REGULATIONS 2017

CURRICULUM AND SYLLABI

B.Tech.

INFORMATION TECHNOLOGY
VISION AND MISSION OF THE INSTITUTION

VISION
B.S. Abdur Rahman Institute of Science and Technology aspires to be a leader in Education, Training and Research in Engineering, Science, Technology and Management and to play a vital role in the Socio-Economic progress of the Country.

MISSION
Â To blossom into an internationally renowned University
Â To empower the youth through quality education and to provide professional leadership
Â To achieve excellence in all its endeavors to face global challenges
Â To provide excellent teaching and research ambience
Â To network with global institutions of Excellence, Business, Industry and Research Organizations
Â To contribute to the knowledge base through Scientific enquiry, Applied research and Innovation
DEPARTMENT OF INFORMATION TECHNOLOGY

VISION AND MISSION

VISION

- To be a leader in providing quality education and training in the field of Information Technology at Undergraduate and Postgraduate levels and undertake Research activities thereby contributing to the progress of the country.

MISSION

- To impart quality education and inculcate professionalism to suit the needs of the industries and society.
- To involve graduates in undertaking need based Research activities and disseminate the knowledge to develop entrepreneurial skills.
- To improve the professionalism through extension activities, industrial visits and in-plant training.
- To improve communicate effectively both in documentation and presentation.
- To create awareness of social, economic responsibilities ethically.
PROGRAMME EDUCATIONAL OBJECTIVES

- To provide students with core competence in mathematics, science and engineering concepts essential to formulate, analyze and solve hardware / software engineering problems.
- To impart students with good breadth of knowledge in the core areas of information technology and related engineering so as to comprehend engineering trade-offs, analyze, design and synthesize data and technical concepts to create novel products and solutions for the real time problems.
- To train students in the use of tools and techniques for software development in different application domains and to grow as an entrepreneur.
- To prepare students to apply their knowledge and multifaceted skills to get immediate employment and excel in IT professional careers or awareness of the lifelong learning needed to continue their education in IT or related post graduate programmes to perform excellence, leadership and demonstrate good citizenship.
- To inculcate in students to maintain high professionalism and ethical standards, effective oral and written communication skills, to work as part of teams on multidisciplinary projects and diverse professional environments, and relate engineering issues to the society, global economy and to emerging technologies.

PROGRAMME OUTCOMES

On successful completion of the programme, the graduates will

- Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- Identify, formulate, research literature, and analyses complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 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.
- 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.
• 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.

• 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.

• Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

• Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

• Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

• 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.

• 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.

• 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.

• To impart broad spectrum of knowledge and skill in the analysis, design, implementation and testing of software systems.

• To focus on need based research in different domains relevant to Information Technology and carry out research projects of national and social relevance.

• To provide problem solving capability through IT tools and techniques with adequate hands on experience to meet industry/ societal needs.

• To develop communication, problem solving, team spirit and leadership skills for a successful professional career.
1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i) "Programme" means B.Tech. Degree Programme.

ii) "Branch" means specialization or discipline of B.Tech. Degree Programme like Civil Engineering, Mechanical Engineering, etc.,

iii) "Course" means a theory or practical subject that is normally studied in a semester, like Mathematics, Physics, Engineering Graphics, Computer Practice, etc.,

iv) "Institution" means B.S.Abdur Rahman Crescent Institute of Science and Technology.

v) "Dean (Academic Affairs)" means the Dean (Academic Affairs) of B.S.Abdur Rahman Crescent Institute of Science and Technology.

vi) "Dean (Student Affairs)" means the Dean (Students Affairs) of B.S.Abdur Rahman Crescent Institute of Science and Technology.

vii) "Controller of Examinations" means the Controller of Examination of B.S.Abdur Rahman Crescent Institute of Science and Technology who is responsible for conduct of examinations and declaration of results.

2.0 ADMISSION

2.1a) Candidates for admission to the first semester of the eight-semester B.Tech. degree programme shall be required to have passed the Higher Secondary Examination of the (10+2) curriculum (Academic stream) prescribed by the appropriate authority or any other examination of any university or authority accepted by the Institution as equivalent thereto.

2.1b) Candidates for admission to the third semester of the eight-semester B.Tech. programme under lateral entry scheme shall be required to have passed the Diploma examination in Engineering / Technology of the Department of Technical Education, Government of Tamil Nadu or any other examination of any other authority accepted by the Institution as equivalent thereto.

2.2 Notwithstanding the qualifying examination the candidate might have passed, the candidate shall also write an entrance examination prescribed by the Institution for admission. The entrance examination shall test the proficiency of
the candidate in Mathematics, Physics and Chemistry on the standards prescribed for Ten plus Two academic stream.

2.3 The eligibility criteria such as marks, number of attempts and physical fitness shall be as prescribed by the Institution from time to time.

3.0 BRANCHES OF STUDY

3.1 Regulations are applicable to the following B.Tech. degree programmes in various branches of Engineering and Technology, each distributed over eight semesters with two semesters per academic year.

B.TECH. DEGREE PROGRAMMES:

1. Aeronautical Engineering
2. Automobile Engineering
3. Civil Engineering
4. Computer Science and Engineering
5. Electrical and Electronics Engineering
6. Electronics and Communication Engineering
7. Electronics and Instrumentation Engineering
8. Information Technology
9. Manufacturing Engineering
10. Mechanical Engineering
11. Polymer Engineering
12. Biotechnology
13. Cancer Biotechnology
14. Food Biotechnology

4.0 STRUCTURE OF THE PROGRAMME

4.1 Every Programme will have a curriculum with syllabi consisting of theory and practical courses such as,
   i) Basic Sciences (BS)
   ii) Humanities & Social Sciences (HS)
   iii) Management Sciences (MS)
   iv) Engineering Sciences Fundamentals (ESF)
   v) Engineering Core Courses (EC)
   vi) Professional Electives (PE)
   vii) General Electives (GE)
   viii) Workshop practice, laboratory work, industrial training, seminar
presentation, project work, etc.

4.2 Each course is normally assigned certain number of credits:

- one credit per lecture period per week
- one credit per tutorial period per week
- one credit for two to three periods and two credits for four periods of laboratory or practical sessions
- one credit for two periods of seminar / project work per week
- one credit for two weeks of industrial training.

4.3 Each semester curriculum shall normally have a blend of lecture courses, laboratory courses and laboratory integrated theory courses of total not exceeding 26 credits.

4.4 For the award of the degree, a student has to earn a minimum total credits specified in the curriculum of the relevant branch of study. The minimum credits to be earned will be between 174 and 180, depending on the program.

4.5 The medium of instruction, examinations and project report shall be in English, except for courses in languages other than English.

5.0 DURATION OF THE PROGRAMME

5.1 A student is ordinarily expected to complete the B.Tech. programme in eight semesters (six semesters in the case of lateral entry scheme), but in any case not more than 14 continuous semesters reckoned from the date of first admission (12 semesters in the case of lateral entry student).

5.2 Each semester shall consist of a minimum of 90 working days.

5.3 Semester end examination will normally follow within a week after the last working day of the semester.

6.0 CLASS ADVISOR AND FACULTY ADVISOR

6.1 CLASS ADVISOR

A faculty member will be nominated by the HOD as Class Advisor for the class throughout the period of study except first year.

The Class Advisor shall be responsible for maintaining the academic, curricular and co-curricular records of students of the class throughout their period of study.

However, for the first and second semester, the class advisors (First year class advisors) will be nominated by the first year coordinator.
6.2 FACULTY ADVISOR
To help the students in planning their courses of study and for general counseling, the Head of the Department of the students will attach a maximum of 20 students to a faculty member of the department who shall function as faculty advisor for the students throughout their period of study. Such faculty advisor shall guide the students in taking up the elective courses for registration and enrolment in every semester and also offer advice to the students on academic and related personal matters.

7.0 COURSE COMMITTEE
7.1 Each common theory course offered to more than one group of students shall have a Course Committee comprising all the teachers teaching the common course with one of them nominated as course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The Course Committee shall meet as often as possible and ensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests. Wherever it is feasible, the Course Committee may also prepare a common question paper for the test(s).

8.0 CLASS COMMITTEE
A class committee comprising faculty members handling the classes, student representatives and a senior faculty member not handling the courses as chairman will be constituted branch-wise and semester-wise.

8.1 The composition of class committees for first and second semester will be as follows:
   i) The first year coordinator shall be the chairman of the class committee
   ii) Faculty members of all individual courses of first / second semester
   iii) Six student representatives (male and female) of each class nominated by the first year coordinator
   iv) The class advisor and faculty advisors of the class.

8.2 The composition of the class committee for each branch from 3rd to 8th semester will be as follows:
   i) One senior faculty member preferably not handling courses for the concerned semester, appointed as chairman by the Head of the
Department

ii) Faculty members of all courses of the semester

iii) Six student representatives (male and female) of each class nominated by the Head of the Department in consultation with the relevant faculty advisors

iv) All faculty advisors and the class advisors.

v) Head of the Department

8.3 The class committee shall meet at least four times during the semester. The first meeting will be held within two weeks from the date of commencement of classes, in which the nature of continuous assessment for various courses and the weightages for each component of assessment will be decided for the first and second assessment. The second meeting will be held within a week after the date of first assessment report, to review the students' performance and for follow up action. The third meeting will be held within a week after the second assessment report, to review the students' performance and for follow up action.

8.4 During these three meetings the student members representing the entire class, shall meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process.

8.5 The fourth meeting of the class committee, excluding the student members, shall meet within 5 days from the last day of the semester end examination to analyze the performance of the students in all the components of assessments and decide their grades in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the concerned course coordinator.

9.0 REGISTRATION AND ENROLMENT

9.1 Except for the first semester, every student shall register for the ensuing semester during a specified week before the semester end examination of the ongoing semester. Every student shall submit a completed registration form indicating the list of courses intended to be enrolled during the ensuing semester. Late registration with the approval of the Dean (Academic Affairs) along with a late fee will be permitted up to the last working day of the current semester.
9.2 From the second year onwards, all students shall pay the prescribed fees for the year on a specific day at the beginning of the semester confirming the registered courses. Late enrolment along with a late fee will be permitted up to two weeks from the date of commencement of classes. If a student does not enroll, his/her name will be removed from rolls.

9.3 The students of first semester shall register and enroll at the time of admission by paying the prescribed fees.

9.4 A student should have registered for all preceding semesters before registering for a particular semester.

10.0 COURSE CHANGE / WITHDRAWAL

10.1 CHANGE OF A COURSE
A student can change an enrolled course within 10 working days from the commencement of the course, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

10.2 WITHDRAWAL FROM A COURSE
A student can withdraw from an enrolled course at any time before the first assessment for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

11.0 TEMPORARY BREAK OF STUDY FROM PROGRAMME
A student may be permitted by the Dean (Academic Affairs) to avail temporary break of study from the programme up to a maximum of two semesters for reasons of ill health or other valid grounds. A student can avail the break of study before the start of first assessment of the ongoing semester. However the total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 5.1). If any student is debarred for want of attendance or suspended due to any act of indiscipline, it will not be considered as break of study. A student who has availed break of study has to rejoin in the same semester only.

12.0 CREDIT LIMIT FOR ENROLMENT & MOVEMENT TO HIGHER SEMESTER
12.1 A student can enroll for a maximum of 32 credits during a semester including Redo/Pre do Courses
12.2 The minimum earned credit required to move to the higher semester shall be
   • Not less than 20 credits, to move to the 3rd semester
   • Not less than 40 credits, (20 for lateral entry) to move to the 5th semester
Not less than 60 credits, (40 for lateral entry) to move to the 7th semester

13.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

13.1 Every theory course shall have a total of three assessments during a semester as given below:

<table>
<thead>
<tr>
<th>Assessment No.</th>
<th>Course Coverage in Weeks</th>
<th>Duration</th>
<th>Weightage of Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment 1</td>
<td>1 to 6</td>
<td>1.5 hours</td>
<td>25%</td>
</tr>
<tr>
<td>Assessment 2</td>
<td>7 to 12</td>
<td>1.5 hours</td>
<td>25%</td>
</tr>
<tr>
<td>Semester End Exam</td>
<td>Full course</td>
<td>3 hours</td>
<td>50%</td>
</tr>
</tbody>
</table>

13.2 Appearing for semester end theory examination for each course is mandatory and a student should secure a minimum of 40% marks in each course in semester end examination for the successful completion of the course.

13.3 Every practical course will have 60% weightage for continuous assessments and 40% for semester end examination. However a student should have secured a minimum of 50% marks in the semester end practical examination.

13.4 For laboratory integrated theory courses, the theory and practical components shall be assessed separately for 100 marks each and consolidated by assigning a weightage of 75% for theory component and 25% for practical component. Grading shall be done for this consolidated mark. Assessment of theory component shall have a total of three assessments with two continuous assessments carrying 25% weightage each and semester end examination carrying 50% weightage. The student shall secure a separate minimum of 40% in the semester end theory examination. The evaluation of practical component shall be through continuous assessment.

13.5 The components of continuous assessment for theory/practical/laboratory integrated theory courses shall be finalized in the first class committee meeting.

13.6 In the case of Industrial training, the student shall submit a report, which will be evaluated along with an oral examination by a committee of faculty members, constituted by the Head of the Department. A progress report from the industry will also be taken into account for evaluation. The weightage for report shall be 60% and 40% for Viva Voce examination.

13.7 In the case of project work, a committee of faculty members constituted by the
Head of the Department will carry out three periodic reviews. Based on the project report submitted by the student(s), an oral examination (viva-voce) will be conducted as the semester end examination, for which one external examiner, approved by the Controller of Examinations, will be included. The weightage for periodic review will be 50%. Of the remaining 50%, 20% will be for the project report and 30% for the Viva Voce examination.

13.8 Assessment of seminars and comprehension will be carried out by a committee of faculty members constituted by the Head of the Department.

13.9 For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during first appearance will be used for grading along with the marks scored in the arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester end examination and the internal assessment marks secured during the course of study shall be ignored.

In case of laboratory integrated theory courses, after one regular and one arrear appearance, the internal mark of theory component is invalid and full weightage shall be assigned to the marks scored in the semester end examination for theory component. There shall be no arrear or improvement examination for lab component.

14.0 SUBSTITUTE EXAMINATIONS

14.1 A student who has missed, for genuine reasons, a maximum of one of the two continuous assessments of a course may be permitted to write a substitute examination paying the prescribed substitute examination fees. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accidents, admission to a hospital due to illness, etc. by a committee constituted by the Dean of School for that purpose. However there is no Substitute Examination for Semester End examination.

14.2 A student who misses any continuous assessment test in a course shall apply for substitute exam in the prescribed form to the Head of the Department / Dean of School within a week from the date of missed assessment test. However the Substitute Examination will be conducted after the last working day of the semester and before Semester End Examination.

