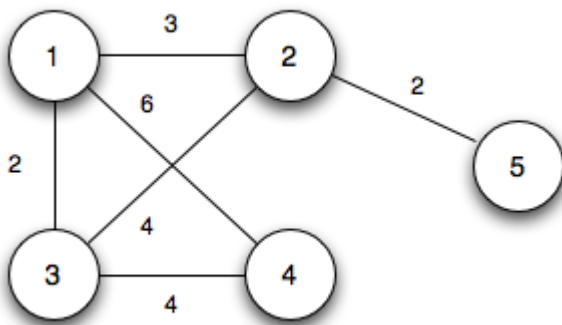
Find a subset of a given set $S = \{s_1, s_2, \dots, s_n\}$ of n positive integers whose sum is equal to a given positive integer d . For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$ there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. A suitable message is to be displayed if the given problem instance 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

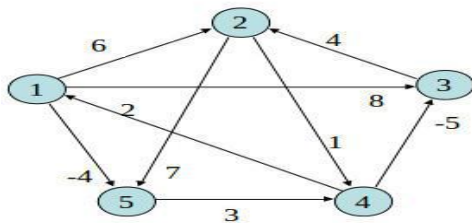
Week-10 MINIMUM COST SPANNING TREE

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



Week-11 ALL PAIRS SHORTEST PATHS

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



	1	2	3	4	5
1	0	6	8	∞	-4
2	∞	0	∞	1	7
3	∞	4	0	∞	∞
4	2	∞	-5	0	∞
5	∞	∞	∞	3	0

Week-12	N QUEENS PROBLEM
Implement N Queen's problem using Back Tracking.	
Reference Books:	
<ol style="list-style-type: none"> 1. Levitin A, —Introduction to the Design and Analysis of Algorithms, Pearson Education, 2008. 2. Goodrich, M.T. R Tomassia, —Algorithm Design foundations Analysis and Internet Examples, John Wiley and Sons, 2006. 3. Base Sara, Allen Van Gelder, —Computer Algorithms Introduction to Design and Analysis, Pearson, 3rd Edition, 1999. 	
Web Reference:	
<ol style="list-style-type: none"> 1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html 2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms 3. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html 	

DATABASE MANAGEMENT SYSTEMS LABORATORY

IV Semester: CSE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB09	Core	L	T	P	C	CIA	SEE	Total
		0	0	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

- I. Implement 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.

Name	Type
Empno	Number
Ename	Varchar2(20)
Job	Varchar2(20)
Mgr	Number
Sal	Number

- 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.

Name	Type
Deptno	Number
Deptname	Varchar2(20)
location	Varchar2(20)

- 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

Name	Type
Cust name	Varchar2(20)
Cust street	Varchar2(20)
Cust city	Varchar2(20)

- Insert records into the table.
- Add salary column to the table.
- Alter the table column domain.
- Drop salary column of the customer table.
- Delete the rows of customer table whose cust_city is 'hyd'.

Create a table called branch table.

Name	Type
Branch name	Varchar2(20)
Branch city	Varchar2(20)
asserts	Number

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

5. Create a table called sailor table

Name	Type
Sid	Number
Sname	Varchar2(20)
rating	Varchar2(20)

- Add column age to the sailor table.
- Insert values into the sailor table.
- Delete the row with rating > 8.
- Update the column details of sailor.
- Insert null values into the table.

6. Create a table called reserves table

Name	Type
Boat id	Integer
sid	Integer
day	Integer

- Insert values into the reserves table.
- Add column time to the reserves table.
- Alter the column day data type to date.
- Drop the column time in the table.
- Delete the row of the table with some condition.

Week -2	QUERIES USING DDL AND DML
<ol style="list-style-type: none"> <ol style="list-style-type: none"> Create a user and grant all permissions to the user. Insert the any three records in the employee table and use rollback. Check the result. Add primary key constraint and not null constraint to the employee table. Insert null values to the employee table and verify the result. <ol style="list-style-type: none"> Create a user and grant all permissions to the user. Insert values in the department table and use commit. Add constraints like unique and not null to the department table. Insert repeated values and null values into the table. <ol style="list-style-type: none"> Create a user and grant all permissions to the user. Insert values into the table and use commit. Delete any three records in the department table and use rollback. Add constraint primary key and foreign key to the table. <ol style="list-style-type: none"> Create a user and grant all permissions to the user. Insert records in the sailor table and use commit. Add save point after insertion of records and verify save point. Add constraints not null and primary key to the sailor table. <ol style="list-style-type: none"> Create a user and grant all permissions to the user. Use revoke command to remove user permissions. Change password of the user created. Add constraint foreign key and not null. <ol style="list-style-type: none"> Create a user and grant all permissions to the user. Update the table reserves and use savepoint and rollback. Add constraint primary key , foreign key and not null to the reserves table Delete constraint not null to the table column. 	
Week -3	QUERIES USING AGGREGATE FUNCTIONS
<ol style="list-style-type: none"> <ol style="list-style-type: none"> By using the group by clause, display the enames who belongs to deptno 10 along with average salary. Display lowest paid employee details under each department. Display number of employees working in each department and their department number. 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. List all employees which start with either B or C. Display only these ename of employees where the maximum salary is greater than or equal to 5000. <ol style="list-style-type: none"> Calculate the average salary for each different job. Show the average salary of each job excluding manager. Show the average salary for all departments employing more than three people. Display employees who earn more than the lowest salary in department 30 Show that value returned by sign (n) function. 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
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1.
 - a. Write a PL/SQL program to swap two numbers.
 - b. Write a PL/SQL program to find the largest of three numbers.
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 world 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																																			
<div>1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.</div> <div>2. Accept year as parameter and write a Function to return the total net salary spent for a given year.</div> <div>3. Create a function to find the factorial of a given number and hence find NCR.</div> <div>4. Write a PL/SQL block o pint prime Fibonacci series using local functions.</div> <div>5. Create a procedure to find the lucky number of a given birth date.</div> <div>6. Create function to the reverse of given number.</div>																																				
Week-6	TRIGGERS																																			
<div>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:</div> <div>CUSTOMERS table:</div> <table><tr><th>ID</th><th>NAME</th><th>AGE</th><th>ADDRESS</th><th>SALARY</th></tr><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></table> <div>2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.</div> <div>Passenger(Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) Not NULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) Not NULL);</div> <div>a. Write a Insert Trigger to check the Passport_id is exactly six digits or not.</div> <div>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.</div> <div>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.</div> <div>4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.</div> <div>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.</div> <div>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.</div>		ID	NAME	AGE	ADDRESS	SALARY	1	Alive	24	Khammam	2000	2	Bob	27	Kadappa	3000	3	Catri	25	Guntur	4000	4	Dena	28	Hyderabad	5000	5	Eeshwar	27	Kurnool	6000	6	Farooq	28	Nellur	7000
ID	NAME	AGE	ADDRESS	SALARY																																
1	Alive	24	Khammam	2000																																
2	Bob	27	Kadappa	3000																																
3	Catri	25	Guntur	4000																																
4	Dena	28	Hyderabad	5000																																
5	Eeshwar	27	Kurnool	6000																																
6	Farooq	28	Nellur	7000																																

Week-7	PROCEDURES
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 1. Write a PL/SQL block that will display the name, dept no, salary of fist highest paidemployees. 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
<p>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.</p> <p>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 on 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:</p> <ol style="list-style-type: none"> 1. Analyze the data required. 2. Normalize the attributes. <p>Create the logical data model using E-R diagrams.</p>	
Week -10	CASE STUDY GENERAL HOSPITAL
<p>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</p>	

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 outgoing 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:

1. Ramez Elmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
2. Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

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								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB10	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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 - I: Interactions, Interaction diagrams. 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:								
1. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education, 2 nd Edition, 2004. 2. Craig Larman, “Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development”, Pearson Education, 3 rd Edition, 2005.								
Reference Books:								
1. MeilirPage-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education, 1 st Edition, 2006. 2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, “UML 2 Toolkit”, WILEY-Dreamtech India Pvt. Ltd., Pearson Education, 3 rd Edition, 2005.								

Web References:

1. https://www.tutorialspoint.com/uml/uml_overview.html
2. https://www.utdallas.edu/~chung/OOAD/M03_1_StructuralDiagrams.ppt
3. <https://onedrive.live.com/download?cid=99CBBF765926367>

E-Text Books:

1. <https://www.utdallas.edu/UML2.0/Rumbaugh>
2. <https://www.utdallas.edu/~chung/SP/applying-uml-and-patterns.pdf>

WEB TECHNOLOGIES

V Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB09	Core	L	T	P	C	CIA	SEE	Total
		2	1	-	3	30	70	100
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 Java Script. 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: 1. Chris Bates, “Web Programming: Building Internet Applications”, Wiley DreamTech, 2 nd Edition, 2002. 2. Jeffrey C K Jackson, “Web Technologies”, Duquesne University, Pearson Education, 3 rd Edition, 2010. 3. Steven Holzner, “The Complete Reference PHP”, Tata McGraw-Hill, 1 st Edition, 2007.								
Reference Books:								

1. Hans Bergsten, “Java Server Pages”, O Reilly, 3rd Edition, 2003.
2. D.Flanagan, “Java Script”, O’Reilly, 6th Edition, 2011.
3. Jon Duckett, “Beginning Web Programming”, WROX, 2nd Edition, 2008.
4. Herbert Schildt, “Java the Complete Reference”, Tata McGraw-Hill - Osborne, 8th Edition, 2011.

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:

1. <http://bookboon.com/en/it-programming-ebooks>
2. <https://www.free-ebooks.net/category/internet-technology>

Course Home Page:

V Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB10	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. 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	
The transport service, elements of transport protocols, congestion control; The internet transport protocols: UDP (User Datagram Protocol), TCP (Transport Control Protocol), performance problems in computer networks, network performance measurement.								
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:								
1. Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw-Hill,5 th Edition, 2012.								
2. Andrew S. Tanenbaum, David.j.Wetherall, “Computer Networks”, Prentice-Hall, 5 th Edition, 2010.								
Reference Books:								

1. Douglas E. Comer, “Internetworking with TCP/IP “, Prentice-Hall, 5th Edition, 2011.
2. Peterson, Davie, Elsevier, “Computer Networks”, 5th Edition, 2011
3. Comer, “Computer Networks and Internets with Internet Applications”, 4th Edition, 2004.
4. Chwan-Hwa Wu, Irwin, “Introduction to Computer Networks and Cyber Security”, CRC publications, 2014.

Web References:

1. <http://computer.howstuffworks.com/computer-networking-channel.htm>
2. <https://www.geeksforgeeks.org/layers-osi-model/>
3. https://www.wikilectures.eu/w/Computer_Network
4. <https://technet.microsoft.com/en-us/network/default.aspx>

E-Text Books:

1. <http://www.freebookcentre.net/networking-books-download/Lecture-Notes-on-Computer-Networks.html>
2. <http://www.freebookcentre.net/networking-books-download/Introduction-to-Computer-Networks.html>

MOOC Course

1. <https://www.mooc-list.com/course/networking-introduction-computer-networking-stanford-university>
2. <https://lagunita.stanford.edu/courses/Engineering/Networking/Winter2014/about>.

V Semester: CSE / IT								
Course Code	Category	Hours / WEEK			Credits	Maximum Marks		
ACSB11	Core	L	T	P	C	CIA	SEE	Total
		2	1	-	3	30	70	100
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.								
MODULE-V	CODE OPTIMIZATION AND CODE GENERATION						Classes: 09	

Code optimization: The principle sources of optimization, optimization of basic blocks, loops in flow graphs, peephole optimization; Code Generation: Issues in the Design of a Code Generator, The Target Language, addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, register allocation and assignment, DAG representation of basic blocks.

Text Book:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers–Principles, Techniques and Tools", Pearson Education, 2nd Edition, 2006.

Reference Books:

1. Kenneth C. Louden, Thomson, "Compiler Construction–Principles and Practice", PWS Publishing, 1st Edition, 1997.
2. Andrew W. Appel, "Modern Compiler Implementation C", Cambridge University Press, Revised Edition, 2004.

Web References:

1. www.vssut.ac.in/lecture_notes/lecture1422914957.pdf
2. <http://csenote.weebly.com/principles-of-compiler-design.html>
3. <http://www.faadooengineers.com/threads/32857-Compiler-Design-Notes-full-book-pdf-download>
4. <https://www.vidyarthiplus.com/vp/thread-37033.html#.WF0PhlMrLDc>

E-Text Books:

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

CASE TOOLS LABORATORY

V Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB12	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 24			Total Classes: 24			
OBJECTIVES: The course 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 On line 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:	
<ol style="list-style-type: none"> 1. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education, 2nd Edition, 2004. 2. Craig Larman, “Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development”, Pearson Education, 3rd Edition, 2005. 	
Web References:	
<ol style="list-style-type: none"> 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	

V Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB11	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 30			Total Classes: 30			
OBJECTIVES: The course should enable the students to: I. 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 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.								
Week -6	CASCADING STYLE SHEET							
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).	
Week -7	CASCADING STYLE SHEET
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.	
Week -8	JAVASCRIPT
<ol style="list-style-type: none"> 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. 	
Week-9	JAVASCRIPT
<ol style="list-style-type: none"> 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. 	
Week-10	JAVASCRIPT
<ol style="list-style-type: none"> 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. 	
Week-11	PHP
<ol style="list-style-type: none"> 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. 	
Week-12	PHP
<ol style="list-style-type: none"> 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. 	
Week-13	PHP
<ol style="list-style-type: none"> 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. 	
Week-14	PHP
<ol style="list-style-type: none"> 1. Write php program to upload registration form into database. 2. Write php program to display the registration form from the database. 	
Week-15	PHP
<ol style="list-style-type: none"> 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:

1. Uttam K Roy, “Web Technologies”, Oxford University Press, 1st Edition, 2010.
2. Steven Holzner, “The Complete Reference PHP”, Tata McGraw-Hill, 1st Edition, 2007

Web References:

1. <http://www.scoopworld.in>
2. <http://www.sxecw.edu.in>
3. <http://www.technofest2u.blogspot.com>
4. <http://www.ptutorial.com/php-example/php-upload-image>
5. <http://www.ptutorial.com/php-example/php-change-case>

Course Home Page:**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.