15.0 ATTENDANCE REQUIREMENT AND SEMESTER / COURSE REPETITION

15.1 A student shall earn 100% attendance in the contact periods of every course,
subject to a maximum relaxation of 25% (for genuine reasons such as medical grounds or representing the Institution in approved events etc.) to become eligible to appear for the semester-end examination in that course, failing which the student shall be awarded ãò grade in that course. The cases in which the student is awarded ãò grade, shall register and repeat the course when it is offered next.

15.2 The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in that course to the Class Advisor. The Class Advisor will consolidate and furnish the list of students who have earned less that 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department/ Dean of School. Thereupon, the Dean (Academic Affairs) shall announce the names of such students prevented from writing the semester end examination in each course.

15.3 A student who has obtained ãò grade in all the courses in a semester is not permitted to move to next higher semester. Such student shall repeat all the courses of the semester in the subsequent academic year.

15.4 A student should register to re-do a core course wherein ãò or ãWò grade is awarded. If the student is awarded, ãò or ãWò grade in an elective course either the same elective course may be repeated or a new elective course may be taken with the approval of Head of the Department / Dean of School.

15.5 A student who is awarded ãUò grade in a course will have the option to either write the semester end arrear examination at the end of the subsequent semesters, or to redo the course in the evening when the course is offered by the department. Marks scored in the continuous assessment during the redo classes shall be considered for grading along with the marks scored in the semester-end (redo) examination. If any student obtained ãUò grade in the redo course, the marks scored in the continuous assessment test (redo) for that course will be considered as internal mark for further appearance of arrear examination.

15.6 If a student with ãUò grade, who prefers to redo any particular course, fails to earn the minimum 75% attendance while doing that course, then he / she will not be permitted to write the semester end examination and his / her earlier ãUò grade and continuous assessment marks shall continue.
16.0 REDO COURSES

16.1 A student can register for a maximum of two redo courses per semester in the evening after regular college hours, if such courses are offered by the concerned department. Students may also opt to redo the courses offered during regular semesters.

16.2 The Head of the Department with the approval of Dean Academic Affairs may arrange for the conduct of a few courses during the evening, depending on the availability of faculty members and subject to a specified minimum number of students registering for each of such courses.

16.3 The number of contact hours and the assessment procedure for any redo course will be the same as those during regular semesters except that there is no provision for any substitute examination and withdrawal from an evening redo course.

17.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

17.1 All assessments of a course will be made on absolute marks basis. However, the Class Committee without the student members shall meet within 5 days after the semester-end examination and analyze the performance of students in all assessments of a course and award letter grades. The letter grades and the corresponding grade points are as follows:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Grade Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>10</td>
</tr>
<tr>
<td>A</td>
<td>9</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
</tr>
<tr>
<td>C</td>
<td>7</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
</tr>
<tr>
<td>U</td>
<td>0</td>
</tr>
<tr>
<td>W</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>0</td>
</tr>
<tr>
<td>AB</td>
<td>0</td>
</tr>
</tbody>
</table>

"W" denotes withdrawal from the course.

"I" denotes inadequate attendance and hence prevention from semester-end examination.

"U" denotes unsuccessful performance in the course.

"AB" denotes absence for the semester-end examination.

17.2 A student who earns a minimum of five grade points (E grade) in a course is
declared to have successfully completed the course. Such a course cannot be repeated by the student for improvement of grade.

17.3 The results, after awarding of grades, shall be signed by the Chairman of the Class Committee and Head of the Department/Dean of Schools and it shall be declared by the Controller of Examinations.

17.4 Within one week from the date of declaration of result, a student can apply for revaluation of his/her semester-end theory examination answer scripts of one or more courses, on payment of prescribed fee, through proper application to Controller of Examination. Subsequently the Head of the Department/Dean of School offered the course shall constitute a revaluation committee consisting of Chairman of the Class Committee as Convener, the faculty member of the course and a senior member of faculty knowledgeable in that course. The committee shall meet within a week to revalue the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

17.5 After results are declared, grade sheets shall be issued to each student, which will contain the following details. The list of courses enrolled during the semester including redo courses, if any, and the grade scored, the Grade Point Average (GPA) for the semester and the Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards. GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.

If \( C_i \) is the number of credits assigned for the \( i^{th} \) course and \( GP_i \) is the Grade Point in the \( i^{th} \) course

\[
GPA = \frac{\sum_{i=1}^{n} C_i GP_i}{\sum_{i=1}^{n} C_i}
\]

Where \( n \) = number of courses

The Cumulative Grade Point Average CGPA shall be calculated in a similar manner, considering all the courses enrolled from first semester.

"I" and "W" grades will be excluded for calculating GPA.

"U", "I", "AB" and "W" grades will be excluded for calculating CGPA.
The formula for the conversion of CGPA to equivalent percentage of marks shall be as follows:

Percentage Equivalent of Marks = CGPA × 10

17.6 After successful completion of the programme, the Degree will be awarded with the following classifications based on CGPA.

<table>
<thead>
<tr>
<th>Classification</th>
<th>CGPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class with Distinction</td>
<td>8.50 and above and passing all the courses in first appearance and completing the programme within the Prescribed period of 8 semester for normal entry and 6 semesters for lateral entry</td>
</tr>
<tr>
<td>First Class</td>
<td>6.50 and above and completing the programme within a maximum of 10 semester for normal entry and 8 semesters for lateral entry</td>
</tr>
<tr>
<td>Second Class</td>
<td>Others</td>
</tr>
</tbody>
</table>

However, to be eligible for First Class with Distinction, a student should not have obtained 'D' or 'P' grade in any course during his/her study and should have completed the U.G. programme within a minimum period (except break of study). To be eligible for First Class, a student should have passed the examination in all the courses within the specified minimum number of semesters reckoned from his/her commencement of study. For this purpose, the authorized break of study will not be counted. The students who do not satisfy the above two conditions will be classified as second class. For the purpose of classification, the CGPA will be rounded to two decimal places. For the purpose of comparison of performance of students and ranking, CGPA will be considered up to three decimal places.

18.0 ELECTIVE CHOICE:

18.1 Apart from the various elective courses listed in the curriculum for each branch of specialization, the student can choose a maximum of two electives from any other specialization under any department, during the entire period of study, with the approval of the Head of the parent department and the Head of
the other department offering the course.

18.2 ONLINE / SELF STUDY COURSES
Students are permitted to undergo department approved online/ self study courses not exceeding a total of six credits with the recommendation of the Head of the Department / Dean of School and with the prior approval of Dean Academic Affairs during his/ her period of study. In case of credits earned through online mode ratified by the respective Board of Studies, the credits may be transferred following the due approval procedures. The students shall undergo self study courses on their own with the mentoring of a member of the faculty. The online/ self study courses can be considered in lieu of elective courses.

19.0 SUPPLEMENTARY EXAMINATION
Final Year students can apply for supplementary examination for a maximum of two courses thus providing an opportunity to complete their degree programme. Likewise students with less credits can also apply for supplementary examination for a maximum of two courses to enable them to earn minimum credits to move to higher semester. The students can apply for supplementary examination within three weeks of the declaration of results.

20.0 PERSONALITY AND CHARACTER DEVELOPMENT
20.1 All students shall enroll, on admission, in any of the personality and character development programmes, NCC / NSS / NSO / YRC / Rotaract and undergo practical training.
- **National Cadet Corps (NCC)** will have to undergo specified number of parades.
- **National Service Scheme (NSS)** will have social service activities in and around Chennai.
- **National Sports Organization (NSO)** will have sports, games, drills and physical exercises.
- **Youth Red Cross (YRC)** will have social service activities in and around Chennai.
- **Rotaract** will have social service activities in and around Chennai.

21.0 DISCIPLINE
21.1 Every student is required to observe disciplined and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend
to affect the prestige of the Institution.

21.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the HOD / Dean will be referred to a Discipline and Welfare Committee nominated by the Vice-Chancellor, for taking appropriate action.

22.0 ELIGIBILITY FOR THE AWARD OF DEGREE

22.1 A student shall be declared to be eligible for the award of B.Tech. degree provided the student has:
   i) successfully completed all the required courses specified in the programme curriculum and earned the number of credits prescribed for the specialization, within a maximum period of 14 semester (12 semesters for lateral entry) from the date of admission, including break of study
   ii) no dues to the Institution, Library, Hostels
   iii) no disciplinary action pending against him/her.

22.2 The award of the degree must have been approved by the Institution.

23.0 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council has the right to modify the above regulations from time to time.
## SEMESTER I

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BS</td>
<td>MAC 1181</td>
<td>Differential Calculus and Geometry</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>HS</td>
<td>ENC 1181/</td>
<td>English / Arabic / Mandarin / German</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISC 1181/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNC 1181/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNC 1182 /</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNC 1183</td>
<td>Japanese</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BS</td>
<td>PHC 1181</td>
<td>Physics</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>BS</td>
<td>CHC 1181</td>
<td>Chemistry</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>ESF</td>
<td>GEC 1101</td>
<td>Engineering Graphics</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>ESF</td>
<td>GEC 1102</td>
<td>Engineering Design</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>ESF</td>
<td>GEC 1103</td>
<td>Basic Engineering Practices</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>ESF</td>
<td>GEC 1104</td>
<td>Computer Programming I</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

## SEMESTER II

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BS</td>
<td>MAC 1281</td>
<td>Advanced Calculus</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>BS</td>
<td>-</td>
<td>Physics Elective</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>BS</td>
<td>-</td>
<td>Chemistry Elective</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>ESF</td>
<td>GEC 1211</td>
<td>Basic Engineering Mechanics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>BS</td>
<td>GEC 1212</td>
<td>Environmental Studies</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>ESF</td>
<td>GEC 1213</td>
<td>Computer Programming II</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>EC</td>
<td>ITC 1201</td>
<td>Digital Principles and Applications</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>EC</td>
<td>ITC1202</td>
<td>Programming in Python</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
### SEMESTER III

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>BS MAC</td>
<td>2181</td>
<td>Partial Differential Equations and Transforms</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>HS</td>
<td></td>
<td>Humanities Elective I</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>HS ENC</td>
<td>2181</td>
<td>Oral Communication</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>EC ITC</td>
<td>2101</td>
<td>Data Structures</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>EC ITC</td>
<td>2102</td>
<td>Computer Architecture</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>EC ITC</td>
<td>2103</td>
<td>Computer Networks</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>EC ITC</td>
<td>2104</td>
<td>Advanced Java &amp; Internet Programming</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>EC ITC</td>
<td>2106</td>
<td>Network Configuration Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>EC ITC</td>
<td>2107</td>
<td>Advanced Java &amp; Internet Programming Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

### SEMESTER IV

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>BS</td>
<td></td>
<td>Mathematics Elective I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>HS</td>
<td></td>
<td>Humanities Elective II</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>HS ENC</td>
<td>2282</td>
<td>Written Communication</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>EC ITC</td>
<td>2212</td>
<td>Database Management System</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>EC ITC</td>
<td>2213</td>
<td>Operating Systems</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>EC ITC</td>
<td>2214</td>
<td>Software Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>EC ECC</td>
<td>2208</td>
<td>Signals and Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>EC ITC</td>
<td>2215</td>
<td>DBMS Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>PE</td>
<td></td>
<td>Programme Elective - I</td>
<td>3</td>
<td></td>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>
### SEMESTER V

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MS</td>
<td>MSC 3181/ MSC 3182</td>
<td>Leadership and CEO Training/ Social Entrepreneurship</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>GE</td>
<td>-</td>
<td>General Elective I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>HS</td>
<td>ENC3181</td>
<td>Communication &amp; soft skill I</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>EC</td>
<td>ITC3101</td>
<td>Object Oriented Analysis and Design</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>EC</td>
<td>ITC3102</td>
<td>Fundamentals of Web Designing</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>EC</td>
<td>ITC3103</td>
<td>Microprocessor and Microcontrollers</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>EC</td>
<td>ITC3104</td>
<td>Case Tools Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>PE</td>
<td>-</td>
<td>Programme Elective - II</td>
<td>6</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SEMESTER VI

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MS</td>
<td>MSC 3181/ MSC 3182</td>
<td>Leadership and CEO Training/ Social Entrepreneurship</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>BS</td>
<td>-</td>
<td>Mathematics Elective II</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>HS</td>
<td>ENC3281</td>
<td>Communication &amp; soft skill II</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>EC</td>
<td>ITC3211</td>
<td>Software Testing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>EC</td>
<td>ITC3212</td>
<td>Cloud Computing Technologies</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>EC</td>
<td>ITC3213</td>
<td>Distributed Computing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>EC</td>
<td>ITC3214</td>
<td>Open Source Technologies</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>EC</td>
<td>ITC3215</td>
<td>Software Development Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>PE</td>
<td>-</td>
<td>Programme Elective - III</td>
<td>6</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SEMESTER VII

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>GE</td>
<td>-</td>
<td>General Elective II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>EC</td>
<td>ITC4101</td>
<td>Internet of Things</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>EC</td>
<td>ITC4102</td>
<td>Information Security</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>EC</td>
<td>ITC4103</td>
<td>Wireless Networks</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>EC</td>
<td>ITC4104</td>
<td>Programming in Hadoop</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>PE</td>
<td>-</td>
<td>Programme Elective - IV</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>7.</td>
<td>EC</td>
<td>ITC4105</td>
<td>Internship</td>
<td></td>
<td></td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

Total credits – 178

* Industrial training will be undertaken during Third year summer vacation for 15 days. The credit will be awarded in the 7th Semester.
### PROGRAMME ELECTIVES
#### IV SEMESTER ELECTIVES (3 CREDITS)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PE</td>
<td>ITCX201</td>
<td>Android Application Development</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>PE</td>
<td>ITCX202</td>
<td>Nextgen Technologies</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PE</td>
<td>ITCX203</td>
<td>Multimedia Tools &amp; Techniques</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>PE</td>
<td>ITCX204</td>
<td>System Software</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>PE</td>
<td>ITCX205</td>
<td>Principles of Communication</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>PE</td>
<td>ITCX206</td>
<td>Principles of Compiler Design</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>PE</td>
<td>ITCX207</td>
<td>User Interface Design</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>PE</td>
<td>ITCX208</td>
<td>Semantic Web</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

### V SEMESTER ELECTIVES (6 CREDITS)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PE</td>
<td>ITCX101</td>
<td>iOS Application Development</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>PE</td>
<td>ITCX102</td>
<td>Oracle Database Programming</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>PE</td>
<td>ITCX103</td>
<td>Natural Language Processing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>PE</td>
<td>ITCX104</td>
<td>Game Theory</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>PE</td>
<td>ITCX105</td>
<td>Soft Computing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>PE</td>
<td>ITCX106</td>
<td>Machine Learning Algorithms</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>PE</td>
<td>ITCX107</td>
<td>C# and .NET Framework</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>PE</td>
<td>ITCX108</td>
<td>Artificial Intelligence</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Course Group</td>
<td>Course Code</td>
<td>Course Title</td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>C</td>
</tr>
<tr>
<td>--------</td>
<td>--------------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>9.</td>
<td>PE</td>
<td>ITCX109</td>
<td>Grid Computing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>PE</td>
<td>ITCX110</td>
<td>Information Coding Techniques</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>PE</td>
<td>ITCX112</td>
<td>Mobile AdHoc Networks</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