PRINCIPLES OF ARTIFICIAL INTELLIGENCE

VI Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB13	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The students will try to learn: I. Gain a historical perspective of AI and its foundations. II. Become familiar with basic principles of AI toward problem solving, inference, knowledge representation, and learning. III. Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models. IV. Experience AI development tools such as Prolog (AI language), expert system shell, and/or data mining tool. V. Explore the current scope, potential, limitations, and implications of intelligent systems..								
MODULE-I	INTRODUCTION OF AI AND KNOWLEDGE EPRESENTATION					Classes: 08		
Definition of AI, The AI Problems, The Underlying Assumption, AI Techniques, The Level of the Model, Criteria for Success, The importance of AI, Early works in AI, AI and Related fields, The Foundations of Artificial Intelligence, The History of Artificial Intelligence. Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs. Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation. AI Languages and Tools: Lisp, Prolog, CLIPS.								
MODULE-II	FIRST ORDER LOGIC AND INFERENCE					Classes: 10		
Using Predicate Logic: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Properties of Wff, Clausal Forms, Conversion to clausal forms, Resolution. Representing Knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge.								
MODULE-III	SEARCH TECHNIQUES					Classes: 08		
Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-first Search, A* algorithm, AO* algorithm, Problem Reduction, And-Or search, Constraint Satisfaction, Means-ends Analysis. Adversarial Search and Game Playing: Optimal Decision in Games, The minimax algorithm, Alpha-Beta pruning, Iterative Deepening, Expectimax search.								

MODULE-IV	HANDLING UNCERTANTY	Classes: 10
<p>Symbolic Reasoning Under Uncertainty: Introduction to Non monotonic Reasoning, Logics for Non monotonic Reasoning, Implementation Issues, Augmenting a Problem-solver.</p> <p>Statistical Reasoning: Probability and Bayes' Theorem, Certainty Factors and Rule-based Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic.</p>		
MODULE-V	PLANNING, LEARNING AND EXPERT SYSTES	Classes: 09
<p>Planning: Overview, An Example Domain: The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems.</p> <p>Learning: What is learning, Rote learning, Learning by taking Advice, Learning from example: Induction, Explanation based learning (EBL), Discovery, Clustering, Analogy, Neural net and genetic learning, Reinforcement learning.</p> <p>Expert System: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition, Expert System Architectures, Rule based systems, Non production system, knowledge acquisition.</p>		
Textbooks:		
<ol style="list-style-type: none"> 1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd Edition, 2019. 2. Dan W.Patterson, "Introduction to AI and Expert Systems", Prentice Hall, 2007. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Nils J.Nilsson, Principles of Artificial Intelligence, Narosa Publishing House, 1990. 2. Stuart Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Pearson Education, 2nd Edition, 2010. 3. VS Janakiraman K, Sarukesi Gopalakrishnan, Foundations of Artificial Intelligence & Expert Systems, Macmillan. 		
Web References:		
<ol style="list-style-type: none"> 1. Department of Computer Science, University of California, Berkeley, http://www.youtube.com/playlist?list=PLD52D2B739E4D1C5F 2. NPTEL: Artificial Intelligence, https://nptel.ac.in/courses/106105077/ 3. http://www.udacity.com/ 4. http://www.library.thinkquest.org/2705/ 5. http://www.ai.eecs.umich.edu/ 		
E-Text Books:		
<ol style="list-style-type: none"> 1. http://www.stpk.cs.rtu.lv/sites/all/.../Artificial%20Intelligence%20A%20Modern%20Approach.pdf 2. http://www.bookboon.com/en/artificial-intelligence-ebooks 3. http://www.onlineprogrammingbooks.com/ai-and-robotics 4. http://www.e-booksdirectory.com 		

LINUX PROGRAMMING

VI Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB12	Core	L	T	P	C	CIA	SEE	Total
		2	1	-	3	30	70	100
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.		
MODULE-V	SHARED MEMORY AND SOCKETS	Classes: 08
Shared Memory- Kernel support for shared memory, APIs for shared memory, shared memory example. Sockets: Introduction to Berkeley Sockets, IPC over a network, client/server model, Socket Address structures (UNIX domain & internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs- single client/server connection, Multiple simultaneous clients..		
Text Books:		
<ol style="list-style-type: none"> 1. Sumitabha Das, “Your Unix The Ultimate Guide”, Tata McGraw-Hill, New Delhi, India, 2007. 2. W. Richard. Stevens, “Advanced Programming in the UNIX Environment”, Pearson Education, New Delhi, India, 1st Edition, 2005. 		
Reference Books:		
<ol style="list-style-type: none"> 1. T. Chan, “Unix System Programming using C++”, PHI. 4th Edition, 2007. 2. N. Mathew, R. Stones, Wrox, “Beginning Linux Programming”, Wiley India Edition, 4th Edition, 2014. 3. Graham Glass, King Ables, “Unix for Programmers and Users”, Pearson Education, 3rd Edition, 2008. 4. A. Hoover, “System Programming with C and Unix”, Pearson Education, 3rd Edition, 2008. 5. K. A. Robbins, “Unix System Programming, Communication, Concurrency and Threads”, Pearson Education, , 4th Edition, 2014. 		
Web References:		
<ol style="list-style-type: none"> 1. https://www.edx.org/course/introduction-linux-linuxfoundationx-lfs101x-0 2. http://www.tutorialspoint.com/listtutorials/linux/1 3. http://www.compsci.hunter.cuny.edu/~sweiss/course_materials/unix_lecture_notes.php 		
E-Text Books:		
<ol style="list-style-type: none"> 1. http:// www.freebookcentre.net/UnixCategory/Free-Linux-Programming-Books-Download.html 2. http://www.fuky.org/abicko/beginning-linux-programming.pdf 3. http://www.penguintutor.com/linux/introduction-creating-website 		
MOOC Course		
<ol style="list-style-type: none"> 1. https://training.linuxfoundation.org/free-linux-training 2. http:// http://cloud62.wixsite.com/v-mooc/linux-programming 		

DATA WAREHOUSING AND DATA MINING

VI Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB14	Core	L	T	P	C	CIA	SEE	Total
		2	1	-	3	30	70	100
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, Differences between OLAP and OLTP, A Multi-dimensional data model- Star, Snow flake and Fact constellation schemas, Measures, Concept hierarchy, OLAP operations in Multi dimensional data model, Data warehouse architecture- A three tier Data warehouse architecture, types of OLAP servers, Data warehouse Implementation, Data warehouse models.								
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 objects. 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 Algorithm, 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:								

1. Jiawei Han, Micheline Kamber, "Data Mining-Concepts and Techniques", Morgan Kaufmann Publishers, Elsevier, 2nd Edition, 2006.
2. Alex Berson, Stephen J. Smith, "Data Warehousing Data Mining and OLAP", Tata McGraw-Hill, 2nd Edition, 2007.

Reference Books:

1. Arun K Pujari, "Data Mining Techniques", Universities Press, 3rd Edition, 2005
2. Pualraj Ponnaiah, "Data Warehousing Fundamentals", Wiley, Student Edition, 2004.
3. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", Wiley, Student Edition, 2006.
4. Vikram Pudi, P Radha Krishna, "Data Mining", Oxford University, 1st Edition, 2007.

Web References:

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

E-Text Books:

1. https://www.cisco.com/application/pdf/en/us/guest/products/ps2011/c2001/ccmigration_09186a00802342cf.pdf<https://www.jntubook.com>
2. http://ftp.utcluj.ro/pub/users/cemil/dwdm/dwdm_Intro/0_5311707.pdf.

MOOC Course

<https://3ca1513rbm.wordpress.com>

LINUX PROGRAMMING LABORATORY

VI Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB13	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 24			Total Classes: 24			
OBJECTIVES: The course 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								
Week-1	BASIC COMMANDS I							
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.								
Week-2	BASIC COMMANDS II							
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.								
Week-3	SHELL PROGRAMMING, I							
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.								
Week-4	SHELL PROGRAMMING II							
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.								
Week-5	SIMULATING COMMANDS I							
a) Simulate cat command b) Simulate cp command								
Week-6	SIMULATING COMMANDS II							
a) Simulate tail command b) Simulate head command								
Week-7	SIMULATING COMMANDS III							
a) Simulate mv command b) Simulate nl command								

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Week-8	SIGNAL HANDLING
Write a program to handle the signals like SIGINT, SIGDFL, SIGIGN	
Week-9	INTERPROCESS COMMUNICATIONS
Implement the following IPC forms a) FIFO b) PIPE	
Week-10	MESSAGE QUEUES
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.	
Week-11	SHARED MEMORY
Implement shared memory form of IPC.	
Week-12	SOCKET PROGRAMMING
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:	
1. Sumitabha Das, “Your Unix The Ultimate Guide”, Tata McGraw-Hill, New Delhi, India, 2007. 2. B. A. Forouzan and R. F. Gilberg, “Unix and Shell Programming”, Cengage Learning. 3. Robert Love, “Linux System Programming”, O'Reilly, SPD. 4. Stephen G. Kochan, Patrick Wood, “Unix Shell Programming”, Sams publications, 3 rd Edition, 2007. 5. T. Chan, “Unix System Programming using C++”, Prentice Hall India, 1999.	
Web References:	
1. http://spoken-tutorial.org/tutorial_search/?search_foss=Linux&search_language=English 2. https://www.redhat.com/en/files/resources/en-rhel-whats-new-in-rhel-712030417.pdf 3. http:// www.tutorialspoint.com/unix/ 4. http://cse09-iiith.virtual-labs.ac.in/	
<p style="text-align: center;">SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:</p> <p>HARDWARE: Desktop Computer Systems: 36nos</p> <p>SOFTWARE: System Software: Linux Operating System</p>	

DATA WAREHOUSING AND DATA MINING LABORATORY

VI Semester: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB15	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 24			Total Classes: 24			
OBJECTIVES: The course 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 datasetiris. 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:	
<ol style="list-style-type: none"> 1. J.Han, M.Kamber, “Data Mining: Concept and Techniques”, Academic Press, Morgan Kaufman Publishers, 3rd Edition, 2008. 2. Alex Berson, Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw-Hill, 10th Edition, 2007. 3. Pieter Adrians, DolfZantinge, “Data Mining”, Addison Wesley, Peter V, 2000. 	
Web References:	
<ol style="list-style-type: none"> 1. https://www.tutorialspoint.com 2. http://www.anderson.ucla.edu 3. https://www.smartworld.com 4. http://iiscs.wssu.edu 	
Course Home Page:	
<p style="text-align: center;">SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:</p> <p>HARDWARE: Intel Desktop Systems: 36 nos</p> <p>SOFTWARE: Application software: Weka</p>	

BIG DATA ANALYTICS

VII Semester: IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB14	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
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: 08	
Types of Digital Data: Classification of Digital Data, Structured Data, SemiStructured data, Unstructured Data; Introduction To Big Data: Characteristic of Data, Evolution, Big Data and its Importance, Four V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications.								
MODULE-II	BIG DATA TECHNOLOGIES						Classes: 09	
NoSQL (Not only SQL): Use of NoSQL, Types of NoSQL, Advantages of NoSQL. Use of No SQL in Industry, NoSQL Vendors, SQL versus NoSQL, NewSQL; Hadoop: Features of Hadoop, Version of Hadoop, Hadoop Ecosystems, Hadoop Distributions, Hadoop versus SQL.								
MODULE-III	HADOOP						Classes: 09	
Hadoop: RDBMS vsHadoop,Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Read and Write, working with HDFS commands, special features HDFS. Processing data with Hadoop, managing resources and applications with Hadoop YARN, interacting with Hadoop Ecosystem Pig, Hive, Sqoop, Hbase.								
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 Input Format, Reading Data with custom Record Reader,-Reader, Writer, Combiner, Partitioners, Map Reduce Phases, Developing simple MapReduce Application.								
MODULE-V	INTRODUCTION TO PIG and HIVE						Classes: 10	
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:								
1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publications, 2 nd Edition, 2014. 2. Tom White, “Hadoop: The Definitive Guide”, O'Reilly, 3 rd Edition, 2012.								
Reference Books:								

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today’s Business”, Wiley CIO Series, 1st Edition, 2013.
2. Rajiv Sabherwal, Irma Becerra- Fernandez, “Business Intelligence –Practice”, Technologies and Management”, John Wiley, 1st Edition, 2011.
3. Arvind Sathi, “Big Data Analytics: Disruptive Technologies for Changing the Game”, IBM Corporation, 1st Edition, 2012.