VI SEMESTER ELECTIVES (6 CREDITS)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>PE</td>
<td>ITCX212</td>
<td>Hybrid Application Development</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>PE</td>
<td>ITCX213</td>
<td>Data Warehousing, Data Mining and Data Mining Tools</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>PE</td>
<td>ITCX214</td>
<td>Cyber Security</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>PE</td>
<td>ITCX215</td>
<td>Software Requirements Management &amp; Software Project Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>PE</td>
<td>ITCX216</td>
<td>Business and Data Analytics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>PE</td>
<td>ITCX217</td>
<td>Web Services</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>PE</td>
<td>ITCX218</td>
<td>Image Processing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>PE</td>
<td>ITCX219</td>
<td>Expert Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>PE</td>
<td>ITCX220</td>
<td>Service Oriented Architecture</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10.</td>
<td>PE</td>
<td>ITCX221</td>
<td>Pervasive Computing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>11.</td>
<td>PE</td>
<td>ITCX222</td>
<td>Knowledge Based Decision Support System</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>12.</td>
<td>PE</td>
<td>ITCX223</td>
<td>Electronics Commerce</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

VII SEMESTER ELECTIVES (9 CREDITS)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>PE</td>
<td>ITCX117</td>
<td>Cloud Middleware Tools</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>PE</td>
<td>ITCX118</td>
<td>Big Data Tools &amp; Technologies</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>B.Tech.</td>
<td>Information Technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---------</td>
<td>------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>PE ITCX119</td>
<td>Forensic Tool Kits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>PE ITCX120</td>
<td>MongoDB for Java developers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>PE ITCX121</td>
<td>Green Computing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>PE ITCX122</td>
<td>XML Technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>PE ITCX123</td>
<td>Big Data Analytics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>PE ITCX124</td>
<td>Programming in Scala</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>PE ITCX125</td>
<td>R Programming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>PE ITCX126</td>
<td>Virtual Reality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>PE ITCX127</td>
<td>Software Quality Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>PE ITCX128</td>
<td>Cloud Forensics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>PE ITCX129</td>
<td>Networking Simulators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>PE ITCX130</td>
<td>Enterprise Resource Planning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>PE ITCX131</td>
<td>Embedded System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Physics Elective Courses
(To be offered in II Semester)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>PHCX 01</td>
<td>Fundamentals of Engineering Materials</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>PHCX 02</td>
<td>Heat and Thermodynamics</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>PHCX 03</td>
<td>Introduction to Nanoscience and Technology</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>PHCX 04</td>
<td>Lasers and their applications</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>PHCX 05</td>
<td>Materials Science</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>PHCX 06</td>
<td>Non-Destructive Testing</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>PHCX 07</td>
<td>Properties of Matter and Acoustics</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>PHCX 08</td>
<td>Properties of Matter and Nondestructive Testing</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>PHCX 09</td>
<td>Semiconductor Physics and Optoelectronics</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### Chemistry Elective Courses
(To be offered in II Semester)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CHCX01</td>
<td>Analytical Instrumentation</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>CHCX02</td>
<td>Corrosion and its Control</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>CHCX03</td>
<td>Electrical Materials and Batteries</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>CHCX04</td>
<td>Engineering Materials</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>CHCX05</td>
<td>Fuels and Combustion</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>CHCX06</td>
<td>Fundamentals of Physical Chemistry</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>CHCX07</td>
<td>Green Technology</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>CHCX08</td>
<td>Organic Chemistry of Biomolecules</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
### Maths Elective Courses
(To be offered in IV Semester)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MACX 01</td>
<td>Discrete Mathematics And Graph Theory</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MACX 02</td>
<td>Probability And Statistics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>MACX 03</td>
<td>Random Processes</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>MACX 04</td>
<td>Applied Numerical Methods</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

### Maths Elective Courses
(To be offered in VI Semester)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MACX 05</td>
<td>Mathematical Programming</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>MACX 06</td>
<td>Statistical Methods for Data Analysis</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>MACX 07</td>
<td>Numerical Methods for Integral and Differential Equations</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>MACX 08</td>
<td>Mathematical Modelling</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>MACX 09</td>
<td>Graph Theory</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>
### Humanities Elective I
(To be offered in III Semester)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SSCX01</td>
<td>Fundamentals of Economics</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>SSCX02</td>
<td>Principles of Sociology</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>SSCX03</td>
<td>Sociology of Indian Society</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

### Humanities Elective II
(To be offered in IV Semester)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SSCX04</td>
<td>Economics of Sustainable Development</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>SSCX05</td>
<td>Industrial Sociology</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>SSCX06</td>
<td>Law for Engineers</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Course Code</td>
<td>Course Title</td>
<td>Offering Department</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td>-------------------------------</td>
<td>---------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>GECX101</td>
<td>Disaster Management</td>
<td>Civil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>GECX102</td>
<td>Total Quality Management</td>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>GECX103</td>
<td>Energy Studies</td>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>GECX104</td>
<td>Robotics</td>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>GECX105</td>
<td>Transport Management</td>
<td>Automobile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>GECX106</td>
<td>Control Systems</td>
<td>EEE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GECX107</td>
<td>Introduction to VLSI Design</td>
<td>ECE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>GECX108</td>
<td>Plant Engineering</td>
<td>EIE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>GECX109</td>
<td>Network Security</td>
<td>CSE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>GECX110</td>
<td>Knowledge management</td>
<td>CSE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>GECX111</td>
<td>Cyber security</td>
<td>IT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>GECX112</td>
<td>Genetic Engineering</td>
<td>LS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>GECX113</td>
<td>Fundamentals of Project Management</td>
<td>CBS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>GECX114</td>
<td>Operations Research</td>
<td>Mathematics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>GECX115</td>
<td>Nano Technology</td>
<td>Physics / Chemistry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>GECX116</td>
<td>Vehicle Maintenance</td>
<td>Automobile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>GECX117</td>
<td>Fundamentals of Digital Image Processing</td>
<td>ECE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Course Code</td>
<td>Course Title</td>
<td>Offering Department</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td>------------------------------------------------------</td>
<td>---------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>GECX201</td>
<td>Green Design and Sustainability</td>
<td>Civil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>GECX202</td>
<td>Appropriate Technology</td>
<td>Civil / Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>GECX203</td>
<td>Engineering System Modelling and Simulation</td>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>GECX204</td>
<td>Value Analysis and Engineering</td>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>GECX205</td>
<td>Industrial Safety</td>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>GECX206</td>
<td>Advanced Optimization Techniques</td>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GECX207</td>
<td>Mat Lab Simulation</td>
<td>EEE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>GECX208</td>
<td>Embedded Systems and its Applications</td>
<td>ECE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>GECX209</td>
<td>Usability Engineering</td>
<td>CSE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>GECX210</td>
<td>Supply Chain Management</td>
<td>CBS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>GECX211</td>
<td>System Analysis and Design</td>
<td>CA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>GECX212</td>
<td>Advanced Materials</td>
<td>Physics &amp; Chemistry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>GECX213</td>
<td>National Service Scheme</td>
<td>School of Humanities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>GECX214</td>
<td>Automotive Pollution and Control</td>
<td>Automobile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>GECX215</td>
<td>Motor Vehicle Act, Insurance and Policy</td>
<td>Automobile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>GECX216</td>
<td>Principles of Communication Systems</td>
<td>ECE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>GECX217</td>
<td>Lean Management</td>
<td>Civil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>GECX218</td>
<td>Spatial Data Modeling &amp; Analysis</td>
<td>Civil</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SEMESTER I

MAC 1181 DIFFERENTIAL CALCULUS AND GEOMETRY

OBJECTIVES:
The aims of this course are to
- introduce eigen values and eigenvectors of matrix algebra.
- make the student knowledgeable in the area of Three Dimensional Analytical Geometry.
- demonstrate the application of Differential Calculus.
- familiarize the student with the functions of several variables.
- develop the use of ODE solvable techniques necessary for engineering applications.
- motivate the students with some basic engineering application problems in ODE.

MODULE I MATRICES

Characteristic Equation- Eigenvalues and Eigenvectors of a real matrix
Properties of Eigenvalues and Eigenvectors
Cayley-Hamilton Theorem (without proof)
Orthogonal matrices
Orthogonal transformations of a symmetric matrix to diagonal form
Reduction of quadratic form to canonical form by orthogonal transformation.

MODULE II THREE DIMENSIONAL ANALYTICAL GEOMETRY

Direction cosines and ratios
Angle between two lines
Equations of a plane
Equations of a straight line, coplanar lines
Shortest distance between skew lines
Sphere
Tangent plane
Plane section of a sphere
Orthogonal spheres.

MODULE III DIFFERENTIAL GEOMETRY

Curvature
Cartesian and polar coordinates
Centre and radius of curvature
Circle of curvature
Involutes and evolutes
Envelopes.

MODULE IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES

Functions of two variables
Partial derivatives
Total differential
Implicit Functions
Jacobian - Taylor's series expansion
Optima of two variables
Lagrange's multiplier method.

MODULE V ORDINARY DIFFERENTIAL EQUATIONS

Linear equations of second order with constant and variable coefficients
Simultaneous first order linear equations with constant coefficients
Homogeneous equations of Euler's type
Method of undetermined coefficients, method of variation of parameters.

MODULE VI APPLICATIONS OF ORDINARY DIFFERENTIAL EQUATIONS

B.S. Abdur Rahman Crescent Institute of Science and Technology
Solution of Ordinary Differential Equation Related to Electric Circuits  Bending of Beams- Motion of a Particle in a resisting medium  Simple harmonic motion.

L – 45; T – 15; Total Hours – 60

TEXT BOOKS:

REFERENCES:
7. James Stewart "Calculus"(7th edition),Brooks/Cole cengage learning,UK

OUTCOMES:
After completing the course, student will be able to

- understand the matrix techniques and compute eigenvalues and eigenvectors of a given matrix.
- do the problems based on three dimensional analytic geometry.
- apply differential calculus in engineering problems.
- differentiate more than one variable and their applications.
- solve the differential equations with constant coefficient and variable coefficient.
- form and solve differential equations.
ENC 1181 ENGLISH

OBJECTIVES:

- To train students to use appropriate vocabulary in academic and technical contexts.
- To facilitate students to speak effectively while exchanging ideas and making presentations.
- To develop students’ listening skill for comprehending and analyzing information.
- To develop their reading skill through sub skills like skimming, scanning and critical reading of a text.
- To sharpen their academic writing skills.
- To expose them to the correct usage of language and help them to apply that knowledge appropriately.

MODULE I

L: Listening for general information
S: Self Introduction, Introducing one another.
R: Predicting the content
W: Paragraph Writing
Language Focus: Affixes, Simple Present tense, Connective & Prepositions.

MODULE II

L: Listening for specific information (from dialogues)
S: Exchanging opinion.
R: Skimming technical Passages
W: Argumentative Writing (using the concept of Flipped Learning), Letter to the Editor.
Language Focus: Idioms, use of Modals, Simple Past tense & use of “Whò and question tags.

MODULE III

L: Learning the ways of describing images and presenting specific information (focusing on note making)
S: Making Presentations using visuals.
R: Scanning short texts for gist of information
W: Letter of Invitation, Expository Writing
Language Focus: Homophones, Homographs, Simple Future & Collocations.

MODULE IV

L: Understanding prepared presentation techniques through videos
S: Short Presentations.
R: Reading for coherence and cohesion
W: Letter seeking permission for Industrial Visit
Language Focus: S-V agreement, Euphemism
MODULE V

L: Understanding Non-Verbal Communications while listening to narration of incidents.
S: Narrating an experience
R: Inferential Reading
W: Process Description - Transcoding a Flow chart.
Language Focus: Interchange of Active & passive voice, Impersonal Passive voice.

MODULE VI

L: Learning Story telling techniques (stories & visuals) through audio files
S: Discussion in groups
R: Reading for critical appreciation
W: Developing an idea, Slogan writing, Interpreting a Bar Chart.
Language Focus: If clause and phrasal verbs.

TOTAL HOURS :45

REFERENCES:


OUTCOMES:

After completion of the course, students will have the ability to

- Demonstrate their range of vocabulary in academic and technical contexts
- Exchange ideas and make presentations
- Comprehend and respond appropriately to listening tasks.
- Read a text efficiently and process information.
- Create and draft different kinds of academic documents
- Communicate effectively using grammatically correct expressions.
OBJECTIVES:

To read and write in Arabic language.
To learn vocabulary of different fields
To develop situational communication skills.

MODULE I

PREPARATORY ARABIC

Introducing Arabic Alphabets.
Listening and Reading.
Audio & Video aided listening, Tajweed listening,
Writing Arabic Alphabets (connected & unconnected).
Introducing words.
Reading simple sentences.
Learning names of the things in and around the class room.
Exercises.

MODULE II

FUNCTIONAL ARABIC

Listening Arabic texts, stories and action verbs
Communicating Simple sentences.
Jumla ismiyya and Jumla fiyya
Situational Conversation:
Greetings, Introduction.
Classroom, College, Picnic.
Dining and Kitchen.
Reading skills.
Exercises

MODULE III

FUNCTIONAL ARABIC

Implication of effective listening.
Audio aids.
Writing Simple sentences.
Communicating ordinal and cardinal numbers.
Situational communication:
Playground, library.
Forms of plural ñ Sample sentences.
Introduction to tenses.
Exercises.

MODULE IV

FUNCTIONAL ARABIC

Communication:
Family, travel
Market, Prayer hall
Writing skills:
Note making.
Sequencing of sentences.
Developing answers from the questions.
Exercises.

MODULE V  TECHNICAL ARABIC

Importance of technical communication.
Reading and writing skills.
Audio & Video aided listening.
Introduction to Arabic terms related to administration.
Situation communication:
Air travel, Office administration, passport, visa.
Exercises

MODULE VI  TECHNICAL ARABIC

Situation communication:
Contractual work, machineries and equipments.
Computer, internet browsing.
Banking.
Exercises.

TOTAL HOURS :45

TEXT BOOKS:
1. Arabic for professionals and employees, Kilakarai Bukhari Aalim Arabic College, Chennai, India, 2013.

REFERENCES:
1. Arabic Reader for Non Arabs (Ummul Qura University, Makkah), Kilakarai Bukhari Aalim Arabic College, 2005.

OUTCOMES:
On successful completion of the course, the student will be able to:
Â Write correct sentences in Arabic.
Â Communicate in Arabic at primary level in working situations in the fields of engineering and administration.
LNC1181 MANDARIN L T P C
3 0 0 3

OBJECTIVES:
1. To improve the proficiency of students in Mandarin language.
2. To develop their knowledge of vocabulary.
3. To train them in using appropriate grammatical forms during communications.
4. To empower them for successful communication in social and academic contexts.
5. To make them appreciate the language usage in real life situations.

MODULE I
General Introduction to Chinese ÂPinyin and Tones ÂIntroduction to the Writing System: basic strokes and stroke order ÂNumbers 1-100, song ÂDays of the Week ÂMonths of the Year

MODULE II
Chinese names and related culture ÂChinese family structures and values ÂGreetings ÂIntroducing Yourself ÂFamily members ÂOccupations

MODULE III
Languages and Nationalities ÂDaily Routine ÂChinese breakfast ÂNegative Sentences and Interrogative Sentences ÂAsking for Personal Information ÂThe Verb shi and Basic Sentence Structures

MODULE IV
Answering an Affirmative-negative Question ÂFood and drinks ÂTransportation ÂLikes and dislikes ÂAdverbs bu, jiu and dou ÂVerb-absent Sentences

MODULE V
Jisui and duoda Questions ÂS+V+O Construction ÂRoutines and Daily Activities ÂHaishi Questions ÂModal Verbs ÂHobbies and Habits

MODULE VI
Making Suggestions with haoma ÂColors ÂClothing ÂBody parts ÂTalking about Likes and Dislikes ÂMeasurement Words in Chinese

TOTAL HOURS :45

TEXT BOOKS:

OUTCOMES:
On completion of the course, students will be able to
• Exhibit proficiency in Chinese Language.
- Use vocabulary in appropriate contexts.
- Use appropriate grammatical forms effectively.
- Use the language in social and academic contexts.
- Appreciate the use of language forms.
LNC1182          GERMAN          L  T  P  C
                          3  0  0  3

OBJECTIVES:

- To improve the proficiency of students in German language.
- To create awareness of using vocabulary among students.
- To expose them to correct grammatical forms of the language.
- To empower them for successful communication in social and academic contexts.

MODULE I

Introduction to German alphabets, phonetics and pronunciation- Introducing themselves and others using simple sentences and answer to some basic personal questions-: Introduction to different types of articles and verbs, Nouns

MODULE II

Understanding and responding to everyday queries like instruction, questions, - number & gender, pronouns, present and simple past tense.

MODULE III

Short telephone messages, requests etc., if spoken slowly and clearly-- Detailed overview of articles, adjectives with/without articles, Prepositions

MODULE IV

Ask and giving directions using simple prepositions- Ability to fill basic information on forms while registering for courses / classes.

MODULE V

Ability to extract and understand relevant information in a public announcement, broadcast, newspaper, radio etc-- dative & accusative

MODULE VI

Ability to describe about people, work, immediate environment, education and other topics related to personal needs in a concise manner-- Understanding of matters that are familiar and are encountered regularly like instances at school, work, at public places, places of leisure etc.

TOTAL HOURS :45

REFERENCES:


2. STUDIO D A1 (SET OF 3 BOOKS + CD), Herman Funk, Cornelsen, ISBN: 9788183073509

**OUTCOMES:**

On completion of the course, students will be able to
- Show their proficiency in German Language.
- Use appropriate vocabulary in real life contexts.
- Use appropriate grammatical forms while communicating with people.
- Effectively use the language in social and academic contexts.
OBJECTIVES:

- To train students to use appropriate vocabulary in academic and technical contexts.
- To facilitate students to speak effectively while exchanging ideas and making presentations.
- To develop their reading skill through sub skills like skimming, scanning and critical reading of a text.
- To sharpen their academic writing skills.
- To expose them to the correct usage of language and help them to apply that knowledge appropriately.

MODULE I

Introduction of the Japanese writing system, i.e. Hiragana, Katakana, and Kanji, word-building, writing foreign names and loan words in Katakana.

MODULE II

Oral practice of pronunciation and intonation of Japanese sounds, Japanese greetings, self introduction, identifying things, time of the day, calendar; counting using Japanese numerical classifiers; describing things;

MODULE III

Making comparisons; talking of daily activities, kinship terms used for address and reference, seasons, giving and receiving, shopping; making requests, talking of one's likes and dislikes.

MODULE IV

Extensive practice of basic patterns at the lower intermediate level through drills and exercises.

MODULE V


MODULE VI

Diverse texts based on Japanese culture, customs, history, food habits, and science etc, for the development of communicative competence of students; skimming, scanning of texts with emphasis on advanced sentence patterns, grammatical structures and idiomatic phrases, reading and writing of approximately

TOTAL HOURS: 46
REFERENCES:
1. Nihongo I, Kokusaigakuyukai, and other supplementary material
2. Exersice book 1of Nihongo 1, and other supplementary material
3. Nippon, the Land and its People & Encyclopedia of Contemporary Japanese
5. Chukyu Nihongo, Tokyo Gaikokugo Daigaku; Nihongo II, Kokusaigakuyukai, and other supplementary material.

OUTCOMES:
After completion of the course, students will have the ability to
  - Demonstrate their range of vocabulary in academic and technical contexts
  - Exchange ideas and make presentations
  - Comprehend and respond appropriately to listening tasks.
  - Read a text efficiently and process information.
  - Create and draft different kinds of academic documents
  - Communicate effectively using grammatically correct expressions.
OBJECTIVES:
To make students conversant with the
- basic concepts of crystal physics and its structures
- production and applications of ultrasonic waves
- study of thermal conductivities of good and bad conductors
- phenomenon of wave optics and its applications
- principle of fibre optic communication and its applications to sensors
- wave mechanics principle and its applications in electron microscopy
- green energy physics and its environmental impacts to society

MODULE I  CRYSTAL PHYSICS  8
Crystalline and amorphous solids ï Unit Cell ï Seven Crystal Systems ï Bravais Lattice ï Miller Indices ï Interplanar Spacing ï Characteristics of Unit Cell - Calculation of Number of atoms per unit cell, Atomic Radius, Coordination Number and Packing Factor for SC, BCC, FCC and HCP and Diamond structures ï Defects in crystals-Point defects ï Edge and screw dislocations and their significance - Surface Defects.

MODULE II  ULTRASONICS AND THERMAL PHYSICS  8

MODULE III  APPLIED OPTICS  8
Interference ï Air Wedge ï Michelson's Interferometer ï Determination of wavelength of light and thickness of thin transparent sheet.

MODULE IV  FIBRE OPTICS  7
Optical fibre ï Principle and propagation of light in optical fibre ï Numerical aperture and acceptance angle ï Types of optical fibres ï Attenuation ï Absorption,
Scattering losses, Bending losses and Dispersion in Optical fibres - Fiber Connectors and Couplers - Applications of Fibre optic communication system (block diagram only) - Fibre optic sensors - displacement and pressure sensors (qualitative) - Medical endoscope.

**MODULE V  QUANTUM MECHANICS**

Black body radiation - Planck's theory of radiation - Deduction of Wien's displacement law and Rayleigh - Jean's law from Planck's theory - Dual nature of matter - de Broglie's wavelength - Physical significance of wave function - Schrodinger wave equation - Time independent and time dependent wave equation - Particle in one dimensional box - Harmonic oscillator (qualitative).

**MODULE VI  RENEWABLE ENERGY SOURCES**


**PRACTICALS**

1. Determination of Velocity of Ultrasonic waves in a given liquid using Ultrasonic Interferometer.
2. Determination of wavelength of ultrasonic waves using Kundt's tube method.
3. Determination of thickness of a thin wire using Air Wedge method.
4. Determination of wavelength of light using spectrometer diffraction grating.
5. Determination of angle of divergence of a laser beam using He-Ne laser.
9. Determination of thermal conductivity of a good conductor by Forbe's method.
10. Determination of thermal conductivity of a bad conductor by Lee's disc method.
11. Determination of solar cell characteristics.

L – 45; P – 30; TOTAL HOURS – 75

**REFERENCES :**


OUTCOMES:
At the end of the course, students will be able to
- understand the different types of crystal structures
- apply the concept of ultrasonic principle in engineering and medical field
- calculate thermal conductivities of good and bad conductors
- differentiate the various laser systems and its applications in engineering and medical field
- apply the principle of fibre optics for communication and sensor applications
- formulate wave mechanics principle for applications in electron microscopy
- Correlate the different renewable energy sources for societal needs.
- To complement the knowledge acquired in the theory class.
- To correlate the experimental results for application.
OBJECTIVES:
The students should be conversant with

- the basic problems like hardness, alkalinity, dissolved oxygen associated with the water used for domestic and industrial purpose and treatment process involved.
- the synthesis, properties and applications of nanomaterials.
- the importance of renewable energy sources like solar, wind, biogas, biomass, geothermal, ocean and their limitations.
- the basic analytical techniques like UV-Visible, FT-IR, NMR, AAS, AES, Circular Dichroism and XRD etc.
- photochemistry concepts related to physical processes and chemical reactions induced by photon absorption and their applications.
- basic principles of electrochemistry, cell construction and evaluation and to understand general methodologies for construction & design of electrochemical cell

MODULE I WATER TECHNOLOGY


MODULE II NANOCHEMISTRY

Introduction — distinction between molecules, bulk materials and nanoparticles — classification based on dimension with examples — synthesis (top-down and bottom-up approach) — sol-gel, thermolysis (hydrothermal and solvothermal), electrodeposition, chemical vapour deposition, laser ablation — properties and applications (electronic, magnetic and catalytic) — risk factors and future perspectives.

MODULE III ENERGY SOURCES

Energy: past, today, and future — a brief history of energy consumption — present energy scenario of conventional and renewable energy sources — renewable energy: needs of renewable energy, advantages and limitations of renewable energy — solar energy: basics, solar energy in the past, photovoltaic, advantages and disadvantages — bioenergy: conversion, bio degradation, biogas generation, biomass
gasifier, factors affecting biogas generation, advantages and disadvantages of geothermal energy: geothermal resources (hot dry rock and magma resources, natural and artificial), advantages and disadvantages of wind energy: wind resources, wind turbines, advantages and disadvantages of ocean energy: wave energy, wave energy conversion devices, ocean thermal energy, advantages and disadvantages.

MODULE IV PHOTOCHEMISTRY 7


MODULE V ANALYTICAL TECHNIQUES 7

Spectroscopy: electromagnetic radiation and spectrum of types of transitions of types of spectra (atomic and molecular with their chemical usefulness) of Beer-Lamberts law (problems) of principles, instrumentation and applications of: Colourimetry of UV-Vis spectrophotometer of atomic absorption spectroscopy of atomic emission spectroscopy of principles and applications of: IR, NMR, mass and X-ray diffraction analysis.

MODULE VI ELECTROCHEMISTRY 8

Electrochemistry - types of electrodes (principle and working) of gas (SHE), metal/metal ion electrode, metal-metal insoluble salt (calomel electrode), ion-selective (glass electrode and fluoride ion selective electrode) of Electrolytic and galvanic cells, construction of cell, EMF measurement and applications (problems), standard cell (Weston-cadmium), reversible and irreversible cell, concentration cell. Determination of fluoride ion using fluoride ion selective electrode of Chemically modified electrodes (CMEs): concept, approaches and applications.

PRACTICALS

1. Estimation of hardness in given water sample.
2. Estimation of the alkalinity of the given water sample.
3. Estimation of strong acid by conductometry.
4. Estimation of Fe^{2+} present in the given sample by potentiometry.
5. Verification of Beer-Lamberts law and estimation of Cu^{2+} present in unknown sample.
6. Estimation of sodium and potassium present in the given sample by flame photometry.
7. Determination of molecular weight and degree of polymerisation of a polymer by viscosity method.

L – 45; P – 30; TOTAL HOURS – 75

REFERENCES:


OUTCOMES:

The students will be able to

- solve problems related to hardness, alkalinity, dissolved oxygen associated with the water and describe the treatment processes.

- classify nanomaterials and apply the nanochemistry approach to synthesize the nanomaterials.

- explain the principle and enumerate the advantages and disadvantages of various renewable energy sources.

- state the principle and illustrate the instrumentation of various analytical techniques.

- apply the concepts of photochemistry to elaborate various photo-physical and photochemical reactions.

- construct a electrochemical cell and describe the various types of electrodes and determine the fluoride content.
OBJECTIVES:

Â To introduce the students of all engineering programs, the basic concepts of engineering drawing, which is the basic communication medium for all engineers.

Â To provide practical exposure on important aspects like drawing analytic curves, orthographic projections, section of solids, development of surfaces, isometric projection, perspective projection and free hand drawing.

Â To introduce computerized drafting.

MODULE I BASICS AND ENGINEERING CURVES 10

Drawing instruments, dimensioning, BIS conventions, types of lines, simple geometric constructions.
Conic sections: ellipse, parabola, hyperbola.
Special curves: cycloid, epicycloid, hypocycloid and involutes.

MODULE II ORTHOGRAPHIC PROJECTION 8

Orthographic projection ï first angle, second angle, third angle and fourth angle projections ï setup - assumptions, principle. Free hand sketching of orthographic views of simple machine parts as per first angle projection. Orthographic projection of points in all quadrants. Some commands and demonstration of drafting packages.

MODULE III PROJECTION OF STRAIGHT LINES AND PLANES 10

Projection of straight lines in first quadrant ï true length and true inclinations ï Rotating line and trapezoidal methods ï traces of straight line.
Projection of plane lamina in first quadrant and its traces

MODULE IV PROJECTION OF SOLIDS 10

Projection of solids in first quadrant: Axis inclined to one reference plane only- prism, pyramid, cone, cylinder ï change of position and auxiliary projection methods.

MODULE V SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 12

Section of solids: prism, pyramid, cone, cylinder, and sphere ï sectional view ï true shape of section Solids in simple position and cutting plane inclined to one reference plane only.
Development of surface of truncated solids: prism, pyramid, cone cylinder ï frustum of cone, pyramid and simple sheet metal parts.
MODULE VI  PICTORIAL PROJECTIONS  10

Isometric projection: Isometric scale ï isometric axes- iso sheet - Isometric projection and view of prism, pyramid, cylinder, cone, frustums, truncated solids and simple products

Perspective projection: station point ï vanishing point ï Perspective projection and views of prism, pyramid, cylinder and frustums by Visual ray method.

L – 30; P – 30; TOTAL HOURS – 60

TEXT BOOKS:

REFERENCES:

OUTCOMES:
Â Students should be able to read the specifications and standards of technical drawing and able to draw conic sections and special curves.
Â Students should be able to understand the insight of orthographic projection and to draw the various views of orthographic projection of a point and various components.
Â Students should be able to draw the orthographic views of straight lines and plane figures.
Â Students should be able to draw the orthographic views of simple solids.
Â Students should be able to draw the sections of solids and development of solid surfaces.
Â Students should be able to draw the isometric and perspective projection of simple solids and components.
GEC 1102 ENGINEERING DESIGN L T P C
2 0 0 2

OBJECTIVES:
• To understand the role of design in Engineering
• To understand the basic design concepts
• To understand the role of innovation in design

MODULE  I   DESIGN AS A CENTRAL ACTIVITY IN ENGINEERING  08
Product design - products and processes - product design methodology
Design of systems; Software design

MODULE  II  NEED ANALYSIS AND CONCEPT DEVELOPMENT  07
Voice of customers - product specification - need analysis Bench marking Product
architecture - concept generation and evaluation;

MODULE  III  CASE STUDIES IN ENGINEERING DESIGN  08
Product design - process design; system design; software design
Ergonomics - usability

MODULE  IV  INNOVATION AND DESIGN  07
Role of innovation in Engineering - incremental changes and systemic changes;
scientific approach to driving innovation - case studies.