Web References:

1. https://www.sas.com/en_us/insights/analytics/big-data-analytics.html
2. <https://www.searchbusinessanalytics.techtarget.com/definition/big-data-analytics>
3. <https://www.webopedia.com>

E-Text Books:

1. <https://www.books.google.co.in/books?id=rkWPojgfeM8C&printsec=frontcover&dq=HIGH+PERFORMANCE+COMPUTING>.
2. http://www.datameer.com/pdf/big-data-analytics-ebook.pdf?mkt_tok.

VII Semester: IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB15	Core	L	T	P	C	CIE	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real-life scenarios. II. Enable students exploring some important cloud computing driven commercial systems such as GoogleApps, Microsoft Azure and Amazon Web Services and other businesses cloud applications. III. Expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research. IV. Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing.								
MODULE-I	SYSTEM MODELING, CLUSTERING AND VIRTUALIZATION						Classes:09	
Scalable computing over the Internet, Technologies for network-based systems, System models for distributed and cloud computing, Software environments for distributed systems and clouds, Performance, security and energy efficiency.								
MODULE-II	VIRTUAL MACHINES AND VIRTUALIZATION OF CLUSTERS AND DATA CENTERS						Classes: 09	
Implementation levels of virtualization, Virtualization tools, structures and mechanisms, Virtualization of CPU, Memory and I/O devices, Virtual clusters and resource management, Virtualization for data center automation.								
MODULE-III	CLOUD PLATFORM ARCHITECTURE						Classes: 09	
Cloud computing and service models, Architectural design of compute and storage clouds, Public cloud platforms, Inter-cloud resource management. Cloud security and trust management, Service Oriented Architecture (SOA), Message-oriented middleware architecture.								
MODULE-IV	CLOUD PROGRAMMING AND SOFTWARE ENVIRONMENTS						Classes: 09	
Features of Cloud and grid platforms, Parallel and distributed programming paradigms, Programming support of Google App Engine, Programming on Amazon AWS and MS Azure, Emerging cloud software environments.								
MODULE-V	CLOUD RESOURCE MANAGEMENT AND SCHEDULING						Classes: 09	
Policies and mechanisms for resource management applications of control theory to task scheduling in a cloud, Stability of a two-level resource allocation architecture, Feedback controls based on dynamic thresholds, Coordination of specialized autonomic performance managers, Resource Bundling.								
Textbooks: 1. Rajkumar Buyya, James Broberg and Andrzej, M.Goscinski, “Cloud computing: Principles and Paradigms” Wiley, 2011.								

2. Kai Hwang, Geoffery C.Fox, Jack J.dongarra, “Distributed and Cloud Computing”, Elsevier, 2012.
3. Dan Marinescu, “Cloud Computing Theory and Practice”, Elsevier, 3rd Edition, 2012.
4. Arshadeep Bagra and Vijay Madiseti, “Cloud Computing, A Hands-On Approach”, University Press, 3rd Edition, 2012.

Reference Books:

1. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, Tata McGraw Hill, 2011.
2. Gautam Shroff, “Enterprise Cloud Computing”, Cambridge University Press, 2010.
3. John W .Ritting house ,James F. Ransom, “Cloud Computing: Implementation, Management and Security” CRC press, 2012.
4. George Reese, “Cloud Applications Architectures: Building Applications and Infrastructure in the Cloud”, O Reilly, SPD, 2011.
5. im Mather, Subra Kumaraswamy, Shahed Latif, Oreilly, “Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance”, SPD, 2011.

Web References:

1. <http://searchcloudcomputing.techtarget.com/definition/cloud-computing>.
2. <http://in.pcmag.com/networking-communications-software/38970/feature/what-is-cloud-computing>.

E-Text Books:

1. <http://www.pds.ewi.tudelft.nl/> , <http://csrc.nist.gov/publications/nistpubs>.
2. http://cloudipedia.com/wp-content/uploads/2009/11/cloud_computing_made_easy.pdf.

MOOC Course:

1. <http://www.edx.org/course/introduction-cloud-computing-ieee-x-cloudintro-x-1>
2. <http://www.coursera.org/specialization/cloud-computing>

BIG DATA ANALYTICS LABORATORY

VII Semester: IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB16	Core	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools. 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.								
LIST OF EXPERIMENTS								
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							
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 MapReduce, since it is semi structured and record-oriented.	
Week-7	MAPREDUCE PROGRAM 3
Implement matrix multiplication with Hadoop Map Reduce.	
Week-8	MAPREDUCE PROGRAM 4
Write a Map Reduce program that makes the dataset to be compressed.	
Week-9	MAPREDUCE PROGRAM 5
Write a Map Reduce program to run sorting techniques to the relevant data.	
Week-10	PIG LATIN LANGUAGE - PIG
Installation of PIG.	
Week-11	PIG COMMANDS
Write Pig Latin scripts sort, group, join, project, and filter your data.	
Week-12	PIG LATIN MODES
Implement the Pig Latin scripts in two different modes: Local mode and HDFS mode and run the different scripts and UDF's.	
Week-13	PIG PROGRAM
Run the Pig Latin Scripts to find a max temp for each and every year.	
Week-14	HIVE
Installation of HIVE.	
Week-15	HIVE OPERATIONS
Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.	
Reference Books:	
1. Jay Liebowitz, "Big Data And Business Analytics Laboratory", CRC Press.	
Web References:	
1. Hadoop : http://hadoop.apache.org/ 2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home 3. Pig latin: http://pig.apache.org/docs/r0.7.0/tutorial.html	
<p style="text-align: center;">SOFTWARE AND HARDWARE REQUIREMENTS FOR 36 STUDENTS:</p> <p>HARDWARE: Desktop Computers with 4 GB RAM 36 nos.</p> <p>SOFTWARE: VMWare, HADOOP.</p>	

CLOUD COMPUTING LABORATORY

VII Semester: IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB17	Core	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45			Total Classes: 45			
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.								
LIST OF EXPERIMENTS								
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.	
Week-12	CLOUD PROGRAMMING
Develop a Hello World application using Google App Engine.	
Week-13	CLOUD PROGRAMMING
Develop a Guestbook Application using Google App Engine.	
Week-14	WINDOWS AZURE
Develop a Windows Azure Hello World application using.	
Week-15	PIPES
Create a Mashup using Yahoo! Pipes.	
Reference Books:	
1. Dan Marinescu, “Cloud Computing: Theory and Practice”, MK Publishers, 1 st Edition, 2013. 2. Kai Hwang, Jack Dongarra, Geoffrey Fox, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, MK Publishers, 1 st Edition, 2013. 3. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, McGraw Hill, 1 st Edition, 2009. 4. Arshdeep Bahga, Vijay Madisetti, “Cloud computing A Hands on Approach”, Universities Publications, 1 st Edition, 2013.	
Web References:	
1. http://www.howtogeek.com/196060/beginner-geek-how-to-create-and-use-virtual-machines/ 2. http://www.tutorialspoint.com/hadoop/ 3. https://aws.amazon.com/ 4. http://www.tutorialspoint.com/zookeeper/	

5. <https://cloud.google.com/appengine/docs/java/gettingstarted/creating-guestbook>
6. <https://www.zdnet.com/article/yahoo-pipes-tutorial-build-an-rss-mashup/>

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

HARDWARE: Intel Desktop Systems: 36 nos

SOFTWARE: Globus Toolkit or equivalent Eucalyptus or Open Nebula.

PROJECT WORK (phase – I)

VII Semester: Common for all branches								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB36	Core	L	T	P	C	CIA	SEE	Total
		-	-	10	5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 150			Total Classes: 150			
<p>The object of Project Work (phase – I) is to enable the student to take up investigative study in the broad field of Information Technology, 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:</p> <ol style="list-style-type: none">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 (phase – II)

VIII Semester: Common for all branches								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB37	Core	L	T	P	C	CIA	SEE	Total
		-	-	12	6	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 180			Total Classes: 180			
<p>The object of Project Work (phase – II) & Dissertation is to enable the student to extend further the investigative study taken up under IT 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:</p> <ol style="list-style-type: none">1. In depth study of the topic assigned in the light of the Report prepared under IT P1;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								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB18	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Learn 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:

1. Robert Sedgewick, Philippe Flajolet, “An Introduction to the Analysis of Algorithms: Introduce Analysis Algori_p2”, kindle Edition, 2nd Edition 2010.
2. Thomas H, Cormen, “Introduction to Algorithms”, Eastern Economy Edition, 2010.

Reference Books:

1. Steven S Skiena, “The Algorithm Design Manual”, Springer. 2nd Edition, 2010.
2. Mott J.L., Ravipudi Venkata Rao Jaya, “An Advanced Engineering Optimization Algorithm and its Applications ”, Hardcover, 2018.

Web References:

1. <http://cs.lth.se/edan55/>

INFORMATION THEORY

PE – I: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB19	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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	
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies. Source Codes: Shannon-Fano coding, Huffman coding.								
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.								
MDULE-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: 1. Shu Lin, Daniel J.Costello,Jr, “ Error Control Coding- Fundamentals and Applications” Prentice Hall, Inc 2014. 2. Man Young Rhee “Error Correcting Coding Theory”, McGraw Hill Publishing 1989.								

Reference Books:

1. John G. Proakis "Digital Communications", TMS, 5th Edition 2008.
2. Salvatore Gravano, "Introduction to Error Control Codes", Oxford.
3. Todd K. Moon, "Error Correction Coding – Mathematical Methods and Algorithms", Wiley India, 2006.
4. Ranjan Bose, "Information Theory, Coding and Cryptography", TMH, 2nd Edition, 2009.

Web References:

1. <https://nptel.ac.in/courses/117101053/>
2. <https://www.cl.cam.ac.uk/teaching/0910/InfoTheory/InfoTheoryLectures.pdf>

FUNDAMENTALS OF OPTIMIZATION TECHNIQUES

PE – I: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB20	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Learn fundamentals of 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	
Transportation problem, formulation, optimal solution, unbalanced transportation problem, degeneracy, assignment problem, formulation, optimal solution, variants of assignment problem, traveling salesman problem.								
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	
Quadratic approximation methods for constrained problems: Direct quadratic approximation, quadratic approximation of the Legrangian function, variable metric methods for constrained optimization.								
Text Books:								
1. A Ravindran, “Engineering Optimization”, John Wiley & Sons Publications, 4 th Edition, 2009. 2. Hillier, Liberman, “Introduction to Operation Research”, Tata McGraw Hill, 2 nd Edition, 2000.								
Reference Books:								
1. Dr. J K Sharma, “Operation Research”, Mac Milan Publications, 5 th Edition, 2013. 2. Ronald L. Rardin, “Optimization in Operation Research”, Pearson Education Pvt. Limited, 2005. 3. N V S Raju, “Operation Research”, S M S Education, 3 rd Revised Edition. 2005.								

Web References:

1. <http://www2.informs.org/Resources/>
2. <http://www.mit.edu/~orc/>
3. <http://www.ieor.columbia.edu/>
4. <http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm>
5. <http://www.wolfram.com/solutions/OperationsResearch/>

E-Text Books:

1. <http://engineeringstudymaterial.net/ebook/new-optimization-techniques-in-engineering-godfrey/>
2. <http://www.fretechbooks.com/urban-operations-research-logistical-and-transportation-planning-methods-t486.html>

MACHINE LEARNING

PE – I: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB21	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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						Classes: 09	
Introduction: Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.								
MODULE-II	DECISION TREE LEARNING						Classes: 09	
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						Classes: 09	
Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Back propagation algorithm. Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms.								
MODULE-IV	BAYESIAN LEARNING						Classes: 09	
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 REINFORMENT LEARNING						Classes: 09	
Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning. Reinforcement Learning: Introduction, Learning Task, Q Learning.								
Textbooks:								
1. Tom M. Mitchell, "Machine Learning ", McGraw-Hill, 1 st Edition, 2013. 2. Stephen Marsland, "Machine Learning - An Algorithmic Perspective ", CRC Press, 1 st Edition, 2009.								

Reference Books:

1. Rajjal Shinghal, "Pattern Recognition and Machine Learning", Springer-Verlag, New York, 1st Edition, 2006.

Web References:

1. [Http://www.udemy.com/MachineLearning/Online_Course](http://www.udemy.com/MachineLearning/Online_Course)
2. https://en.wikipedia.org/wiki/Machine_learning

E-Text Books:

1. <http://www.e-booksdirectory.com/details.php?ebook=1118>
2. <http://www.otexts.org/sfml>

ADVANCED COMPUTER ARCHITECTURE

PE – II: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB22	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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: 1. John L Hennessey and David A Patterson, “Computer Architecture A Quantitative Approach”, Morgan Kaufmann/ Elsevier, 5 th Edition, 2013. 2. John L Hennessey and David A Patterson, “Computer Architecture A Quantitative Approach”, Morgan Kaufmann/ Elsevier, 6 th Edition, 2017.								

Reference Books:

1. Kai Hwang, Faye Briggs, “Computer Architecture and Parallel Processing”, McGraw-Hill International Edition, 2000.
2. Sima D, Fountain T. Kacsuk P, “Advanced Computer Architectures: A Design Space Approach”, Addison Wesley, 2000.
3. David E. Culler, Jaswinder Pal Singh, Anoop Gupta, “Parallel Computer Architecture, A Hardware / Software Approach”, Elsevier.

Web References:

1. <http://uni-site.ir/khuelec/wp-content/uploads/Computer-Architecture-A-Quantitative-Approach.pdf>
2. <https://doc.lagout.org/Computer%20Architecture.pdf>
3. <http://lecturesppt.blogspot.in/2010/03/advanced-computer-architecture.html>

E-Text Books:

1. [http://www.freebookcentre.net/ComputerScience-Books-Download/Advanced-ComputerArchitecture-\(PDF-76P\).html](http://www.freebookcentre.net/ComputerScience-Books-Download/Advanced-ComputerArchitecture-(PDF-76P).html)
2. <http://www.freebookcentre.net/CompuScience/Free-Computer-Architecture-Books-Download.html>

DISTRIBUTED OPERATING SYSTEM

PE – II: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB23	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the concepts of 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:								
1. Andrew S. Tanenbaum, “Distributed Operating System”, PHI, 2 nd Edition, 2015. 2. Andrew S. Tanenbaum,Herbert Bos “Modern Operating Systems”, Pearson Higher Ed, 4 th Edition 2015.								
Reference Books:								

1. Andrew S. Tanenbaum, Maarten van Steen, “Distributed Systems: Principles and Paradigms”, Pearson Prentice Hall, 2nd Edition Illustrated, 2007.
2. R. Chow and T. Johnson, “Distributed Operating Systems & Algorithms”, Addison-Wesley, 1997.

Web References:

1. <https://www.youtube.com/watch?v=sK9MC5GREXg>
2. <http://nptel.ac.in/syllabus/106106107/>

E-Text Books:

1. <http://barbie.uta.edu/~jli/Resources/MapReduce&Hadoop/Distributed%20Systems%20Principles%20and%20Paradigms.pdf>
2. <https://www.amazon.com/Distributed-Operating-Systems-Algorithms-Randy/dp/0201498383>

INTERNET OF THINGS

PE – II: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB20	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the 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 IoTs.								
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 Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model.								
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:								
1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things: A Hands-on-Approach”, VPT, 1 st Edition, 2014.								
2. Matt Richard son, ShawnWallace, “Getting Started with RaspberryPi”, O’Reilly (SPD), 3 rd Edition, 2014.								
Reference Books:								
1. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons, 1 st Edition, 2014.								
2. Francis Da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, A Press Publications, 1 st Edition, 2013.								
Web References:								
1. https://www.upf.edu/practice/en/3376/22580 .								
2. https://www.coursera.org/learn/iot .								
3. https://bcourses.berkeley.edu .								

4. www.innovianstechnologies.com .
E-Text Books:
1. https://mitpress.mit.edu/books/internet-things 2. http://www.apress.com

ADVANCED OPERATING SYSTEM

PE – II: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB21	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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	REAL TIME 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 os layer .								
Text Books: 1. Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001. 2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating System Concepts”, John Wiley & Sons, 7 th Edition, 2004.								
Reference Books:								

1. Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, O’Reilly, 3rd Edition, 2005.
2. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006.
3. NeilSmyth, “I Phone iOS4 Development Essentials–X code”, Payload media, 4th Edition, 2011.

Web References:

1. <https://www.scribd.com/doc/166936614/Advanced-Concepts-in-Operating-Systems>.
2. lib.ewubd.edu/vufind/Record/3488/TOC.
3. <https://docs.google.com/document/d/.../edit>.

E-Text Books:

1. https://groups.google.com/d/msg/me-cse-2013-batch/.../q_R5aHACK3kJ.
2. <https://it325blog.files.wordpress.com/2012/.../operating-system-concepts-7-th-edition> by PB GALVIN - 2005.

MOOC Course

1. <https://www.udacity.com/course/advanced-operating-systems--ud189>.

INFORMATION SECURITY

PE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB22	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Learn the basic categories of threats to computers and networks. II. Understand various cryptographic algorithms and be familiar with public-key cryptography. III. Apply authentication functions for providing effective security. IV. Analyze the application protocols to provide web security. V. Discuss the place of ethics in the information security area.								
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:								

1. William Stallings, “Cryptography and Network Security”, Pearson Education, 4th Edition, 2005.
2. Atul Kahate, “Cryptography and Network Security”, McGraw-Hill, 2nd Edition, 2009.

Reference Books:

1. C K Shymala, N Harini, Dr. T R Padmanabhan, “Cryptography and Network Security”, Wiley India, 1st Edition, 2016.
2. Behrouz A. Forouzan Debdeep Mukhopadhyay, “Cryptography and Network Security”, McGraw- Hill, 2nd Edition, 2010.

Web References:

1. <http://bookboon.com/en/search?q=INFORMATION+SECURITY>
2. https://books.google.co.in/books/about/Cryptography_Network_Security_Sie_2E.html?id=Kokjwdf0E7QC
3. https://books.google.co.in/books/about/Information_Security.html?id=Bh45pU0_E_4C

E-Text Books:

1. https://books.google.co.in/books/about/Information_Security.html
2. <http://www.amazon.in/Cryptography-Network-Security-Behrouz-Forouzan/dp/007070208X>

HIGH SPEED NETWORKS

PE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB24	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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 MANAGMNET						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 DIFFERETIAL 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:								
1. William Stallings, “High-Speed Networks: TCP/IP and ATM Design Principles,” Prentice-Hall, Illustrated Edition, 1998. 2. William Stallings, “High Speed Networks and Internet”, Pearson Education, 2 nd Edition, 2002. 3. B. S.Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 42 nd Edition, 2013.								

Reference Books:

1. A. Shah, G. Ramakrishna, "FDDI – A High Speed Network", Prentice-Hall, Illustrated, 1994.
2. Wolfgang Effelsberg, "High-Speed Networking for Multimedia Applications", Kluwer Academic Publishers, 1st Edition, 1996.
3. William Buchanan, "Handbook of Data Communications and Networks", Kluwer Academic Publications, 2nd Edition, Illustrated, 1999.
4. Jean Warland, Pravin Varaiya, "High Performance Communication Networks", Hardcourt Asia Pvt. Ltd., 2nd Edition, 2001.
5. Irvan Pepelnjk, Jin Guichard, Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003.

Web References:

1. www.iospress.nl/journal/journal-of-high-speed-networks/
2. <http://whatis.techtarget.com/glossary/High-Speed-Networks>
3. <https://technet.microsoft.com/en-us/network/dd277646.aspx>

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
3. <http://www.kiv.zcu.cz/~ledvina/vyuka/PDS/PDS-tut/HighSpeedNetworks/hsn0101.pdf>

MOBILE COMPUTING

PE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB25	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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:								
1. Jochen Schiller, “Mobile Communications”, Pearson Education, 2 nd Edition, 2009. 2. Raj Kamal, “Mobile Computing”, Oxford University Press, Illustrated, 2 nd Edition, 2012.								
Reference Books:								

1. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill Professional, 2005.
2. Hansmann, Merk, Nicklous, Stober, “Principles of Mobile Computing”, Springer, 2nd Edition, 2003.
3. Martyn Mallick, “Mobile and Wireless Design Essentials”, Wiley Dream Tech, 1st Edition, 2003.

Web References:

1. https://en.wikipedia.org/wiki/Mobile_computing
2. https://www.tutorialspoint.com/mobile_computing/mobile_computing_quick_guide.h
3. https://media.techtarget.com/searchMobileComputing/downloads/Mobile_and_pervasive_computing_Ch06.pdf

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

PE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB23	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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.								
Investigation: Introduction to cyber-crime investigation, investigation tools, e-discovery, digital evidence collection, evidence preservation.								
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: 1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Information Security Professionals, 4 th Edition, 2009. 2. Stuart McClure, Saumil Shah, Shreeraj Shah, “Web Hacking: Attacks and Defense”, Addison-Wesley Professional, 1 st Edition, 2002.								

Reference Books:

1. Kevin Mandia, Chris Prosise, Matt Pepe, “Incident Response and Computer Forensics “, Tata Mc Graw Hill, 1st Edition, 2006.
2. Garms, Jess, Daniel Somerfield, “Professional Java Security”, Wrox Press, Illustrated Edition, 2001.
3. Robert M Slade, “Software Forensics”, Tata Mc Graw Hill, New Delhi, 1st Edition, 2005.

Web References:

1. <http://www.mail.nih.gov/user/faq/tlsssl.htm>
2. <http://www.openssl.org/>
3. <http://www.ntsecurity.net/>

E-Text Books:

1. <https://www.mitre.org/sites/.../pr-13-1028-mitre-10-strategies-cyber-ops-center.pdf>
2. <https://www.coursera.org/specializations/cyber-security>
3. <https://www.ccdcoe.org/publications/books/NationalCyberSecurityFrameworkManual.pdf>

ADVANCED DATABASES

PE – IV: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB26	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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					Classes: 10		
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					Classes: 10		
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					Classes: 09		
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					Classes: 08		
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					Classes: 08		
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:								
1. Carlo Zaniolo, Stefano Ceri, “Advanced Database Systems”, Morgan Kauffmann Publishers, VLDB Journal, 1 st Edition, 1997.								

2. Abraham Silberschatz, Henry F. Korth And S. Sudharshan, “Database System Concepts”, Tata McGraw Hill, 6 th Edition, 2011
Reference Books:
1. Raghu Ramakrishnan, “Database Management System”, McGraw-Hill Publications, 3 rd Edition, 2000. 2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Tata McGraw- Hill, 6 th Edition, 2010. 3. Silberschatz A, “Database Systems Concepts” McGraw-Hill Publications, 6 th Edition, 2000.
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/mdb/2007/TermPapers/ErikZeitler.pdf 5. booksite.elsevier.com/9781558604438/slides/zanitem5.htm
E-Text Books:
1. http://www.faadooengineers.com/threads/3854-Computer-Science-Advanced-Database-EbookPDF-Download 2. http://codex.cs.yale.edu/avi/db-book/db5/slide-dir/ 3. https://mitpress.mit.edu/books/advanced-database-techniques 4. https://www.amazon.com/Database-System-Concepts-Abraham-Silberschatz/dp/0073523321
MOOC Course:
1. https://www.edx.org/course/creating-programmatic-sql-database-microsoft-dat215-2x 2. https://www.edx.org/course/delivering-relational-data-warehouse-microsoft-dat216x-0 3. https://www.coursera.org/learn/sql-data-science

DATABASE SECURITY

PE – IV: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB27	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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	
Models for the protection of new generation database Systems-1: A model for the protection of frame based systems; A model for the protection of object-oriented systems: SORION model for the protection of object-oriented databases; models for the protection of new generation database systems-2: The orion model, Jajodia and Kogan's model; A model for the protection of active databases conclusions.								
Text Books: 1. Hassan A, Afyouni, "Database Security and Auditing: Protecting Data Integrity and Accessibility", Cengage Learning, 1 st Edition, 2009. 2. Maria Grazia Fugini,Silvana Castano,Giancarlo Martella, "Database Security", Pearson Education, 1 st Edition, 1994.								

Reference Books:

1. Alfred Basta, Melissa Zgola, Database Security, Cengage Learning, 1st Edition, 2012.

Web References:

1. <http://www.applicure.com/blog/database-security-best-practice>
2. https://docs.oracle.com/cd/B19306_01/network.102/b14266/apdvntro.htm#DBSEG12000
3. <http://www.cse.msu.edu>
4. <http://cms.gcgl.ac.in/>
5. <https://cengage.com.au/product/title/database-security/isbn/9781435453906>

E-Text Books:

1. <http://www.e-booksdirectory.com/details.php?ebook=10166>
2. <http://www.e-booksdirectory.com/details.php?ebook=7400re>
3. <https://www.abebbooks.com/9788131519059/Database-Security-Auditing-Protecting-Data-8131519058/plp>
4. <https://www.datasunrise.com/download/>
5. <https://www.coursera.org/learn/information-security-data>

DISTRIBUTED DATABASES

PE – IV: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB24	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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 QUEREIS						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: 1. Stefano Ceri, Giuseppe Pelagatti, “Distributed Database Principles and Systems”, Tata McGraw-Hill, 1 st Edition, 2010. 2. M Tamer Ozsu, Patrick Valduriez, “Principles of Distributed Database Systems”, Pearson Education. (Last 2 MODULES), 2 nd Edition, 2010.								

Reference Books:
1. M. Tamer ozsu, Patrick Valduriez, “Principles of Distributed Data Base Systems”, Springer, 3 rd Edition, 2011.
Web References:
1. www.cs.sjsu.edu/faculty/pollett/masters/Semesters/Fall06/Preethi/ddbms1.ppt 2. www.https://www.cs.purdue.edu/homes/bb/cs542-05Spr/Query.ppt 3. www.inf.unibz.it/dis/teaching/DDB/ln/ddb07.pdf 4. www.inf.unibz.it/dis/teaching/DDB/ln/ddb09.pdf
E-Text Books:
1. https://computersciencebooks.wordpress.com/2011/12/05/adbms-ebook-advanced-databasemanagement-system-complete-syllabus-free-ebook/ 2. http://aries.ektf.hu/~hz/pdf-tamop/pdf-xx/Radvanyi-hdbms-eng2.pdf 3. https://me2013regulation.wordpress.com/2014/06/24/cp7202-advanced-databases-notes-e-books/ 4. http://www.gupshupstudy.com/note/333033/advance-database-management-system-completeebook-and-lecture-notes-download 5. https://www.bookdepository.com/category/2019/Distributed-Databases
MOOC Course
1. https://www.class-central.com/mooc/454/coursera-web-intelligence-and-big-data 2. https://www.class-central.com/mooc/6309/coursera-cloud-computing-applications-part-2-big-dataand-applications-in-the-cloud 3. https://www.coursera.org/learn/distributed-database

DESIGN PATTERNS

PE – IV: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB25	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the principles of design pattern. II. Understand the design patterns that are common in software applications. III. Analyze and understand how these patterns are related to object- oriented design. IV. Identify appropriate design patterns for various problems. V. 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:								
1. Erich Gamma “Design Patterns”, Pearson Education, 1995.								
Reference Books:								
1. Eric Freeman, “Head First Design Patterns”, Oreilly-spd, 1 st Edition, 2014. 2. Mark Grand,”Pattern”s in JAVA Vol-I”, Wiley DreamTech. 3. Mark Grand, “Pattern”s in JAVA Vol-II”, Wiley DreamTech. 4. Mark Grand,”JAVA Enterprise Design Patterns Vol-III”,Wiley DreamTech.								