TOTAL HOURS – 30

REFERENCES:
1. Clive L. Dym and David C. Brown, "Engineering Design: Representation and
Analysis: Principles and practice in information organizations" Published by
4. Bengt-Arne Vedin, "The Design-Inspired Innovation Workbook" World
Scientific, 2011.
5. Navi Radjou, Jaideep Prabhu and Simone Ahuja, "Jugaad Innovation"
Published by Random House India, 2012.

OUTCOMES:
The students will be able to
• Apply the basic knowledge of design in engineering products / process / service.
• Analyse the problems and give innovative solutions.
• Correlate the basic knowledge of design in the real world problems.
• Apply innovative approaches to engineering design.
OBJECTIVES:

- To provide a practical exposure to basic engineering practices like carpentry, fitting, plumbing, welding and making of simple electrical and electronic circuits
- To have an understanding on the use of various tools, instruments and methods
- To enable the students to appreciate the practical difficulties and safety issues

CIVIL ENGINEERING PRACTICE

1. Study of plumbing in general household and industrial systems
2. Making a small window frame with Lap and Mortise & Tenon Joints
3. Introduction to power tools

MECHANICAL ENGINEERING PRACTICE

1. Fabrication of a small Table frame with Butt, Lap and Fillet Joints
2. Machining of a simple component like a table weight using lathe
3. Mold preparation for simple component

ELECTRICAL ENGINEERING PRACTICE

1. Comparison of incandescent, Fluorescent, CFL and LED lamps.
2. Study of Protection Circuits (small relay, fuse, MCB, HRC, MCCB, ECCB).
3. Familiarization of households Electrical Gadgets (Iron Box, Wet Grinder).
4. Understanding of Domestic and Industrial wiring.
5. Earthing and its significance.
6. Troubleshooting in Electrical Circuits.
7. Study of inverter fed UPS/Emergency lamp

ELECTRONICS ENGINEERING PRACTICE

1. Identifications symbolic representation of active and passive electronic components
2. Soldering and tracing of electronic circuits and checking its continuity
3. Assembling of A.C. to D.C, D.C to A.C. Circuits in bread Board and Mini project

TOTAL HOURS – 30
OUTCOMES:
Upon the completion of the course, students should be able to

- Appreciate the practical skills needed even in making of simple objects, assemblies and circuits
- Attend minor defects especially in items used in day to day life
- Aware of the safety aspects involved in using tools and instruments
GEC 1104  COMPUTER PROGRAMMING I  L  T  P  C
1  0  2  2

OBJECTIVES:
- To identify the hardware and software components of the computer.
- To know the basic concept of operating system and get knowledge about different operating systems.
- To learn various database concepts and operations
- To develop efficient algorithms for solving a problem.
- To implement the algorithms in C language.
- To use arrays in solving problems.

MODULE I  COMPUTER FUNDAMENTALS  7
Introduction - Number System - Planning the computer program - Computer Software - Basic operating system concepts - Database Operations

MODULE II  PROGRAMMING IN C  8
Introduction to C Programming Language - Operators - Control statements - Iterative statements - Arrays.

LIST OF EXPERIMENTS:
1. Computer organization - Hardware in a typical computer Identification - Booting - error messages and what it means
2. Types of Operating systems - Windows and Linux
3. Structure of a basic program - Hello world program - Debugging it
4. Data types: Type conversions
5. Input / Output: Formatted functions - Unformatted functions - Library functions
6. Properties of operators - Priority of operators - Arithmetic relational logical and bitwise operators
7. If - if else- nested if else- goto- switch case - nested switch case - for loops
   - nested for loops - while loop - do-while loop - break and continue statement
8. Arrays - Operation with arrays
9. Sorting and searching.

L – 15; P – 30; TOTAL HOURS – 45

REFERENCES:
OUTCOMES:
Students who complete this course will be able to

- Recognize Modular design, logic flow, data abstraction
- Analyze the working of the programming constructs, functions, and I/O.
- Write down programs for sorting and searching algorithms
- Write down programs developing cycle for different applications
- Debug the programs and solve some practical problems in programming
- Develop programs using arrays.
OBJECTIVES:
The aims of this course are to

- train the students in solving problems using multiple integration.
- provide knowledge in using special functions to find out the area and volume of a region.
- acquire knowledge in tangent and normal vectors.
- gain knowledge in finding the areas of a curve and surface using vector integration.
- learn about the analytic functions and their properties along with bilinear transformation.
- know complex integration using Cauchy’s theorems.

MODULE I  MULTIPLE INTEGRATION AND ITS APPLICATIONS  8+2
Multiple integrals: Cartesian and Polar coordinates, change of order of integration.
Multiple integral to compute area and volume.

MODULE II  TRANSFORMATION OF COORDINATES AND SPECIAL FUNCTIONS  7+3
Change of variables between Cartesian, polar, cylindrical, and spherical coordinates.
Beta and Gamma functions, properties and applications.

MODULE III  VECTOR DIFFERENTIATION  7+3
Angle between two vectors, Gradient, divergence, and curl.

MODULE IV  VECTOR INTEGRATION  8+2
Line, surface, and volume integrals: Green’s Theorem, Gauss Divergence Theorem, and Stokes Theorem (statement only).
Verification and evaluation of integrals.

MODULE V  ANALYTIC FUNCTION  8+2
Analytic function: Necessary and Sufficient condition (statement only).
Cauchy-Riemann equations in polar coordinates.
Properties of analytic function.
Determination of analytic function.
Conformal mapping (w = z+a, aZ and 1/z) and bilinear transformation.
MODULE VI  COMPLEX INTEGRATION

Statement and application of Cauchy's integral theorem - Cauchy's integral formula - Taylor's series and Laurent's series expansion - singularities - classification of residues - Cauchy's residue theorem - contour integration - Unit circle and semi circular contours (excluding poles on the real axis).

L – 45; T – 15; TOTAL HOURS – 60

TEXT BOOKS:

REFERENCES:

OUTCOMES:

After completing the course, student will be able to

- compute the area and volume using multiple integrals.
- apply special functions to solve integration problems.
- apply differentiation in scalar and vector fields.
- find area and volume of a region using vector integration.
- verify analyticity, conformity and bilinearity of complex functions.
- evaluate complex integrals.
OBJECTIVES:

- To impart knowledge about the basic laws of statics and dynamics and their applications in problem solving
- To acquaint both with scalar and vector approaches for representing forces and moments acting on particles and rigid bodies and their equilibrium
- To give on exposure on inertial properties of surfaces and solids
- To provide an understanding on the concept of work energy principle, friction, kinematics of motion and their relationship

MODULE I  VECTOR APPROACH TO MECHANICS


MODULE II  EQUILIBRIUM OF PARTICLE

Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - Single equivalent force

MODULE III  EQUILIBRIUM OF RIGID BODY

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Moments and Couples - Moment of a force about a point and about an axis - Vectorial representation of moments and couples - Scalar components of a moment - Varignon's theorem - Equilibrium of Rigid bodies in two dimensions - Examples

MODULE IV  PROPERTIES OF SURFACES

Determination of Areas - First moment of area and the Centroid of sections - Rectangle, circle, triangle from integration - T section, I section, Angle section, Hollow section by using standard formula - Second and product moments of plane area - Physical relevance - Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia - Mass moment of Area
MODULE V  FRICITION  08
Introduction to friction- types of friction- Laws of Coloumb friction- Frictional force i simple contact friction i Rolling resistance i ladder friction

MODULE VI  LAWS OF MOTION  10
Review of laws of motion i Newton's law i Work Energy Equation of particles i Impulse and Momentum i Impact of elastic bodies.

L – 45; T – 15; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
On completion of this course students should be able

Â Analyse and resolve forces, moments and solve problems using various principles and laws of Mechanics
Â Apply the concept of equilibrium to particles and solve problems
Â Apply the concept of equilibrium to rigid bodies and solve problems
Â Analyse and determine the properties of surfaces
Â Analyse and evaluate the fractional forces between the bodies
Â Apply the laws of motion in solving dynamics problems
OBJECTIVES:
The student will be conversant with the
- various natural resources, availability, utilisation and its current scenario
- different ecosystems, energy transfer, values, threats and conservation of biodiversity
- levels of different pollutants and its impact and the causes and effects of natural disasters
- impacts of human population, impact assessment, human rights and environmental acts and sustainable development

MODULE I  NATURAL RESOURCES
Land resources: land degradation, soil erosion and desertification - Forest resources: use and over-exploitation, deforestation - Water resources: use and over-utilisation of surface and ground water, conflicts over water (inter-state and international), dams (benefits and problems), water conservation (rainwater harvesting and watershed management) - Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, mining - Food resources: world food problems, changes in land use by agriculture and overgrazing, modern agriculture and its effects, fertilizer and pesticide problems, water logging and salinity - Energy resources: increasing energy needs, renewable and non-renewable, use of alternate energy sources.

MODULE II  ECOSYSTEM AND BIODIVERSITY
Ecosystem - energy flow in the ecosystem - food chains, food webs and ecological pyramids - characteristics, structure and function of (a) Terrestrial ecosystems (forest, grassland, desert) and (b) Aquatic fresh water ecosystems (pond, lake, river) (c) Aquatic salt water ecosystems (ocean, estuary) - ecological succession.

MODULE III  ENVIRONMENTAL POLLUTION AND NATURAL DISASTER
Definition, cause, effects and control measures of (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g)
nuclear hazards - ill-effects of fireworks and upkeep of clean environment - solid waste management: types (urban, industrial, biomedical and electronic wastes), collection, processing and disposal (incineration, composting and land-fill) - natural disaster and management: flood, cyclone, drought, landslide, avalanche, volcanic eruptions, earthquake and tsunami.

MODULE IV  HUMAN POPULATION, HEALTH AND SOCIAL ISSUES

Population and population growth, population variation among nations, population explosion, family welfare programme.

Human health: air-borne, water borne diseases, infectious diseases, risks due to chemicals in food and environment.


Case studies related to current situation

TOTAL HOURS – 30

TEXT BOOKS:


REFERENCES:

OUTCOMES:

The student will be able to

- predict the scenario of various natural resources and suggest remedies to curb the exploitation of these resources.
- identify food chain and web and its role in various ecosystems, assess the impacts on biodiversity and provide solutions to conserve it.
- analyse the impacts of pollutants in the environment and propose suitable method to alleviate the pollutants and the natural disasters.
- assess on the impact of human population and the health related issues and the ethics to be followed for sustainable life.
OBJECTIVES:

- To provide knowledge about the benefits of Object Oriented Programming over Procedure oriented programming.
- To learn various File operations.
- To expose fundamental concepts of object-oriented programming in classes, invoking methods and functions.
- To prepare students to get full use of code reusability using object oriented programming.
- To implement the basic concepts of object oriented programming using C++ concepts.
- To focus on solving problems based on analyzing, designing and implementing programs in C and C++.

MODULE I PROGRAMMING IN C

Functions - Storage Classes - Structures and Unions - Pointers - Self Referential Structures and Linked Lists - File Processing.

MODULE II PROGRAMMING IN C++

Programming in C++ - Overview of OOP in C - Inheritance - Polymorphism - Type Casting - Exceptions.

LIST OF EXPERIMENTS:

1. Functions
2. One dimensional arrays, Pointers
3. Recursion
4. Multi dimensional arrays, Linked lists.
5. Operating on Files.
6. Simple C++ program with Control statements.
7. Getting input from user console.
8. Classes, Object and Constructors.
10. Inheritance

L – 15; P – 30; TOTAL HOURS – 45

REFERENCES:

OUTCOMES:

Students who complete this course will be able to

- Develop efficient algorithms for solving problems
- Handle files in C
- Use simple data structures like arrays and linked lists in solving problems.
- Implement algorithms in C++ Language.
- Write simple programs using concepts of object oriented programming.
- Demonstrate the Object Oriented Programming concepts applied in networking, web development and Database applications.
OBJECTIVES:
- To acquire the knowledge of various numbering systems and their applications.
- To understand the different methods for simplification of Boolean Algebra.
- To design and implement combinational logic circuits.
- To design and implement sequential logic circuits.

MODULE I  NUMBER SYSTEMS, CODES AND DIGITAL LOGIC  7

MODULE II  MAPPING AND TABULATION METHODS  7
Sum-of-Products Method ï Truth Table to Karnaugh Map ï Pairs, Quads, and Octets ï Karnaugh Simplifications ï Don't-care Conditions ï Product-of-sums Method ï Products-of-sums Simplifications ï Simplification by Quine-McClusky Method.

MODULE III  COMBINATIONAL LOGIC CIRCUITS  8
Multiplexers ï De-multiplexers ï Decoders ï Encoders ï Code converters - Parity Generators and Checkers ï Magnitude Comparator ï Read-only-Memory ï Programmable Array Logic ï Programmable Logic Arrays ï Binary Adder and Subtractor.

MODULE IV  SEQUENTIAL LOGIC CIRCUITS  8
LIST OF EXPERIMENTS

1. Study of logic gates i.e. AND, OR, NOT, NOR and NAND.
2. Simplification of Boolean functions and implementation with logic gates.
3. Design and implementation of multiplexers.
4. Design and implementation of demultiplexers.
5. Design and implementation of decoders.
6. Design and implementation of encoders.
7. Design and implementation of code converters.
8. Design and implementation magnitude comparators.
9. Design and implementation of adders and subtractors.
10. Design and implementation of parity generator and checker.
11. Study of flip-flops - RS, D, JK and T Design and implementation of Registers with flip-flops.

L – 30; P – 30; TOTAL HOURS 60

TEXT BOOKS:


REFERENCES:


OUTCOMES:

On completion of the course students will be able to:

- Know the fundamental concepts and techniques used in digital electronics.
- Understand and examine the structure of various number systems and codes.
- Apply the principles of Boolean algebra to manipulate and minimize logic expressions.
- Apply the mapping and tabulation method to minimize and optimize logic functions of any level.
Design and implement various combinational logic circuits.

Design and implement various sequential logic circuits built with different flip-flops.
OBJECTIVES:

- To install and execute python program.
- To provide a complete knowledge about python programming language.
- To develop application using python language.

MODULE I  FUNDAMENTALS

Python basics - objects - sequences - strings - lists - tuples.

MODULE II  FILES INPUT AND OUTPUT

Mapping and set types - conditionals and loops - files input and output.

MODULE III  PYTHON IN OTHER PARADIGMS

Errors and exceptions-function programming-object oriented programming-execution environment.

MODULE IV  ADVANCED TOPICS

Network programming-internet client programming-GUI programming.

LIST OF EXPERIMENTS

1. Download and install Python.
2. Write a Python program to print "Hello, World!" and save this in a file named helloworld.py. Make this program executable and run it like: ./helloworld.py
3. Write a Python program (swap.py) to swap values of two variables.
4. Write a program that asks for two numbers. If the sum of the numbers is greater than 100, print "That is a big number."
5. Write a python program to have a separate function for the area of a square, the area of a rectangle and the area of a circle (3.14 * radius ** 2).
6. Write a python program that prints result based on user input from the random integer between 0 and 99. If the user input is above the range print Too High below range print Too Low within the range print That's right.
7. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero. Include a condition in your program if the user inputs a negative number.
8. Write a method fact that takes a number from the user and prints its factorial.

9. Write a function roots that computes the roots of a quadratic equation. Check for complex roots and print an error message saying that the roots are complex.

10. Draw a Digital Clock by creating a class called DigitalClock that has attributes hour, minute, second, pos and draw method. The attributes store the time in the position - the upper left corner of the rectangle face. Add extra methods to help you draw the clock, e.g. a method for drawing the face, a method for drawing the text, a method returning the time as string.

L – 30; P – 30; TOTAL HOURS – 60

TEXT BOOKS:

REFERENCES:

OUTCOMES:
Upon Completion of this course the student will be able to
- Download and install python compiler.
- Write and test python programs.
- Develop applications using python.
OBJECTIVES:
The aims of this course are to

- familiarize in solving partial differential equation of first, second and higher orders.
- introduce basics and engineering applications of Fourier series, Laplace Transform, Fourier Transform and Z- Transform.

MODULE I  PARTIAL DIFFERENTIAL EQUATIONS  8 + 2

MODULE II  FOURIER SERIES  8 + 2
Fourier Series and Dirichlet's conditions - General Fourier series - Half range Fourier series - Parseval's identity - Harmonic Analysis.

MODULE III  FOURIER TRANSFORMS  7 + 3
Fourier integral theorem (without proof) - Fourier transform pair - Fourier Inverse Transform - Properties - Convolution theorem - Parseval's identity.

MODULE IV  APPLICATIONS OF FOURIER SERIES AND FOURIER TRANSFORMS  7 + 3
Applications of Fourier series and Fourier Transform to solution of PDEs having constant coefficients with special reference to Heat & Wave equations, Discrete & point Spectrum and Single pulse.

MODULE V  LAPLACE TRANSFORM  8 + 2
MOlME VI  Z – TRANSFORM  7 + 3

L – 45; T – 15; Total – 60

TEXT BOOKS

REFERENCES

OUTCOMES:
After completing the course, student will be able to
- solve the partial differential equations.
- derive a Fourier series of a given periodic function by evaluating Fourier coefficients.
- apply integral expressions for the forward and inverse Fourier transform to a range of non-periodic waveforms.
- solve wave equation and heat flow equation.
- solve ordinary differential equations using Laplace transform.
- solve difference equation using Z-transform.
ENC 2181 ORAL COMMUNICATION

OBJECTIVES:

- To expose students to a range of professional contexts through podcasts for learning appropriate expressions.
- To train them in making poster presentations.
- To enable them to make effective business presentations.
- To help them learn persuasive and negotiation skills.
- To train them to debate on issues of current relevance.
- To train them to participate in group discussions on current affairs.

MODULE I
Orientation to the Importance of Oral Communication
- Verbal and non-verbal communication
- Paralinguistic features
- One-minute presentations (using Audacity/Voicethread)
- Just a minute (JAM) on random topics

MODULE II
Negotiating and persuading through effective arguments
- to arrive at a conclusion (pair-work)
- Understanding Negotiation, persuasion and marketing skills through Podcasts
- Listening to short conversations and monologues for understanding real life conversations

MODULE III
Making Poster presentations on current issues
Understanding nuances of making effective presentations (TED Videos)

MODULE IV
Deliberation on social and scientific issues
- Debates (focus on rebuttal skills and deconstructing arguments)
- Viewing videos on debates (NDTV Discussions)

MODULE V
Discussing social issues or current affairs in groups
- Viewing group discussions and listening for specific information

MODULE VI
Making full length presentation (through Voicethread) with the focus on one’s career plans and prospects (discipline specific)
- Listening to interviews for understanding speakers’ perception (on industry related issues)

P – 30; Total Hours – 30
REFERENCES:

OUTCOMES:
On completion of the course, students will be able to

- Listen to business conversations and do related tasks.
- Deliver effective poster presentations.
- Make effective business presentations.
- Use persuasive and negotiating skills for justifying arguments.
- Participate effectively in debates.
- Speak English intelligibly, fluently and accurately in group discussions.
OBJECTIVES:
To enable the students to
- depict the different problem solving techniques and the need for data structures.
- be aware of the various abstract data types and their applications.
- know the tree ADT and their applications.
- understand and implement searching and sorting algorithms.
- recognize graphical representation and apply algorithms for path finding.
- apply the knowledge of data structures in practical applications.

Prerequisite: Computer Fundamentals

MODULE I PROBLEM SOLVING AND ABSTRACT DATA TYPES 7
Problem solving - Top-down Design - Efficiency - Analysis - Sample algorithms - Introduction to data structures - Data structure types - Abstract Data Types - Arrays - Structures - Unions - Pointers.

MODULE II LISTS, STACKS AND QUEUES 8
List ADT - Stack ADT - Queue ADT - Circular Queue - Double Ended Queue - Priority Queue - Array implementation of Stack and Queue - Singly Linked List - Doubly Linked Lists - Stack and Queue using Linked List.

MODULE III TREES AND HASHING 8

MODULE IV SEARCHING AND SORTING 7
Linear Search - Binary Search - Preliminaries - Insertion Sort - Selection Sort - Shell Sort - Heap sort - Merge sort - Quick sort.

MODULE V GRAPHS 8
MODULE VI  APPLICATIONS

Linked List - Maintaining an inventory -- Stack - conversion of infix to postfix expression, evaluation of arithmetic expression - Queue - scheduler in OS - Tree - Priority queue - Graph - Traveling Salesman Problem.

Total : 45 Hours

LIST OF EXERCISES:
1. Implementation of linear search and binary search
2. Array implementation of List ADT, STACK ADT, Queue ADT.
3. Implementation of Singly linked list (addition, deletion. Insertion in all positions)
4. Implementation of Doubly linked list (addition, deletion. Insertion in all positions)
5. Implementation of Stack and Queues using linked list.
7. Program for tree traversal (inorder, postorder, preorder)
8. Implementation of Quick sort, Merge sort, Shell sort.
10. Implementation of Depth First search.
11. Implementation of Linked List, Stack and Queue in real world.

Practical: 20 Hours

TEXT BOOK:

REFERENCES:
OUTCOMES:

On successful completion of the course, the students will be able to:

- Analyze the performance of algorithms.
- Describe how arrays, structures, unions and pointers are represented in memory.
- Exhibit an understanding of the abstract properties of various data structures such as lists, stacks and queues.
- Demonstrate the different methods for traversing trees and outline the concepts of hashing.
- Explain the various searching and sorting algorithms.
- Discuss about graph traversal algorithms.
- Choose an appropriate data structure and algorithm design method for a specified application.
OBJECTIVES:
To enable the students to
- have a thorough understanding of the basic structure and operation of a digital computer.
- explore the instruction set and addressing modes of a computer.
- study about the different types of pipelining and processors
- discuss in detail implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- explore the different ways of communicating with I/O devices and standard I/O interfaces.
- study the hierarchical memory system including cache memories and virtual memory.

MODULE I  BASIC COMPUTER ORGANIZATION 7
Instruction codes i Computer Registers i Computer Instructions i Timing and Control i Instruction Cycle i Memory Reference Instructions i Input i output and Interrupt i Complete Computer Description i Design of Basic Computer i Design of accumulator Logic i Micro programmed Control i Control Memory i Address sequencing.

MODULE II  CENTRAL PROCESSING UNIT 8
General Register Organization i Stack Organization i Instruction Formats i Addressing Modes i Data Transfer and Manipulation i Program Control i Reduced Instruction Set Computers.

MODULE III  PIPELINE AND VECTOR PROCESSING 8
Parallel Processing i Pipelining i Arithmetic Pipeline i Instruction Pipeline i RISC Pipeline i Vector Processing i Array Processors.

MODULE IV  COMPUTER ARITHMETIC 8

MODULE V  I/O ORGANIZATION 7
Peripheral Devices i Input-Output Interface i Asynchronous Data Transfer i Modes of Transfer i Priority Interrupt- Direct Memory Access i Input/ Output Processor i Serial Communication.

**MODULE VI MEMORY ORGANIZATION**

Memory Hierarchy i Main Memory i Auxiliary Memory i Associative Memory i Cache Memory i Virtual Memory i Memory Management Hardware - CASE study.

**TEXT BOOK:**

**REFERENCES:**

**OUTCOMES:**

On successful completion of the course, the students will be able to
- Discuss the central ideas in computer organization and show the relationship between hardware and software of a computer.
- Describe various operations and operands of computer hardware and representation of instructions.
- Explain the importance of Pipelining and parallel processing.
- Explain how a computer performs arithmetic operations and decimal arithmetic operations.
- Outline the I/O Organization, interrupts and interfaces.
- Compile the concepts of memory organization.
OBJECTIVES:
To enable the students to
- understand the computer networking basics and the functions of different layers in OSI Model and TCP-IP Model.
- acquire the knowledge about the different error detection and correction methods and how the data flow is controlled in data communication.
- learn the internetworking protocols and how to apply the sub netting scheme to efficiently use the IP addresses by reducing the wastage of addresses.
- be conversant with the various transmission control protocols and congestion control mechanisms.
- be familiar with various application layer protocols.
- learn about cryptographic techniques and algorithms for network security.

Prerequisite: Computer Fundamentals

MODULE I INTRODUCTION TO COMPUTER NETWORKS


MODULE II DATA LINK LAYER


MODULE III INTERNET AND ROUTING PROTOCOLS

MODULE IV  TRANSMISSION AND CONGESTION CONTROL MECHANISMS  8


MODULE V  NETWORK SERVICES AND SECURITY  7

Domain Name System ï Electronic Mail ï Remote Connection ï File Transfer ï Hyper Text Transfer ï Cryptography - Symmetric Key Cryptography - Asymmetric Key Cryptography ï RSA Algorithm.

MODULE VI  SOFTWARE DEFINED NETWORKS  7


Total : 45 Hours

TEXT BOOK:


REFERENCES:


OUTCOMES:

On successful completion of the course, the students will be able to

• discuss the terminology and concepts of the OSI reference model & TCP-
IP model and the various technologies & standards related networks.

- apply the error detection & correction methods and compare various flow control mechanisms in data communication.

- design and apply appropriate subnetting scheme upon analyzing the requirements of the organization networking structure.

- illustrate the role of various transmission control protocols, how congestion in the networks can be controlled.

- explain the various services provided by network and apply cryptographic techniques and algorithms for network security.

- discuss the need for software defined networks and their working principles and characteristics.
ITC2104       ADVANCED JAVA AND INTERNET PROGRAMMING     L   T   P   C
                              3   0   0   3

OBJECTIVES:

- To install and setup Java environment and to learn Java basics
- To develop Java application using swing and AWT
- To explore advanced Java concepts
- To have hands on experience in Internet Programming.

MODULE I       JAVA BASICS  
Introduction to Java - evolution - variables and data types - arrays- operators- control structures- methods- implementation of object oriented concepts - exception handling.

MODULE II      MULTI THREADING AND I / O STREAMS  
Multithread programming, thread creation, inter process communication, synchronization- i/o basics- generic programming - string handling-collections.

MODULE III     INTRODUCTION TO GUI PROGRAMMING  
AWT - using AWT Controls - Event Handling -SWING - Applets and Applications- JavaFX Programming.

MODULE IV      JAVA OPEN DB AND RICH INTERNET APPLICATIONS  
Introduction to databases - SQL-MySQL-Java DB / Apache Derby - Java API with XML-AJAX-Rich Internet Applications with XML and JSON.

MODULE V       INTERNET PROGRAMMING FUNDAMENTALS  
Introduction to HTML5 - cascading Style Sheets -Java Script- functions-arrays - objects- DOM- event handling.

MODULE VI      INTERNET PROGRAMMING FRAMEWORKS  

Total Hours : 45

TEXT BOOKS:

OUTCOMES:
Upon Completion of course the students will be able to:

- become familiar with the Java environment
- develop Java application using Swings and Middleware technology
- develop Applet and AWT based Java Applications
- apply java concepts to develop frontend and backend applications
- use client side and server side scripting
- explore internet application frameworks
OBJECTIVES:

To enable the students to

- study the tools and commands for constructing and maintaining networks.
- configure the IP addresses in the Network devices.
- configure the various routing protocols and enable the different networks to communicate with each other.
- configure the Access control lists in a network topology.
- configure VLANs on the switches in a network topology.

LIST OF EXERCISES:

1. Using Network Tools to verify the various addresses associated with network, connectivity between nodes in a network.
2. Basic configuration of Routers and Switches and Configuration of IP addresses in a computer and in the interfaces of a Router.
3. Creating simple peer to peer network.
4. Creating a Wide Area Network (WAN) with various classes of IP address and configured with RIP protocol.
5. Creating a WAN with subnetted IP addresses and configured with IGRP protocol.
6. Creating a WAN with variable length subnetted IP addresses and configured with RIP Ver 2 Protocol.
7. Creating a WAN with variable length subnetted IP addresses and configured with EIGRP protocol.
8. Creating a WAN with variable length subnetted IP addresses and configured with OSPF protocol.
9. Creating an Access controlled WAN with variable length subnetted IP addresses and configured with any one of the routing protocol.
10. Configuration of Virtual LAN on the switches in a network topology

Total : 30 Hours

OUTCOMES:

On completion of the course students will be able to:

- Design and implement a WAN with a distance vectored routing protocol.
- Design and implement a WAN with a link-state routing protocol.
- Design and implement a WAN with VLSM and appropriate classless inter-domain Routing protocol
- Design and implement a WAN with VLAN configured switches.
- Design and implement a WAN with communication restricted through ACLs.
OBJECTIVES:
To enable the students to
- acquire practical experience on core java programming.
- have hands on experience in advanced concepts of java programming.
- gain hands on experience in Internet Programming.

EXPERIMENTS:
1. Java program using AWT GUI components.
2. Java programs for layout manager.
3. Java program to create applets with the specific features like color palette, background, image insertion, radio buttons, and checkbox group etc.
4. Programs to implement Java swing components.
5. Java programs to implement thread, thread priority, multi thread concepts.
7. Installation and working of webserver like Apache Tomcat and application servers glassfish.
8. Java programs to create three-tier applications using servlets and JSP.
9. Create a web page using HTML (i.e include map,hotspots).
10. Create a web page with various kind of style sheets.
11. Demonstration of Java Script, JQuery, and Ajax.
12. XML and Java API for XML web services.