SOFTWARE ENGINEERING

PE – V: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB26	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Learn 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:								
1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, McGraw-Hill International Edition, 7 th Edition, 2010. 2. Ian Somerville, “Software Engineering”, Pearson Education Asia, 9 th Edition, 2011.								

Reference Books:

1. Rajib Mall, “Fundamentals of Software Engineering”, PHI Learning Private Limited, 3rd Edition, 2009.
2. Pankaj Jalote, “Software Engineering, A Precise Approach”, Wiley India, 1st Edition, 2010.

Web References:

1. <http://www.softwareengineerinsider.com/articles/what-is-software-engineering.html>
2. <https://www.udacity.com/courses/software-engineering>
3. http://www.tutorialspoint.com/software_engineering
4. http://computingcareers.acm.org/?page_id=12
5. http://en.wikibooks.org/wiki/Introduction_to_Software_Engineering

E-Text Books:

1. http://www.acadmix.com/eBooks_Download
2. <http://www.freetechbooks.com/software-engineering-f15.html>

SOFTWARE TESTING METHODOLOGY

PE – V: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB27	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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:								
Boris Beizer, “Software Testing Techniques”, Dreamtech Press, 2 nd Edition, 2003.								
Reference Books:								
1. P. C. Jorgenson, “Software Testing: A Craftmen’s Approach”, Auerbach Publications, 3 rd Edition, 2013. 2. Perry, “Effective Methods of Software Testing”, John Wiley, 2 nd Edition, 1999. 3. P. Nageswara Rao, “Software Testing Concepts and Tools”, Dream Tech Press, 2 nd Edition, 2007.								
Web References:								

- | |
|---|
| <ol style="list-style-type: none">1. http://www.qatutorial.com/?q=Software_Test_Metrics2. http://softwaretestingfundamentals.com/MODULE-testing/3. http://qainsights.com/challenges-in-test-automation/4. http://www.softwaretestinghelp.com/manual-and-automation-testing-challenges/ |
| E-Text Books: |
| <ol style="list-style-type: none">1. http://www.softwaretestinghelp.com/practical-software-testing-new-free-ebook-download/2. http://www.guru99.com/software-testing.html3. http://www.fromdev.com/2012/04/8-best-software-testing-books-every-qa.html4. https://onlinecourses.nptel.ac.in/noc16_cs16/preview |
| MOOC Course |
| <ol style="list-style-type: none">1. https://www.udacity.com/course/software-testing--cs2582. https://www.utest.com/search-result/tag/Test%20Cycles3. https://www.edureka.co/software-testing |

SOFTWARE PROCESS AND PROJECT MANAGEMENT

PE – V: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB28	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand 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:								
1. Pankaj Jalote, “Software Process Management in Practice”, Pearson, Illustrated, 2002.								
2. Walker Royce, “Software Project Management – A Unified Framework”, Pearson Education, 1 st Edition, 2002.								
Reference Books:								
1. Watts S.Humphrey, “PSP: A Self Improvement Process for Software Engineers”, Addison Wesley, 1 st Edition, 2005.								
2. Chris F. Kemerer, “Software Project Management- Readings and Cases”, McGraw-Hill, Illustrated								

Edition, 1997.

3. Watts S. Humphrey, "Introduction to the Team Software Process", Addison-Wesley, Illustrated Reprint, 2000.

Web References:

1. <http://www.cs.ox.ac.uk/people/michael.wooldridge/teaching/soft-eng/lect05.pdf>
2. <https://www.crcpress.com/IntroductiontoSoftwareProjectManagement/Villafiorita/p/book/9781466559530>

E-Text Books:

1. <https://cs.uwaterloo.ca/~apidduck/se362/Lectures/1intro.pdf>
2. http://www.londoninternational.ac.uk/sites/default/files/computing-samples/co3353_ch1-3.pdf

MOOC Course

1. <https://www.coursera.org/learn/software-processes-and-agile-practices>
2. <https://www.coursera.org/specializations/project-management>
3. <https://www.coursera.org/learn/reviews-and-metrics-for-software-improvements>
4. <https://www.coursera.org/learn/process-improvement>

SOFTWARE QUALITY MANAGEMENT

PE – V: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB29	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Analyze 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.								
MODULE-I	INTRODUCTION						Classes: 10	
Software process assessment overview, assessment phases, assessment principles, assessment conduct, implementation consideration, quality management, quality assurance plan, considerations, verification and validation.								
MODULE-II	CONFIGURATION MANAGEMENT						Classes: 10	
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.								
MODULE-III	SOFTWARE STANDARDS AND INSPECTION						Classes: 09	
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.								
MODULE-IV	TESTING AND MANAGING SOFTWARE QUALITY						Classes: 08	
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.								
MODULE-V	DEFECT PREVENTION						Classes: 08	
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.								
Text Book:								
Watts S. Humphrey, “Managing the Software Process”, Addison Wesley, 1 st Edition, 1989.								
Reference Books:								
1. Tsum S.Chow, “Software Quality Assurance a Practical Approach”, IEEE Computer Society Press, 1985.								
2. Richard E. Fairley, “Software Engineering - A Practitioner’s Approach”, McGraw-Hill, 1982.								

Web References:

1. <http://www.win.tue.nl/~wstomv/edu/2ip30/references/#qualitymanagement>
2. <http://www.rstonehouse.co.uk/old-site/biblio.html>
3. <http://www.rspa.com/spi/sqa.html>

E-Text Books:

1. <https://www.scribd.com/doc/19378602/Quality-Management-eBook>
2. <http://www.artechhouse.com/Main/BillingCountry.aspx?ahbRedirect=1&pageurl=%2fMain%2fBooks%2fPractical-Guide-to-Software-Quality-Management-Sec-200.aspx>
3. <http://www.springer.com/us/book/9783319061054>

MOOC Course

1. <http://online-courses.startclass.com/l/59154/Software-Quality-Assurance>
2. <https://alison.com/learn/quality-management>

SOFT COMPUTING

PE – VI: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB30	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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	
ANFIS (Adaptive neuro-fuzzy inference systems): Introduction, ANFIS Architecture, and hybrid learning algorithm; Advantages and limitations of ANFIS; Application of ANFIS/CANFIS for regression.								
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:

1. J.S.R.Jang, C.T. Sun, E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, Pearson Education, 1st Edition, 2004.
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications,” Wiley India, 3rd Edition, 2004.
3. S. N. Sivanandam, S. N. Deepa, “Principles of Soft Computing,” Wiley India, 2nd Edition, 2005.
4. Laurene Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms and Applications”, Pearson Education, Inc, 1st Edition, 2008.

Reference Books:

1. Hagan T. Martin, H. B. Demuth, Mark Beale, “Neural Network Design,” Thomson Learning. 1st Edition, 2004.
2. Satish Kumar, “Neural Networks – A Classroom Approach,” Tata McGraw-Hill, 2nd Edition, 2005.
3. Kishan Mehrotra, Chilukuri. K. Mohan, Sanjay Ranka, “Elements of Artificial Neural Networks,” Penram International Publishing India, 2nd Edition, 2004.
4. H. J. Zimmermann, “Fuzzy Set Theory and its Applications,” Allied Publishers Ltd, 1st Edition, 2004.
5. John Hertz, Anders Krogh, Richard Palmer” Introduction to The Theory of Neural Computation”, Addison –Wesley Publishing Company, 1st Edition, 1991.

Web References:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing->
4. http://www.myreaders.info/html/soft_computing.html

E-Text Books:

1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.>
3. [http:// tradownload.com/.../soft-computing-techniques-by-sn-sivanandam-and-sn-deepa.html](http://tradownload.com/.../soft-computing-techniques-by-sn-sivanandam-and-sn-deepa.html)

NEURAL NETWORKS AND DEEP LEARNING

PE – VI: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB31	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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	
Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.								
MODULE-II	UNSUPERVISED LEARNING NETWORK						Classes: 10	
Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.								
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	
Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms. Applications Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.								

Text Books:

1. Ian Goodfellow and YoshuaBengio and Aaron Courville, “Deep Learning”, An MIT Press Book.
2. Simon Haykin, “Neural Networks and Learning Machines”, Pearson Prentice Hall. 3rd Edition, 2010.

Reference Books:

1. Charu C. Aggarwal, “Neural Networks and Deep Learning: A Textbook”, Kindle Edition
1st Edition, 2018.

PATTERN RECOGNITION

PE – VI: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB28	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand 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						Classes: 10	
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						Classes: 10	
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						Classes: 09	
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						Classes: 08	
Feature extraction and selection entropy minimization: Karhunen-Loeve transformation, feature selection through functions approximation, binary feature selection.								
MODULE-V	RECENT ADVANCES						Classes: 08	
Fuzzy logic: Fuzzy pattern classifiers; Pattern classification using genetic algorithms, case study using fuzzy pattern classifiers and perception.								
Text Books:								
I. Robert J.Schalkoff, “Pattern Recognition: Statistical, Structural and Neural Approaches”, John Wiley and Sons Inc., New York, 1 st Edition, 2007. II. Tou, Gonzales, “Pattern Recognition Principles”, Wesley Publication Company, London, 1 st Edition, 1974. III. Duda R.O, Hart.P.E.,“Pattern Classification and Scene Analysis”, Wiley, New York, 2 nd Edition, 1973.								

Reference Books:

1. M. Narasimha Murthy, V. Susheela Devi, "Pattern Recognition", Springer 2011.
2. S.Theodoridis, K.Koutroumbas, "Pattern Recognition", Academic Press, 4th Edition, 2009.
3. C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
4. R.O.Duda, P.E.Hart and D.G.Stork, "Pattern Classification", John Wiley, 2nd Edition, 2001
5. Andrew Webb, "Statistical Pattern Recognition", Arnold publishers, London, 2nd Edition, 1999.

Web References:

1. <http://www.journals.elsevier.com/pattern-recognition>
2. <https://www.elsevier.com/journals/pattern-recognition/0031-3203/guide-for-authors>
3. https://en.wikipedia.org/wiki/Pattern_recognition

E-Text Books:

1. <http://store.elsevier.com/Pattern-Recognition/Sergios-Theodoridis/isbn-9781597492720/>
2. <http://www.springer.com/in/book/9780387310732>
3. <http://homepages.inf.ed.ac.uk/rbf/IAPR/researchers/PPRPAGES/pprbks.html>

MOOC Course

1. <https://www.coursera.org/courses?languages=en&query=pattern+recognition>
2. <https://ocw.mit.edu/courses/media-arts-and-sciences/mas-622j-pattern-recognition-and-analysis-fall-2006/>

NATURAL LANGUAGE PROCESSING

PE – VI: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB29	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Knowledge of 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:								
Tan veer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 1 st Edition, 2008.								

Reference Books:

1. Daniel Jurafsky, James H Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.
2. James Allen, "Natural Language Understandings", Benjamin-Cummings Publishing and Co., 2nd Edition, 1995.

Web References:

1. <http://www.textrazor.com>
2. <http://www.coursera.org/course/nlp>
3. <http://www.nlp.stanford.edu/>
4. <http://www.nltk.org/>

E-Text Books:

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

MICRO PROCESSORS AND INTERFACING

OE - I								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AECB55	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the 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. Analyse the basic concepts and programming of 8051 microcontroller.								
MODULE -I	Introduction to 8 bit and 16 bit Microprocessor.						Classes: 08	
An over view of 8085, Architecture of 8086 Microprocessor, register organization of 8086, 8086 flag register. Addressing modes of 8086, Instruction set of 8086. Assembler directives, procedures, and macros. Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation.								
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:								
1. A.K.Ray and K.M.Bhurchandi, “Advanced Microprocessor and Peripherals”, TMH, 2000.								
2. Deshmukh, “Micro Controllers”, Tata McGraw Hill Edition, TMH, 2000								
Reference Books:								
1. Douglas U, “Micro Processors & Interfacing”, Hall, 2007.								

2. By Liu, GA Gibson, “Micro Computer System 8086/8088 Family Architecture, Programming and Design”, PHI, 2nd Edition, 2007.