OUTCOMES:
Upon Completion of course the students will be able to:
- become familiar with the Java environment.
- develop Applet , AWT, and Swing based Java Applications.
- practice advanced Java concepts.
- practice Markup languages and programming.
- work in the Internet frameworks.

Total Hours: 30
SEMMESTER IV

ENC2282  WRITTEN COMMUNICATION  L  T  P  C
0 0 2 1

OBJECTIVES:

○ To help students identify content specific vocabulary and learn its usage.
○ To expose them to reading for specific purposes, especially in professional contexts.
○ To expose them to the process of different kinds of formal writing.
○ To help them learn corporate correspondence for different purposes.
○ To train them in preparing effective applications with résumé
○ To make them write different types of reports.

MODULE I  4
Introduction - process of writing Ũ Fundamentals of academic and professional writing Ũ Understanding short, real world notices, messages, etc.

MODULE II  4
Reading industry related texts (ex. Manufacturing, textile, hospitality sector etc.) for specific information. -Writing Instructions and recommendations

MODULE III  6
Understanding format and conventions of writing email, memo, fax, agenda and minutes of the meeting - Writing email, memo, fax, agenda and minutes of the meeting for various purposes (industry specific)

MODULE IV  6

MODULE V  6
Viewing a Video and reading a case study (industry specific) Ũ collaborative writing using Edmodo Ũ reading and information transfer - Writing reports- Survey, feasibility and progress Ũ exposure to discipline specific reports

MODULE VI  4
Writing Statement of purpose (Higher Education)-- Justifying and writing about one’s preparedness for job (Statement of Purpose highlighting strengths and weaknesses) 

Peer evaluation skills through Edmodo.

P – 30; Total Hours –30

REFERENCES:


OUTCOMES:

On completion of the course, the students will have the ability to

- Identify content specific vocabulary and also use them in appropriate contexts.
- Demonstrate reading skills with reference to business related texts.
- Draft professional documents by using the three stages of writing.
- Create different types of documents for various corporate correspondences.
- Write effective letter of applications, résumé and statement of purpose.
- Write business related reports efficiently.
OBJECTIVES:

- To describe essential features of database management systems and its use.
- Familiar to identify about the procedural and non-procedural language.
- Mastering the design principles of databases, as well as in the normalization approach.
- To provide the description of physical file structures and access methods.
- Master the advanced topics and current trends.

MODULE I BASIC CONCEPTS 7
General Introduction to database and Transactions - Traditional file system and database - Database system three-tier architecture - various components of database- Data models - Modeling using ER model ï UML ï OLTP Vs OLAP

MODULE II RELATIONAL ALGEBRA AND SQL LANGUAGE 8
Unary Operations: Select and Project - Relational Set operations - Binary Relational operators. SQL: Data definition Language, Data Manipulation Language, Data Control Language in SQL - Basic constraints in SQL - Basic Queries in SQL- Joins, Aggregate & SORT functions -SQL Views and Privileges.

MODULE III DATABASE DESIGN AND DATA STORAGE 8

MODULE IV INDEXING AND TRANSACTION PROCESSING 8
What is Indexing? Advantages of Indexing; Indexing structure for files: Different type of single-level ordered index- Multi level index-Dynamic multilevel indexing using B tree and B+ trees: Create Index using SQL; Introduction to transaction processing: single-user verses multiuser - Need for Concurrency and recovery - Transaction states - ACID properties and Logs - Schedules based on Serializability: Conflict and View serializability - testing for serializability. Characterizing schedules based on Recoverability: Recoverable - Non-recoverable schedules - cascading rollback and cascade less schedule. ï What is SQL Tuning?

MODULE V CONCURRENCY AND RECOVERY TECHNIQUES 8
Concurrency control techniques: Locking, Lock compatibility matrix, Basic Two-phase locking (2PL) protocol, and various 2PL protocol, Timestamp-ordering based protocol. Deadlock prevention, Deadlock detection and Deadlock recovery -
Database recovery techniques: Immediate update, deferred update, Shadow paging, and Checkpoint.

**MODULE VI  ENHANCED DATA MODELS**  
Overview of object oriented concepts - Temporal databases - Introduction to multimedia and spatial databases - Distributed databases and issues - Types of distributed database systems - XML documents and XML Querying - Data mining concepts - Introduction to NoSQL & Columnar databases

**Total Hours : 45**

**TEXT BOOKS:**

**REFERENCE BOOKS:**

**OUTCOMES:**
On successful completion of the course, the students will be able to
- Summarize the vital concepts and architecture associated with DBMS
- Describe relational database using SQL.
- Apply normalization techniques in database design.
- Use the transaction processing and concurrency control for application software.
- Utilize the query evaluation techniques and query optimization.
- Apply the knowledge in current trends of database system.
OBJECTIVES:
To enable the students to
- Study about different types of system software and operating systems.
- understand the concepts of process scheduling and compare the various scheduling algorithms.
- acquire the knowledge about critical section problem and how the solution is provided
- explain conditions that lead to deadlock and the different methods to handle the deadlock.
- understand the concepts of various memory management schemes.
- learn about the file and disk management.

Prerequisite: Computer Programming and Computer Architecture

MODULE I  INTRODUCTION TO SYSTEM SOFTWARE AND OPERATING SYSTEM  8

MODULE II  PROCESS SCHEDULING  7

MODULE III  PROCESS SYNCHRONIZATION  7
MODULE IV  DEADLOCKS AND SYSTEM PROTECTION  7

MODULE V  MEMORY MANAGEMENT  8

MODULE VI  FILE AND DISK MANAGEMENT  8

LIST OF EXPERIMENTS
1. Study of UNIX Commands & Utilities.
2. Study of Shell Programming
3. Creation of process using system calls, fork() & exec().
4. Implementation of Inter-process communication using pipes and filters.
5. Development of multi-threaded program.
6. Implementation of Semaphore.
7. Implementation of Scheduling algorithms (FIFO, SJF, Priority & Round-robin)
12. Creation of Virtual Machines
14. Implementation of disk scheduling algorithms (SCAN, C-SCAN & LOOK)

Lecture: 45 Hours, Practical: 30 Hours  Total: 75 Hours
TEXT BOOK:

REFERENCES:

OUTCOMES:
On successful completion of the course, the students will be able to
- discuss the different types of system software and operating systems
- analyze the different CPU scheduling algorithms
- use appropriate schemes for providing process synchronization
- discuss how the deadlock can be managed / avoided.
- illustrate the various memory management schemes.
- explain the concepts of file and disk management
ITC2214 SOFTWARE ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
To enable the students to
- understand various software process models.
- acquire the knowledge about software requirements engineering.
- Understand the fundamental concepts of software design.
- learn software design techniques.
- comprehend software testing techniques.
- understand software project management concepts.

Prerequisite: Computer Programming

MODULE I SOFTWARE PROCESS MODELS 8

MODULE II SOFTWARE REQUIREMENTS 8

MODULE III SOFTWARE DESIGN FUNDAMENTALS 7

MODULE IV SOFTWARE DESIGN 7

MODULE V SOFTWARE TESTING 8
Test Strategies For Conventional Software - Test Strategies For Object-Oriented Software - Test Strategies For Webapps - Test Strategies For Mobileapps - Validation Testing - System Testing - The Art Of Debugging - White-Box Testing

**MODULE VI MANAGING SOFTWARE PROJECTS**

Introduction To Software Configuration Management - Project Management Concepts - Empirical Estimation Models - Estimation For Object-Oriented Projects - The CMMI -

**Total : 45 Hours**

**TEXT BOOK:**


**REFERENCES:**


**OUTCOMES:**

On successful completion of the course, the students will be able to
- select the suitable software process model to develop the software successfully.
- prepare requirements specification document and analyze the requirements.
- explain software design concepts.
- design a software for given requirements to develop a quality software.
- develop test case specification and to test the software using both white-box and black-box testing techniques.
- explain about the software project management concepts.
ECC2208 SIGNALS AND SYSTEMS

OBJECTIVES:

- To introduce the concepts of Signals and Linear Time-Invariant Systems
- To illustrate various Transform such as Fourier, Laplace, Z-Transform etc. for signal processing applications

PREREQUISITES:

- Fundamentals of Engineering Mathematics

MODULE I  INTRODUCTION TO SIGNALS

MODULE II  INTRODUCTION TO LTI SYSTEMS

MODULE III  FOURIER SERIES ANALYSIS
Fourier Series representation of signals. Properties of Fourier Series. Complex exponential Fourier Series

MODULE IV  FOURIER TRANSFORM ANALYSIS

MODULE V  LAPLACE TRANSFORM ANALYSIS

MODULE VI  Z-TRANSFORM ANALYSIS

Total Hours – 45

TEXT BOOKS:


REFERENCES:


OUTCOMES:

On completion of the course, students will be able to

- Mathematically represent and classify the signals
- Mathematically represent and classify the systems
- Evaluate and manipulate signals mathematically.
- Identify, and characterize common LTI Systems.
- Apply the tools such as Fourier Series and Fourier Transform in problem solving.
- Apply the Laplace Transform and Z-Transform in problem solving
OBJECTIVES:

To enable the students to

- know how to create a database and query it using SQL.
- understand the importance of Referential and Integrity constraints.
- know how to work with PL/SQL.
- be aware of database connectivity for developing an application.

LIST OF EXERCISES:

1. Creation of Data Definition Language (DDL) to perform table creation, Alter, modify and drop commands in RDBMS.
2. Integrity and referential Constraints.
3. Data Manipulation Language Basic Queries in SQL, Joined tables in SQL, Aggregate functions in SQL, Group By and Having clause.
5. Basic programs in Procedural Language using SQL (PL/SQL).
6. No_Data_Found, Too_Many_Rows Exception program using PL/SQL.
7. Programs using Cursors.
8. Programs using Functions and Procedures.
10. Database connectivity using MySQL.
11. Design and implementation of any application using database.

OUTCOMES:

On successful completion of the course, the students will be able to

- Apply SQL DML/DDL commands for creating a database.
- Demonstrate PL/SQL programming.
- Develop small-scale database oriented applications.
OBJECTIVES:
The course aims at

- Bringing about positive transformation in students’ attitude.
- Building unique leadership competencies that would ensure successful transition of students across all career stages.
- Sensitizing students to identify their strengths & weakness and training them to deal with it
- Assisting students in enhancing their expressive ability and inducing a high level of self confidence to manage both business and emotions
- Training students to become more adaptable and flexible to changing business environment

MODULE I  Introduction to Leadership  12
Leadership concept - meaning, definitions, importance of leadership, leadership traits. Leadership functions- general functions, listening, observing, managing and decision making. Components of leadership - leaders, followers and situation. Leadership theories – Trait theory, Skills theory, Style theory, Situational theory, Transformational theory, Transactional theory, Path Goal Theory and LMX. Assessing emotional intelligence and exploring the capabilities and inherent traits through psychometric tests - Multi factor leadership questionnaire and personal reflections

MODULE II  Leadership Style and Communication  08
Leadership styles-visionary, Coaching, Affiliative, Democratic, Pacesetting Commanding, Transformational, Transactional. Autocratic, Participative, Laissez-Faire Leader versus Managers. Leadership communication - Rationale, tactic, assertive, formal, informal, communication in crisis- leadership and negotiations, Leadership Presentations-convincing and impressive style

MODULE III  Leadership Roles  08
Facets of leadership- Leader as an individual – personality and leadership, values, attitudes and ethics of a leader. Leader as a relationship builder- empowering people to meet higher order needs, initiating organization wide motivational programs, involvement with all stakeholders- focusing on organization growth. Leader as an inspirer- motivation and leadership, recognizing and appreciating contributions, empowering others to lead Leader as an innovator –
leader's role in shaping culture and values in an organization. **Leader as a Liaison** - Leader as team player

**MODULE IV Leadership Challenges and Strategies**

Challenges in leadership: Perception of organization culture and values, interpreting the power dynamics in the organization, establishing work-life balance. Bad leadership - Reasons and impact. Case Study of Marissa Mayer-Yahoo Inc. Organizational transformation through efficient leaders - Case study of Apple Inc. Blue Ocean Leadership - Steps to Blue ocean Leadership - Four Pillars of Blue Ocean leadership - Blue Ocean leadership grid

**MODULE V Leadership and CEO Training**

**Leader as a CEO**: Traits of a successful CEO, Key responsibilities of a CEO, the path to be a CEO - Training on Board Room Discussions, Meeting the CEO - Live sessions with industry CEO. Requirements of Leadership: - Cognitive skills, Interpersonal skills, Business skills, Strategic skills. Role of Emotional Intelligence in taking up key-positions in the organization.

**Teaching Pedagogy:**

**Nurturing** - Based on the identified strengths and weaknesses, training will be given to enhance the strengths and overcome the weakness.

**Assessment** - Continuous evaluation will be effected through group discussions, oratory assignments and situational enactments. Pre-and post-training assessment through peer reviews and faculty feedback.

**Sustained development** - Training will be imparted for self-development and monitoring of leadership skills to ensure sustained applicability of the skills learnt.

**Total Hours: 45**

**REFERENCES:**


6. Emotional Intelligence, Why it can matter no more than IQ by Daniel Goleman (include a book) Publisher: Bloomsbury Publishing India Private Limited; Latest edition (2017)


**Recommended Readings:**


4. Leadership Wisdom by Robin Sharma Jaico Publishing House;

**OUTCOMES**

The students will be able to

- Explore through self-introspection one's own leadership style, their strength and weakness
- Gain self confidence to lead a team in the organization
- Realize the role of leadership in making or breaking of an organization
- Acquire the practice of self introspection and development of leadership competencies thorough continuous efforts
- Manage their own emotions as well as other resulting in successful relationship building with all stakeholders
MSC 4181 SOCIAL ENTREPRENEURSHIP L T P C

3 0 0 3

OBJECTIVES:

- To be able to understand the field of social entrepreneurship and Social problems
- To be able to describe and understand the traits of social entrepreneurs
- To recognize the social business opportunities
- To synthesize the resource mobilization ways for social entrepreneurship
- To understand the social entrepreneurship models
- To recognize the impact of social entrepreneurship on societies

MODULE I INTRODUCTION TO SOCIAL ENTREPRENEURSHIP 07


MODULE II SOCIAL ENTREPRENEURSHIP: DRIVERS AND CHALLENGES 07


MODULE III SOCIAL ENTREPRENEURSHIP: OPPORTUNITY RECOGNITION 07


MODULE IV RESOURCE MOBILIZATION FOR SOCIAL VENTURE 08

MODULE V BUSINESS MODELS AND BUSINESS PLAN FOR SOCIAL ENTERPRISES


MODULE VI THE IMPACT OF SOCIAL ENTREPRENEURSHIP ON SOCIETY


Case Study of Social Entrepreneurs

Total Hours: 45

REFERENCES:

1. “Social Entrepreneurship: New models of sustainable social change”. Alex Nicholls, Oxford University Press 2006
2. The Process of social value creation: A multiple case study on Social Entrepreneurship in India, Archana Singh, Springer 2016

OUT COMES:

The students can able to
- Conceptualize social entrepreneurship in terms of a theoretical framework between changing social values and institutions
- Think and communicate about social values
- Learn about practical models of social change to launch, lead, manage, and evaluate a social venture
- Analyze funding needs and sources for the social venture
- Experience the ideas can be critically and collaboratively examined prior to commitment.
ENC 3181 COMMUNICATION AND SOFT SKILLS - I

CONFIDENCE BUILDING

OBJECTIVES:
- To develop professional skills like work ethics, analytical skills, presentation skills etc.
- To train them in problem solving skills and leadership skills pertaining to industries.
- To train them in team building skills.
- To train in setting up career goals

MODULE I
Brief about Multinational companies- Analysing work ethics of multinational companies and small industries- discussing as pairs-Knowledge about etiquette (different types)

MODULE II
Visit to an Industry and prepare reports--Critically reading of industry specific journal articles and write ups-- preparing reports.