Web References:

1. <http://www.nptel.ac.in/downloads/106108100/>
2. <http://www.the8051microcontroller.com/web-references>
3. <http://www.iare.ac.in>

E-Text Books:

1. <https://books.google.co.in/books>
2. <http://www.jntubook.com>
3. <http://www.ebooklibrary.org/articles/mpmc>

PRINCIPLES OF COMMUNICATION

OE - I								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AECB56	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. 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	
Introduction, Amplitude Modulation: Time & Frequency – Domain description, Switching modulator, Envelop detector.								
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	
Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, Phase-Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver								
MODULE -V	DIGITAL REPRESENTATION OF ANALOG SIGNALS						Classes: 10	
Introduction, Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise, Pulse-Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing								
Text Books:								
1. Communication Systems, Simon Haykins & Moher, 5th Edition, John Willey, India Pvt. Ltd, 2010, ISBN 978 – 81 – 265 – 2151 – 7.								
Reference Books:								
1. Modern Digital and Analog Communication Systems, B. P. Lathi, Oxford University Press., 4th edition.								
2. An Introduction to Analog and Digital Communication, Simon Haykins, John Wiley India Pvt. Ltd., 2008, ISBN 978–81–265–3653–5.								
3. Principles of Communication Systems, H.Taub & D.L.Schilling, TMH, 2011.								
4. Communication Systems, Harold P.E, Stern Samy and A.Mahmond, Pearson Edition, 2004.								

5. Communication Systems: Analog and Digital, R.P.Singh and S.Sapre: TMH 2nd edition, 200
Web References:
1. http://www.web.eecs.utk.edu 2. https://everythingvtu.wordpress.com 3. http://nptel.ac.in/ 4. http://www.iare.ac.in
E-Text Books:
1. http://www.bookboon.com/ 2. http://www.jntubook.com 3. http://www.smartworld.com 4. http://www.archive.org

IMAGE PROCESSING

OE - I								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AECB57	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the 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	
Digital Image through scanner, digital camera. Concept of gray levels. Gray level to binary image conversion. Sampling and quantization. Relationship between pixels. Imaging Geometry.								
MODULE -II	IMAGE TRANSFORMS						Classes: 09	
2-D FFT , Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform, Hotelling transform.								
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:								
1. R.C. Gonzalez & R.E. Woods, “Digital Image Processing”, Addison Wesley/ Pearson education, 2 nd Edition, 2002.								
Reference Books:								
1. A.K.Jain, “Fundamentals of Digital Image Processing, PHI. 3 RD Edition, 2003.								
2. – Rafael C. Gonzalez, Richard E Woods and Steven, “Digital Image Processing using MAT LAB” L. Edition, PEA, 2004.								
3. William K. Pratt, John, “Digital Image Processing”, Wiley , 3 rd Edition, 2004.								

Web References:

1. <https://imagingbook.com/>
2. https://en.wikipedia.org/wiki/Digital_image_processing
3. <http://www.tutorialspoint.com/dip/>
4. <http://www.imageprocessingplace.com/>

E-Text Books:

1. http://www.sci.utah.edu/~gerig/CS6640-F2010/dip3e_chapter_02.pdf
2. <http://www.faadooengineers.com/threads/350-Digital-Image-Processing>
3. <http://newwayofengineering.blogspot.in/2013/08/anil-k-jain-fundamentals-of-digital.html>

ELECTRICAL ENGINEERING MATERIALS

OC – I								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEEB55	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Learn the 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: 1. J Dekker, “Electrical Engineering Materials Adrianus”, Phi Learning Publishers, 2 nd Edition, 1996. 2. Solymar, L, “Electrical Properties of Materials”, Oxford University Press-New Delhi 8 th Edition, 2009.								

Reference Books:

1. Indulkar C, “Introduction to Electrical Engineering Materials”, S Chand & Company Ltd-New Delhi 4th Edition, 2004.
2. SK Bhattacharya, “Electrical and Electronic Engineering Materials”, Khanna Publishers, New Delhi, 2nd Edition, 1998.

Web References:

1. <https://www.electrical4u.com/electrical-engineering-materials/>
2. <https://lecturenotes.in/subject/219/electrical-engineering-materials-eem>

E-Text Books:

1. https://www.books.google.co.in/books/about/A_Textbook_of_Electrical_Engineering_Mat.html?id=Ee8ruUXkJeMC.
2. <https://www.amazon.in/Introduction-Electrical-Engineering-Materials-ebook/dp/B00QUYKXTI>

NON CONVENTIONAL ENERGY SOURCES

OE - I								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEEB56	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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. Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects								
MODULE - IV	GEOTHERMAL ENERGY AND OCEAN ENERGY						Classes: 10	
Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.								
MODULE - V	DIRECT ENERGY CONVERSION						Classes: 08	
Need for DEC, Carnot cycle, limitations, principles of DEC.								
Text Books: 1.G.D. Rai, “Non-Conventional Energy Sources”, TMH, 3 rd Edition 2009. 2.Twidell & Weir, “Renewable Energy Sources”, CRC Press, 1 st Edition, 2008.								
Reference Books:								

1. Renewable Energy resources /Tiwari and Ghosal/Narosa
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Renewable Energy sources and emerging technologies by D.P. Kothari, K.C. Singhal, P.H.I

NANOTECHNOLOGY

OE - I								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEEB57	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: Nil			
OBJECTIVES: The course should enable the students to: I. Impart the basic knowledge in Nano Science and Technology. II. Give insight into many aspects of Nano science, technology and their applications in the prospective of materials science. III. Develop new devices and technologies for applications in a wide range of industrial sectors including information technology, medicine, manufacturing, high-performance materials								
UNIT-I	INTRODUCTION							
History and scope, can small things make a big difference, classification of nanostructured materials, fascinating nanostructures, applications of nanomaterials, Nature: The best of nanotechnologist, challenges, and future prospects.								
UNIT-II	UNIQUE PROPERTIES OF NANOMATERIALS							
Microstructure and Defects in Nanocrystalline Materials: Dislocations, twins, stacking faults and voids, grain boundaries, triple, and disclinations, effect of Nano-dimensions on materials behavior: Elastic properties, melting point, diffusivity, grain growth characteristics, enhanced solid solubility; Magnetic Properties: Soft magnetic Nanocrystalline alloy, permanent magnetic Nanocrystalline materials, giant magnetic resonance, electrical properties, optical properties, thermal properties, and mechanical properties.								
UNIT-III	SYNTHESIS ROUTES							
Bottom up approaches: Physical vapor deposition, inert gas condensation, laser ablation, chemical vapor deposition, molecular beam Epitaxy, solgel method, self assembly.								
Top down approaches: Mechanical alloying, Nano-lithography, consolidation of Nano powders: Shock wave consolidation, hot isostatic pressing and cold isostatic pressing spark plasma sintering.								
UNIT-IV	TOOLS TO CHARACTERIZE NANOMATERIALS							
X-Ray Diffraction (XRD), small angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.								
UNIT-V	APPLICATIONS OF NANOMATERIALS							
Nano-electronics, micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, food and agricultural industry, cosmetic and consumer goods, structure and engineering, automotive industry, water treatment and the environment, Nano-medical applications, textiles, paints, energy, defence and space applications, concerns and challenges of Nanotechnology.								
Text Books:								

1. B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, “Text Book of Nano Science and Nano Technology”, University Press-IIM.
2. Charles P. Poole, Jr., and Frank J. Owens, “Introduction to Nanotechnology”, Wiley India Edition, 2012.

Reference Books

1. T. Pradeep, “Nano: The Essentials”, McGraw- Hill Education.
2. David Ferry, “Transport in Nano structures”, Cambridge University Press, 2000.
3. Challa S., S. R. Kumar, J. H. Carola, “Nanofabrication towards Biomedical Application: Techniques, tools”, Application and impact Edition.
4. Michael J. O’Connell. “Carbon Nanotubes: Properties and Applications”, Cambridge University Press.
5. S. Dutta, “Electron Transport in Mesoscopic Systems”, Cambridge University Press.

Web References:

1. <https://www.dummies.com/education/.../useful-nanotechnology-information-websites/>
2. <https://www.ncbi.nlm.nih.gov/books/NBK21031/>
3. <https://libguides.northwestern.edu> > LibGuides

E-Text Book:

1. <https://www.accessengineeringlibrary.com/.../textbook-of-nanoscience-and-nanotechn>
2. <https://www.azonano.com/book-reviews-index.aspx>
3. https://en.wikibooks.org/wiki/Nanotechnology/Print_version

SOFT SKILLS AND INTERPERSONAL COMMUNICATION

OE - II								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB18	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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:

1. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.
2. Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.
3. Klaus, Peggy, Jane Rohman & Molly Hamaker. "The Hard Truth about Soft Skills", London: HarperCollins E-books, 2007.
4. Stein, Steven J. & Howard E. Book. "The EQ Edge: Emotional Intelligence and Your Success" Canada: Wiley & Sons, 2006
5. Suresh Kumar. English for Success. Cambridge University Press India Pvt. Ltd. 2010.
6. Dorling Kindersley. Communication Skills & Soft Skills - An Integrated Approach. India Pvt. Ltd. 2013.

Web References:

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

E-Text Books:

2. <http://bookboon.com/en/communication-ebooks-zip>
3. <http://www.bloomsbury-international.com/images/ezone/ebook/writing-skills-pdf.pdf>
4. https://americanenglish.state.gov/files/ae/resource_files/developing_writing.pdf
5. <http://learningenglishvocabularygrammar.com/files/idiomsandphraseswithmeaningsandexamplespdf.pdf>
6. [http://www.robinwood.com/Democracy/General Essays/CriticalThinking.pdf](http://www.robinwood.com/Democracy/General%20Essays/CriticalThinking.pdf)

CYBER LAW AND ETHICS

OE - II								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB19	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand 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	
Definitions, Specificities of the Cyberspace, Dimensions of Cyber Ethics in Cyber Society, Fourth Industrial Revolution, Users' Motivations in Cyber-Space, Core Values and Virtues, Old Values or Eschatological Vision?, Cyber Ethics by Norms, Laws and Relations Artificial Intelligence Ethics: "AI for Good", Cyber-Capitalism: Cyber-Ethics as Business Ethics.								
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	
Principles: Ethical Values, Participation: Access to Knowledge for All, People: Community, Identity, Gender, Generation, Education, Profession: Ethics of Information Professions, Privacy: Dignity, Data Mining, Security. Piracy: Intellectual Property, Cybercrime, Protection: Children and Young People, Power: Economic Power of Technology, Media and Consumers, Policy: Ethics of Regulation and Freedom.								
MODULE-IV	DISRUPTIVE CYBER TECHNOLOGIES AND AI ETHICS						Classes: 09	
Disruptive Cyber Technologies and Ethics -I Artificial: Negative Moral Judgment?, Artificial: Ethically Positive Innovation?, Intelligence: Action-oriented Ability, Creation Story: Human Beings Responsibility, The Commandment to Love and Artificial Intelligence; 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.								

Text Books:
1. Christoph Stuckelberger, Pavan Duggal, “Cyber Ethics 4.0 Serving humanity with values”, Globethics.net Global Series, 2018.
Reference Books:
1. Dr. Farooq Ahmad, Cyber Law in India, Allahbad Law Agency- Faridabad. 2. J.P. Sharma, SunainaKanojia, Cyber Laws 3. Harish Chander , Cyber Laws and IT Protection
E-Reference:
1. https://www.globethics.net/documents/4289936/13403236/Ge_Global_17_web_isbn9782889312641.pdf/

ECONOMIC POLICIES IN INDIA

OE - II								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB20	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil		Practical Classes: Nil			Total Classes: 45		
OBJECTIVES: The course should enable the students to: I. 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 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: 1. The Wealth of Nations-Adam Smith, introduction by Alan B Krueger. 2. The Strength of Economic Development by Albert Hirschman. 3. Money, Banking and Public Finance by Dr. V.C.Sinha 4. Government of India, Economic Survey (Annual), Ministry of Finance, New Delhi. 5. Jain, a. K. (1986), Economic Planning in India, Ashish Publishing House, New Delhi.								

Reference Books:

1. Ahluwalia, I. J. and I. M. D Little (Eds.) (1999), India's Economic Reforms and Development (Essays in honour of Manmohan Singh), Oxford University Press, New Delhi.
2. Bardhan, P. K. (9th Edition) (1999), The Political Economy of Development in India, Oxford University Press, New Delhi.
3. Bawa, R. s. and P. S. Raikhy (Ed.) (1997), Structural Changes in Indian Economy, Guru Nanak Dev University Press, Amritsar.
4. Brahmananda, P. R. and V. R. Panchmukhi (Eds.) (2001), Development Experience in the Indian Economy: Inter-State Perspectives, Book well, Delhi.
5. Chakravarty, S. (1987), Development Planning: The Indian Experience, Oxford University Press, New Delhi.
6. Dantwala, M. L. (1996), Dilemmas of Growth: The Indian Experience, Sage Publications, New Delhi.
7. Datt, R. (Ed.) (2001), Second Generation Economic Reforms in India, Deep & Deep Publications, New Delhi.

Web References:

1. Parikh, K. S. (1999), India Development Report – 1999-2000, Oxford University Press, New Delhi8.
2. Reserve Bank of India, Report on Currency and Finance, (Annual).
3. Sandesara, J. c. (1992), Industrial Policy and Planning, 1947-19919 : Tendencies, Interpretations and Issues, Sage Publications, New Delhi.

GLOBAL WARMING AND CLIMATE CHANGE

OE - II								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB21	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 60			
OBJECTIVES: The course should enable the students to: I. Understand the importance of Ozone layer in the atmosphere. II. Comprehend composition of atmosphere. III. Understand impacts of climate change on ecosystem. IV. Understand initiatives taken by different countries to reduce emission of greenhouse gases.								
MODULE - I	EARTH'S CLIMATE SYSTEM						Classes: 09	
Role of ozone in environment, Ozone layer – Ozone depleting gases, Green House Effect – Radioactive effects of Greenhouse gases, The Hydrological cycle, Green House Gases and Global Warming, Carbon Cycle.								
MODULE -II	ATMOSPHERE AND ITS COMPONENTS						Classes: 09	
Importance of Atmosphere – Physical and chemical characteristics of Atmosphere, Vertical structure of the atmosphere, Composition of the atmosphere, Atmospheric stability, Temperature profile of the atmosphere, Lapse rates, Temperature inversion, Effects of inversion on pollution dispersion.								
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	
Climate change and Carbon credits, CDM – Initiatives in India-Kyoto Protocol, Paris Convention - Intergovernmental Panel on Climate change, Climate Sensitivity and Feedbacks. The Montreal Protocol – UNFCCC – IPCC – Global Climate Models (GCM) - Evidences of Changes in Climate and Environment- on a Global scale and in India.								
MODULE - V	CLIMATE CHANGE AND MITIGATION MEASURES						Classes: 09	
Clean Development Mechanism, Carbon Trading – Examples of future clean technology, Biodiesel – Natural Compost, Eco-friendly plastic, Alternate Energy –Hydrogen, Bio-fuels, Solar Energy, Wind and Hydroelectric Power. Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices – Energy Supply, Transport, Buildings, Industry, Agriculture, Forestry – Carbon sequestration, Carbon capture and storage (CCS), Waste (MSW & Bio-waste, Biomedical, Industrial waste) – International and Regional cooperation.								
Text Books: 1. Dr. Sushil Kumar Dash, “Climate Change: An Indian Perspective (Environment and Development)”, Cambridge University Press India Pvt Ltd, 2007. 2. Adaptation and mitigation of climate change – Scientific Technical Analysis, Cambridge University Press, Cambridge, 2006.								

Reference Books:

1. Atmospheric Science, J.M. Wallace and P.V Hobbs, Elsevier/ Academic Press, 2006.
2. “Climate Change and Climate Variability on Hydrological Regimes”, Jan C. Van Dam, Cambridge University Press, 2003.

E-Text Books:

1. <https://www.worldcat.org/title/encyclopedia-of-global-warming-climate-change/oclc/805580328>
2. <https://libguides.nus.edu.sg/c.php?g=433566&p=2955835>

INTELLECTUAL PROPERTY RIGHTS

OE: II								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB22	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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: 1. P. K. Vasudeva,World Trade Organization: Implications on Indian Economy, Pearson Education,2015. 2. P.KrishnaRao, WTO, Text and cases, Excel Books, 2015. 3. Carlos M.Correa- Intellectual property rights, The WTO and Developing countries-Zed books.								
Reference Books: 1. Caves, Frankel, Jones, World Trade and Payments-An Introduction, Pearson4. Education, 2015. 2. Carlos M.Correa- Intellectual property rights, The WTO and Developing countries-Zed books. 3. Peter-Tobias stoll, Jan busche, Katrianarend- WTO- Trade –related aspects of IPR- Library of Congress.								
Web References:								

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|--|
| <ol style="list-style-type: none">1. http://www.ebooks directory.com2. http://Campus guides.lib.utah.edu |
| E-Text Books: |
| <ol style="list-style-type: none">1. http://www.bookboon.com2. http://www.freemagagement.com3. http://www.emeraldinsight.com |

ENTREPRENEURSHIP

OE - II								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB23	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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	
The revolution impact of entrepreneurship- The evolution of entrepreneurship - Functions of Entrepreneurs – types of entrepreneurs -Approaches to entrepreneurship- Process approach- Role of entrepreneurship in economic development- Twenty first century trends in entrepreneurship.								
MODULE-II	INDIVIDUAL ENTREPRENEURIAL MIND-SET AND PERSONALITY						Classes: 09	
The entrepreneurial journeyStress and the entrepreneur - the entrepreneurial ego - Entrepreneurial motivations- Motivational cycle – Entrepreneurial motivational behavior – Entrepreneurial competencies. Corporate Entrepreneurial Mindset, the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.								
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:

1. D F Kuratko and T V Rao, “Entrepreneurship- A South-Asian Perspective”, Cengage Learning, 2012.
2. Bruce R. Barringer/ R.Duane Ireland, “Entrepreneurship Successfully Launching New Ventures”, Pearson, 4th Edition, 2015.
3. S.S.Khanka, Entrepreneurship Development, S. Chand Publications, 2015.

Reference Books:

1. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
2. Rajeev Roy, Entrepreneurship, Oxford publications, 2nd Edition, 2012.
3. Nandan .H, Fundamentals of Entrepreneurship, PHI, 2013.

VIRTUAL REALITY

OE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB33	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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	
Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark 3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.								
MODULE-II	GEOMETRIC MODELLING						Classes: 09	
Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.								
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. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.								
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	
Introduction, Engineering, Entertainment, Science, Training.The Future: Virtual environment, modes of interaction								

Text Books:

1. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.

Reference Books:

1. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.
2. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
3. Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Inter Science, 2nd Edition, 2006.
4. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application and Design”, Morgan Kaufmann, 2008.

Web References:

1. <http://www.vrac.iastate.edu/>

HUMAN COMPUTER INTERACTION

OE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB34	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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						Classes: 10	
Human computer interface: Characteristics of graphics interface, direct manipulation graphical system; web user interface, popularity, characteristic and principles.								
MODULE-II	INTERFACE DESIGN PROCESS						Classes: 10	
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.								
MODULE-III	WINDOWS						Classes: 09	
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.								
MODULE-IV	MULTIMEDIA						Classes: 08	
Text for web pages: Effective feedback, guidance and assistance, internationalization, accessibility; Icons, image, multimedia, coloring.								
MODULE-V	WINDOWS LAYOUT-TEST						Classes: 08	
Prototypes: Kinds of tests, retest, information search; Visualization, hypermedia; World wide web, software tools.								
Text Books: 1. Wilbent. O. Galitz, “The Essential Guide To User Interface Design”, John Wiley and Sons, 3 rd Edition, 2001. 2. Ben Sheiderman, “Design The User Interface”, Pearson Education, 2 nd Edition, 1998.								

Reference Books:
1. Alan Cooper, “The Essential of User Interface Design”, Wiley – Dream Tech Ltd., 2 nd Edition, 2002.
Web References:
1. http://blog.careerfoundry.com/ui-design/how-to-become-a-ui-designer 2. https://www.edx.org/course/user-experience-ux-design-human-factors-tsinghuax-70167012x-0 3. http://www.creativebloq.com/web-design/examples-ui-design-7133429
E-Text Books:
1. http://www.adhamdannaway.com/blog/ui-design/ui-design-books 2. http://www.springer.com/us/book/9789811024559 3. http://ps.fragmel.edu.in/~dipalis/prgdwnl/eguid.pdf 4. http://www.templatemonster.com/blog/top-10-user-interface-books
MOOC Course
1. https://www.coursera.org/specializations/interaction-design 2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-user-interface-design-and-implementation-spring-2011/ 3. https://www.edx.org/course/subject/design

E-COMMERCE

OE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITB35	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. 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: Frame work, 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: Ravi Kalakata, Whinston Andrew B, “Frontiers of Electronic Commerce”, Pearson, 1 st Edition, 1996.								

Reference Books:
<ol style="list-style-type: none"> 1. David Whitley, “E-Commerce-Strategy, Technologies and Applications”, Tata McGraw-Hill, 2nd Edition, 2000. 2. Kamlesh K. Bajaj, “E-Commerce- The Cutting Edge of Business”, Tata McGraw-Hill, 1st Edition, 2005. 3. J. Christopher Westland, Theodore H. K Clark, “Global Electronic Commerce- Theory and Case Studies”, University Press, 1st Edition, 1999.
Web References:
<ol style="list-style-type: none"> 1. www.engr.sjsu.edu/gaojerry/course/cmpe296u/296z/introduction.pdf 2. https://www.tutorialspoint.com/e_commerce/e_commerce_payment_systems.htm 3. www.csnotes.upm.edu.my/kelasmaya/web.nsf/.../\$FILE/chapt%2001.ppt
E-Text Books:
<ol style="list-style-type: none"> 1. http://www.ebooks-for-all.com/bookmarks/detail/Introduction-To-E-Commerce/onecat/Electronic-books+Economics-and-Business+E-Business/5/all_items.html 2. https://www.tutorialspoint.com/e_commerce/e_commerce_pdf_version.htm 3. https://www.bdc.ca/en/articles-tools/entrepreneur-toolkit/ebooks/pages/e-commerce-guide.aspx
MOOC Course:
<ol style="list-style-type: none"> 1. https://www.edx.org/course/digital-marketing-social-media-e-wharton-digitalmarketing1-1x-0 2. http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s096-effective-programming-in-c-and-c-january-iap-2014/index.htm 3. https://www.class-central.com/mooc/2294/coursera-foundations-of-e-commerce 4. https://www.class-central.com/mooc/1966/canvas-network-basics-of-e-commerce

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY

OE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB35	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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	
The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS) .								
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. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, HashcashPoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.								
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	
Hyperledger Fabric: Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, writing smart contract using Hyperledger Fabric, Writing smart contract using								

Ethereum, Overview of Ripple and Corda.
Text Books:
<ol style="list-style-type: none"> 1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. “Bitcoin and cryptocurrency technologies: a comprehensive introduction”, Princeton University Press, 2016. 2. Melanie Swan, “Block Chain: Blueprint for a New Economy”, O’Reilly, 2015
Reference Books:
<ol style="list-style-type: none"> 1. Josh Thompsons, “Block Chain: The Block Chain for Beginners- Guide to Blockchain Technology and Leveraging Block Chain Programming”, A press, 1st Edition, 2017. 2. Daniel Drescher, “Block Chain Basics”, A press, 1st Edition, 2017. 3. Anshul Kaushik, “Block Chain and Crypto Currencies”, Khanna Publishing House, Delhi. 4. Imran Bashir, “Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Packt Publishing. 5. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Block Chain”, Packt Publishing.
Web References:
https://www.cse.iitm.ac.in/course_details.php?arg=MTQx

PARALLEL COMPUTING

OE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB36	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Understand the 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:
1. Michel J.Quinn, “Parallel Computing Theory and Practice”, McGraw-Hill, 2 nd Edition, 1994. 2. T. G. Lewis, H. El-Rewini, “Introduction to Parallel Computing. Prentice Hall, New Jersey, 1992.
Reference Books:
Albert y.Zomaya , “Parallel and Distributed Computing Hand book”, McGraw -Hill Publications, 2 nd Edition, 2005.
Web References:
1. https://computing.llnl.gov/tutorials/parallel_comp/ 2. http://www.personal.kent.edu/~rmuhamma/Parallel/parallel.html 3. https://www2.cisl.ucar.edu/user-support/parallel-computing-concepts
E-Text Books:
1. http://pages.cs.wisc.edu/%7Eetvrdik/cs838.html 2. http://larc.unt.edu/ian 3. http://www.netlib.org/utk/lsi/pcwLSI/text/
MOOC Course
1. https://ocw.mit.edu/courses/mathematics/18-337j-parallel-computing-fall-2011/ 2. https://www.mooc-list.com/tags/parallel-computing

INFORMATION RETRIEVAL SYSTEMS

OE – III: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB37	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Learn the 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	
Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities.								
MODULE-II	CATALOGING AND INDEXING						Classes: 9	
Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.								
MODULE-III	AUTOMATIC INDEXING, DOCUMENT AND TERM CLUSTERING						Classes: 9	
Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages. Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters								
MODULE-IV	USER SEARCH TECHNIQUES AND INFORMATION VISUALIZATION						Classes: 9	
User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext; Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies								
MODULE-V	TEXT SEARCH ALGORITHMS						Classes: 9	
Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems; Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.								

Text Books:

1. Gerald J. Kowalski, Mark T. Maybury, “Information Storage and Retrieval Systems – Theory and Implementation”, 2nd Edition, Springer.

Reference Books:

1. Frakes, W.B., Ricardo Baeza-Yates, “Information Retrieval Data Structures and Algorithms”, Prentice Hall, 1992.
2. Robert Korfhage, “Information Storage & Retrieval”, John Wiley & Sons.
3. Yates and Neto, “Modern Information Retrieval”, Pearson Education.

Web References:

1. <https://www.math.unipd.it/~aiolli/corsi/0910/IR/irbookprint.pdf>
2. <https://nlp.stanford.edu/IR-book/pdf/irbookonlinereading.pdf>

ENERGY FROM WASTE

OE – IV								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACEB52	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes:45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
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:

1. Nicholas P Cheremisinoff, “Handbook of Solid Waste Management and Waste Minimization Technologies”, An Imprint of Elsevier, New Delhi, 2003.
2. P Aarne Vesilind, William A Worrell and Debra R Reinhart, “Solid Waste Engineering”, 2nd Edition 2002.
3. M Dutta , B P Parida, B K Guha and T R Surkrishnan, “Industrial Solid Waste Management and Land filling practice”, Reprint Edition New Delhi, 1999.
4. Rajya Sabha Secretariat, “E-waste in India: Research unit”, Reprint Edition, June, 2011.

Reference Books:

1. C Parker and T Roberts (Ed), “Energy from Waste”, An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985.
2. KL Shah, “Basics of Solid and Hazardous Waste Management Technology”, Prentice Hall, Reprint Edition, 2000.
3. M Datta, “Waste Disposal in Engineered Landfills”, Narosa Publishing House, 1997.

Web References:

1. <https://www.e-waste Management: From waste to Resource> Klaus Hieronymi, Ramzy Kahnat, Eric williams Tech. & Engg.-2013 (Publisher: Earthscan 2013
2. <https://www.What is the impact of E-waste: Tamara Thompson>
3. <https://www. E-waste poses a Health Hazard: Sairudeen Pattazhy>

E-Text Books:

1. <https://www.unep.org>
2. <https://www.outledge.com>
3. <https://www.bookdepository.com>
4. <https://www.ecoactiv.com>

DISASTER MANAGEMENT

OE - IV								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACEB53	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Identify 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 hazards/ disasters, population explosion.		
MODULE - V	EMERGING APPROACHES IN DISASTER MANAGEMENT	Classes: 09
<p>Emerging approaches in Disaster Management, Three Stages</p> <ol style="list-style-type: none"> 1. Pre, disaster stage(preparedness) 2. EmergencyStage 3. Post Disaster stage, Rehabilitation. 		
Text Books:		
<ol style="list-style-type: none"> 1. Pardeep Sahni, “Disaster Mitigation: Experiences and Reflections”, PHI Learning Pvt. Ltd., 1st Edition, 2001. 2. J.Glynn,GaryW.HeinKe,“EnvironmentalScienceandEngineering”,PrenticeHallPublishers, 2nd Edition, 1996. 		
Reference Books:		
<ol style="list-style-type: none"> 1. R.B.Singh (Ed), “Environmental Geography”, 2nd Edition, 1990. 2. R.B. Singh (Ed), “Disaster Management”, 2nd Edition, 2006. 		
Web References:		
<ol style="list-style-type: none"> 1. https://www.google.co.in/?gfe_rd=cr&ei=iAwWLiDIazv8we8_5LADA#q=disater+mangement 2. http://ndma.gov.in/images/policyplan/dmpln/National%20Disaster%20Management%20Plan%20May%202016.pdf 3. http://www.eib.europa.eu/attachments/pipeline/20080021_eia_en.pdf 4. http://www.ndmindia.nic.in/ 		
E-Text Books:		
<ol style="list-style-type: none"> 1. https://www.google.co.in/?gfe_rd=cr&ei=iAwWLiDIazv8we8_5LADA#q=disaster+management+e+textbooks 2. http://cbse.nic.in/natural%20hazards%20&%20disaster%20management.pdf 3. http://www.digitalbookindex.org/_search/search010emergencydisastera.asp 4. http://www.icbse.com/books/cbse,ebooks,download 		

ELEMENTS OF AERONAUTICS

OE – IV								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AAEB55	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. 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 centreaerofoil characteristics-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.
Text Books:
<ol style="list-style-type: none"> 1. Newman D, “Interactive Aerospace Engineering and Design”, McGraw-Hill, 1st Edition, 2002. 2. Anderson J. D, “Introduction To Flight”, McGraw-Hill Education, 5th Edition, 2002
Reference Books:
<ol style="list-style-type: none"> 1. Kermode. A. C, “Flight without Formulae”, McGraw Hill, 4th Edition, 1997. 2. Barnard R.H and Philpot. D.R, “Aircraft Flight”, Pearson, 3rd Edition, 2004. 3. Swatton P.J, “Flight Planning”, Blackwell Publisher, 6th Edition, 2002.
Web References:
<ol style="list-style-type: none"> 1. https://www.aerospaceengineering.es/book/ 2. https://www.ne.nasa.gov/education/ 3. https://nptel.ac.in
E-Text Books:
<ol style="list-style-type: none"> 1. https://www.e-booksdirectory.com/ 2. https://www.adl.gatech.edu/extrovert/Ebooks/ebook_Intro.pdf 3. https://www.academia.edu/7950378/Introduction_to_Flight_-_Anderson_5th_Ed

AVIATION MANAGEMENT

OE – IV								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AAEB28	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand 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:
<ol style="list-style-type: none"> 1. Graham. A Managing airports - an International Perspective butterworth-heinemann, oxford 2001. 2. Wells. A. Airport Planning and Management, 4th edition McGraw-Hill, London 2000.
Reference Books:
<ol style="list-style-type: none"> 1. Alexander t. wells, seth young, Principles of Airport management, McGraw-hill 2003Y. V. C. Rao, 2. Richard de neufille, Airport systems: Planning, Design & Management, McGraw-hill London 2007.
Web References:
<ol style="list-style-type: none"> 1. https://memberfiles.freewebs.com/94/47/55224794/documents/airport%20planning%20and%20management.pdf 2. https://books.google.co.in/books?id=RYS6cu4YSBcC&dq=Planning%20and%20Design%20of%20Airports&source=gbs_similarbooks
E-Text Books:
<ol style="list-style-type: none"> 1. https://accessengineeringlibrary.com/browse/airport-planning-and-management-sixth-edition 2. https://www.only4engineer.com/2014/10/planning-and-design-of-airports-by.html

INTRODUCTION TO ROBOTICS

OE – IV								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEB56	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. 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 over view of robotics, classification by coordinate system and control systems; Components of the industrial robotics: Degrees of freedom, end effectors: Mechanical gripper, magnetic, vacuum cup and other types of grippers, general consideration on gripper selection and design.								
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:								
1. Groover M. P, “Industrial Robotics”, Tata McGraw-Hill, 1 st Edition, 2013.								
2. J. J Craig, “Introduction to Robotic Mechanics and Control”, Pearson, 3rd Edition, 2013.								

Reference Books:

1. Richard D. Klafter, “Robotic Engineering”, Prentice Hall, 1st Edition, 2013.
2. Fu K S, “Robotics”, McGraw-Hill, 1st Edition, 2013.

Web References:

1. <https://www.doc.ic.ac.uk/~ajd/Robotics/RoboticsResources/lecture1.pdf>.
2. <http://opencourses.emu.edu.tr/course/view.php?id=32>
3. https://www.researchgate.net/publication/277712686_Introduction_to_Robotics_class_notes_UG_level_1

E-Text Book:

1. <http://www.robot.bmstu.ru/>
2. <http://www.robotee.com/index.php/download-free-robotic-e-books/>

RAPID PROTOTYPING

OE – IV								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEB57	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES: The course should enable the students to: I. Identify 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						Classes : 09	
Introduction: Prototype Fundamentals, Types and Roles of Prototype, Fundamentals of Rapid Prototyping, Phases of Development Leading to Rapid Prototyping, Advantages of Rapid Prototyping and Classifications of Rapid Prototyping System, Generic RP process. Rapid Product Development: An Overview virtual prototyping and testing technology, Physical Prototyping and Rapid Manufacturing technologies and Synergic Integration Technologies.								
MODULE -II	LIQUID-BASED RAPID PROTOTYPING SYSTEMS						Classes : 09	
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						Classes: 09	
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) andCAM-LEM.								
MODULE -IV	POWDER-BASED RAPID PROTOTYPING SYSTEMS						Classes: 09	
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						Classes : 09	
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 3DP. Reverse engineering: Acquiring Point Data, Constructing 3D model and Applications. Virtual Augmented Reality: Requirement of devices and								

technologies and applications. Case Studies: Applications of Rapid Prototyping in Aerospace Industry, Automotive Industry, Biomedical Industry, Jewellery Industry, Coin Industry, Tableware Industry and Sports Field.

Text Books:

1. Chua C K, Leong K F, Chu S L, “Rapid Prototyping: Principles and Applications in Manufacturing”, World Scientific, 3rd Edition, 2008.
2. Liou W L, Liou F W, “Rapid Prototyping and Engineering applications: A Tool Box for Prototype Development”, CRC Press, 1st Edition, 2007.

Reference Books:

1. Gibson D W Rosen, Brent Stucker, “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 1st Edition, 2014.
2. Kamrani A K, Nasr E A, “Rapid Prototyping: Theory and practice”, Springer, 1st Edition, 2006.
3. Rafiq I. Noorani, “Rapid Prototyping: Principles and Applications”, John Wiley & Sons, 1st Edition, 2005.

Web References:

1. <https://nptel.ac.in/courses/112102103/16>
2. <https://nptel.ac.in/courses/112107078/37>

E-Text Book:

1. https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf

ENVIRONMENTAL SCIENCES

IV Semester: AE / CSE / IT / ECE / EEE / ME / CE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB07	Mandatory	L	T	P	C	CIA	SEE	Total
		-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: Nil			
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 act1981, water act, forest act, wild life act, municipal solid waste management and handling rules, biomedical waste management and handling rules2016, hazardous waste management and handling rules, Environmental impact assessment(EIA); Towards sustainable future: Concept of sustainable development, population and its explosion, crazy consumerism, environmental education, urban sprawl, concept of green building								

Text Books:

1. Benny Joseph, "Environmental Studies", Tata McGraw Hill Publishing Co. Ltd, New Delhi, 2005.
2. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", Universities Press. 2005.

Reference Books:

1. Anji Reddy .M, "Textbook of Environmental Sciences and Technology", BS Publications, 2007.
2. Anjaneyulu, "Introduction to Environmental Sciences", BS Publications, 2004.
3. Anubha Kaushik, Perspectives in Environmental Science, New age international. 3rd Edition, 2006.
4. Tyler Miller, Scott Spoolman, "Environmental Science", Cengage Learning, 14th Edition, 2012.

Web References:

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

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

VII Semester: AE / CSE / IT / ECE / EEE / ME / CE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSB17	Mandatory	L	T	P	C	CIA	SEE	Total
		-	-	-	-	30	70	100
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								
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); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.								
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:								
1. Traditional Knowledge System in India, by Amit Jha, 2009. 2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh Pratibha Prakashan 2012.								
Reference Books:								
1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002. 2. "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 INFORMATION TECHNOLOGY

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

A graduate of the Information Technology Program should:

- PEO – I:** To prepare the graduates for a successful career to meet the diversified needs of industry, academia and research.
- PEO – II:** To equip graduates with a solid foundation in discrete mathematical and engineering fundamentals required to develop problem solving ability in complex engineering design.
- PEO – III:** To train students to comprehend, analyze, design and provide ability to create novel products and technologies that give solution-frameworks to real world problems.
- PEO – IV:** To inculcate in graduates the qualities of leadership in technology innovation and entrepreneurship with effective communication skills, teamwork, ethics and to create ability for life-long learning needed in a successful professional 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: Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service 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 stake – holders know that we are an Autonomous College?

Autonomous status, once declared, shall be accepted by all the stake holders. The Govt. of Telangana mentions autonomous status during the First Year admission procedure. Foreign Universities and Indian Industries will know our status through our website.

5. What is the change of Status for Students and Teachers if we become Autonomous?

An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic performances, our capability of self- governance and the kind of quality education we offer.

6. Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?

There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic 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.

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

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 i represent the number of courses in which a student registered in the concerned semester. SGPA is rounded to two decimal places.

17 What is a Cumulative Grade Point Average (CGPA)?

An up-to-date assessment of overall performance of a student from the time of his first registration is

obtained by calculating a number called CGPA, which is weighted average of the grade points obtained in all the courses registered by the students since he entered the Institute.

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

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. CGPA is rounded to two decimal places.

18 Is there any Software available for calculating Grade point averages and converting the same into Grades?

Yes, The institute has its own MIS software for calculation of SGPA, CGPA, etc.

19 Will the teacher be required to do the job of calculating SGPAs etc. and convert the same into Grades?

No. The teacher has to give marks obtained out of whatever maximum marks as it is. Rest is all done by the computer.

20 Will there be any Revaluation or Re-Examination System?

No. There will double valuation of answer scripts. There will be a make up Examination after a reasonable preparation time after the End Semester Examination for specific cases mentioned in the Rules and Regulations. In addition to this, there shall be a ‘summer term’ (compressed term) followed by the End Semester Exam, to save the precious time of students.

21 How fast Syllabi can be and should be changed?

Autonomy allows us the freedom to change the syllabi as often as we need.

22 Will the Degree be awarded on the basis of only final year performance?

No. The CGPA will reflect the average performance of all the semester taken together.

23 What are Statutory Academic Bodies?

Governing Body, Academic Council, Examination Committee and Board of Studies are the different statutory bodies. The participation of external members in every body is compulsory. The institute has nominated professors from IIT, NIT, University (the officers of the rank of Pro-vice Chancellor, Deans and Controller of Examinations) and also the reputed industrialist and industry experts on these bodies.

24 Who takes Decisions on Academic matters?

The Governing Body of institute is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like Boards of Studies. Decisions taken at the 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

S.No	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculator, cell phone, pager, palm computer or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Controller of Examinations /Additional Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the COE or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the COE or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the Institute premises or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination, or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	<p>Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.</p> <p>Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.</p>
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

UNDERTAKING BY STUDENT / PARENT

“To make the students attend the classes regularly from the first day of starting of classes and be aware of the College regulations, the following Undertaking Form is introduced which should be signed by both student and parent. The same should be submitted to the Dean, Academic”.

I, Mr. / Ms. ----- joining I Semester / III Semester for the academic year 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