MODULE III
Analysing problem solving situations in industries (relating to application of core subject to specific jobs) and discussing about them- working on a sample case

MODULE IV
Developing Leadership in team projects-- debating about various aspects of leadership: for example, responsibility and reliability-time management

MODULE V
Team building skills-- group discussions pertaining to industries-- presenting career goals. -- preparing for interviews- interpersonal skills

Total Hours – 30

REFERENCES:

OUTCOMES:
After completing the course students would be able to
- Exhibit critical reading skills through review of industry specific articles.
- Provide solutions to problem based situations.
- Exhibit leadership qualities by debating over industry specific issues.
- Participate in group discussions confidently.
- Present their career goals.
OBJECTIVES:

- To understand the object oriented life cycle.
- To know how to identify objects, relationships, services and attributes through UML.
- To provide knowledge in Object Oriented Design process.
- To analyze about software quality and usability.

MODULE I  INTRODUCTION  7

MODULE II  OBJECT ORIENTED METHODOLOGIES  8

MODULE III  OBJECT ORIENTED ANALYSIS  8
Identifying use cases - Object Analysis: Classification - Identifying Object relationships, Attributes, and Methods.

MODULE IV  OBJECT ORIENTED DESIGN - I  7
Design axioms - Designing Classes

MODULE V  OBJECT ORIENTED DESIGN - II  8

MODULE VI  SOFTWARE QUALITY AND USABILITY  7
Designing Interface Objects - Software Quality Assurance - System Usability - Measuring User Satisfaction

Total Hours: 45

TEXT BOOKS:

REFERENCES:

OUTCOMES:
On completion of the programme students will be able to:
- Outline the basics of object oriented system development life cycle.
- Explain the various UML diagrams.
- Analyze software requirements to identify objects, attributes and methods.
- Prepare design for software using UML diagrams.
- Outline how to identify requirements, analyze requirements and prepare design for application and real-time software.
- Explain how to develop user friendly software.
ITC3102  FUNDAMENTALS OF WEB DESIGNING  L  T  P  C
2  0  2  3

OBJECTIVES:

- To introduce the basics of web designing
- To discuss methods and techniques to create simple to complex websites.
- To explore prevailing vocabulary in web development in creating social media websites.
- To focus on client side and server side scripting languages.
- To discuss about software and services that are easily incorporated in a website.

MODULE I  INTRODUCTION  8
Introduction to web design environment, role of web designers, basics of scripting and programming, need of multimedia, tools and equipment assisting web designing, working of web, browser server communication, web page address, anatomy of a web page, Multitude of devices in web, standards in web, responsive web design.

MODULE II  STRUCTURE OF WEB PAGE AUTHORING  7
Introduction to First XHTML Example, Headers, Linking, Images, Special Characters, Unordered Lists, Nested and Ordered Lists, Basic XHTML Tables, Basic HTML Forms. Internal Linking, Meta Elements, Framesets, Forms and creation of Forms.

MODULE III  PROGRAMMING WITH JAVASCRIPT  8
Introduction to scripting, simple program, memory concepts, arithmetic, decision making statements, control structures, JavaScript functions, objects, dynamic html event model.

MODULE IV  STYLING WITH CSS  7
Introduction, Inline styles, embedded style sheets, conflicting styles, linking external style sheets, W3C CSS validation services, positioning elements, Backgrounds, element dimensions, text flow and box model, user style sheets, internal style sheets.

Total Hours : 30
REFERENCES:
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles - (Eds.) - Springer - 2011.

OUTCOMES:
Upon Completion of course the students will be able to:

- Create local HTML pages and move them to a remote web server.
- Design and develop basic web pages using HTML and CSS.
- Use graphics and tables in Web pages.
- Link pages so that they create a Web site.
OBJECTIVES:
• To study the architecture and Instruction set of 8086.
• To develop assembly language programs in 8086.
• To understand and design multiprocessor configurations.
• To study different peripheral devices and their interfacing to 8086.
• To study the architecture and programming of 8051 microcontroller.

MODULE I  8086 ARCHITECTURE
Introduction to 8086 Microprocessor, Minimum and Maximum Mode Signals, Architecture, Memory Organization, Interrupt structure of 8086, Introduction to Advanced Microprocessors.

MODULE II  INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING OF 8086
Instruction formats, addressing modes, Instruction Set of 8086, String Manipulations, assembler directives, Procedures and Macros, Assembly Language Programming.

MODULE III  I/O INTERFACING
Memory Interfacing, I/O Interfacing, Parallel Communication Interface, 8255 PPI Architecture and Interfacing, Serial Communication Interface, 8251 USART Architecture and Interfacing, Real Time Applications.

MODULE IV  INTERFACING WITH ADVANCED DEVICES
Interrupt service routine, Programmable Interrupt controller 8259 Architecture and Interfacing, Introduction to Timer/ Counter Controller 8253, Keyboard/Display Controller 8279 and DMA Controller 8257, Simple Applications.

MODULE V  8051 MICROCONTROLLER
Introduction, Signals of 8051, Architecture, Memory Organization, Interrupt Structure, Serial & Timer control.

MODULE VI  8051 REAL TIME CONTROL
Addressing Modes and Instruction set of 8051, Programming Timer interrupts, external hardware interrupts and serial communication interrupts, Real Time Applications using 8051, Introduction to Embedded System.

Total Hours : 45

TEXT BOOKS:
1. A. K. Ray and K.M. Bhurchandani, "Advanced Microprocessors and


REFERENCES:


OUTCOMES:

- Explain the internal architecture of 8086 Microprocessor.
- Develop assembly language programs using 8086 instructions.
- Design and demonstrate I/O interfacing concepts and programming techniques using 8255 and 8251 for simple applications.
- Explain the internal architecture of 8051 Microcontroller.
- Develop simple programs using 8051 instructions.
- Develop and demonstrate real time control applications using 8051 instructions.
OBJECTIVES:

- Define the process of object-oriented analysis and design to software development.
- Pointing out the importance and function of each UML model throughout the process of object-oriented analysis and design and explaining the notation of various elements in these models.
- Providing students with the necessary knowledge and skills in using object oriented CASE tools.

Prepare the following documents for two or three of the experiments listed below and develop the software using software engineering methodology.

1. Feasibility Study and Project Planning.
   Thorough study of the problem - Identify project scope, Objectives, Infrastructure.
2. Software Requirements Analysis.
   Develop Scenario-based Model, Class-based Model, and Behavioral Model.
3. Data Modelling.
   Use work products - use case diagrams and activity diagrams, class diagrams, sequence diagrams and add interface to class diagrams.
4. Software development and debugging.
5. Study of software testing tools.

LIST OF EXERCISES:
1. Student Marks Analyzing System.
2. Gas Booking System.
3. Online Flight Ticket Reservation System.
4. Employee Payroll Management System.
5. Course Registration System.
6. Hostel Room Allocation System.
8. Online Mobile Recharging System.
10. Vacation Management System
11. Satellite Navigation System

Total Hours : 45

OUTCOMES:
Students on successful completion of the course should have gained the following skills

- Show the importance of systems analysis and design in solving complex problems.
- Show how the object-oriented approach differs from the traditional approach to systems analysis and design.
OBJECTIVES:
The course aims at

- Bringing about positive transformation in students' attitude.
- Building unique leadership competencies that would ensure successful transition of students across all career stages.
- Sensitizing students to identify their strengths & weakness and training them to deal with it.
- Assisting students in enhancing their expressive ability and inducing a high level of self-confidence to manage both business and emotions.
- Training students to become more adaptable and flexible to changing business environment.

MODULE I  Introduction to Leadership  12
Leadership concept - meaning, definitions, importance of leadership, leadership traits. Leadership functions - general functions, listening, observing, managing and decision making. Components of leadership - leaders, followers and situation. Leadership theories - Trait theory, Skills theory, Style theory, Situational theory, Transformational theory, Transactional theory, Path Goal Theory and LMX. Assessing emotional intelligence and exploring the capabilities and inherent traits through psychometric tests - Multi factor leadership questionnaire and personal reflections.

MODULE II  Leadership Style and Communication  8
Leadership styles - visionary, Coaching, Affiliative, Democratic, Pacesetting Commanding, Transformational, Transactional. Autocratic, Participative, Laissez-Faire Leader versus Managers. Leadership communication - Rationale, tactic, assertive, formal, informal, communication in crisis - leadership and negotiations, Leadership Presentations - convincing and impressive style.

MODULE III  Leadership Roles  8
Facets of leadership - Leader as an individual - personality and leadership, values, attitudes and ethics of a leader. Leader as a relationship builder - empowering people to meet higher order needs, initiating organization wide motivational programs, involvement with all stakeholders - focusing on organization growth. Leader as an inspirer - motivation and leadership, recognizing and
appreciating contributions, empowering others to lead Leader as an innovator ï leaderïs role in shaping culture and values in an organization. Leader as a Liaison-Leader as team player

MODULE IV Leadership Challenges and Strategies

Challenges in leadership: Perception of organization culture and values, interpreting the power dynamics in the organization, establishing work life balance. Bad leadership ï Reasons and impact.-Case Study of Marissa Mayer-Yahoo.Inc Organizational transformation through efficient leaders-Case study of Apple Inc. Blue Ocean Leadership-Steps to Blue ocean Leadership-Four Pillars of Blue Ocean leadership-Blue Ocean leadership grid

MODULE V Leadership and CEO Training

Leader as a CEO: Traits of a successful CEO, Key responsibilities of a CEO, the path to be a CEO ,Training on Board Room Discussions, Meeting the CEO ï Live sessions with industry CEOâ. Requirements of Leadership: - Cognitive skills, Interpersonal skills, Business skills, Strategic skills. Role of Emotional Intelligence in taking up key-positions in the organization.

Teaching Pedagogy:

Nurturing ï Based on the identified strengths and weaknesses, training will be given to enhance the strengths and overcome the weakness.

Assessment - Continuous evaluation will be effected through group discussions, oratory assignments and situational enactments. Pre-and post-training assessment through peer reviews and faculty feedback.

Sustained development ï Training will be imparted for self-development and monitoring of leadership skills to ensure sustained applicability of the skills learnt.

Total Hours: 45

REFERENCES:

6. Emotional Intelligence, Why it can matter no more than IQ by Daniel Goleman (include a book) Publisher: Bloomsbury Publishing India Private Limited; Latest edition (2017)

Recommended Readings:

4. Leadership Wisdom by Robin Sharma, Jaico Publishing House;

OUTCOMES

The students will be able to

- Explore through self-introspection one's own leadership style, their strength and weakness
- Gain self confidence to lead a team in the organization
- Realize the role of leadership in making or breaking of an organization
- Acquire the practice of self introspection and development of leadership competencies thorough continuous efforts
- Manage their own emotions as well as other resulting in successful relationship building with all stakeholders
OBJECTIVES:

1. To be able to understand the field of social entrepreneurship and social problems
2. To be able to describe and understand the traits of social entrepreneurs
3. To recognize the social business opportunities
4. To synthesize the resource mobilization ways for social entrepreneurship
5. To understand the social entrepreneurship models
6. To recognize the impact of social entrepreneurship on societies

MODULE I INTRODUCTION TO SOCIAL ENTREPRENEURSHIP


MODULE II SOCIAL ENTREPRENEURSHIP: DRIVERS AND CHALLENGES


MODULE III SOCIAL ENTREPRENEURSHIP: OPPORTUNITY RECOGNITION


MODULE IV RESOURCE MOBILIZATION FOR SOCIAL VENTURE


MODULE V BUSINESS MODELS AND BUSINESS PLAN FOR SOCIAL ENTERPRISES

**MODULE VI  THE IMPACT OF SOCIAL ENTREPRENEURSHIP ON SOCIETY  08**


Case Study of Social Entrepreneurs

**Total Hours: 45**

**REFERENCES:**

5. "Social Entrepreneurship : New models of sustainable social change". Alex Nicholls, Oxford University Press 2006
6. The Process of social value creation : A multiple case study on Social Entrepreneurship in India, Archana Singh Springer 2016

**OUT COMES:**

The students can able to
- Conceptualize social entrepreneurship in terms of a theoretical framework between changing social values and institutions
- Think and communicate about social values
- Learn about practical models of social change to launch, lead, manage, and evaluate a social venture
- Analyze funding needs and sources for the social venture
- Experience the ideas can be critically and collaboratively examined prior to commitment.
ENC 3281  COMMUNICATION AND SOFT SKILLS - II  L  T  P  C
CAREER CHOICE  0  0  2  1

OBJECTIVES:
- To create awareness of industrial trends and market demands.
- To encourage students to explore career opportunities in an industry and evaluate themselves in relation to industry preparedness

MODULE I  6
Knowledge about specific industry - Discussion with industry experts - Self evaluating career prospects through survey questionnaire (based on his/her eligibility for taking up a job (industry preparedness))

MODULE II  6
Knowing case studies of industries (pertaining to students’ choice of career) - Reading and discussing about job markets - goal setting, working on creativity.

MODULE III  4
SWOC analysis and discussing outcomes - exploring mini projects or case studies of latest industries.

MODULE IV  6
Writing statement of purpose pertaining to career choice ---- Outcomes

MODULE V  8
Project or case study presentations (Presentation in pairs) - mini project report or case study report.

Total Hours – 30

REFERENCES:
OUTCOMES:
After the completion of the course, students would be able to
- Speak about their career choice.
- Self evaluate their strengths and weaknesses and speak about it.
- Make effective presentations on case studies or relating to projects.
- Write the statement of purpose relating to their career choice.
OBJECTIVES:

The objective of this course is to enable the students:

- To discuss the distinctions between different levels of testing.
- To describe the principles of software testing and maturity levels.
- To describe strategies for generating system test cases.
- To understand the essential characteristics of tool used for test automation.
- Demonstrate the ability to apply multiple methods to develop reliability estimates for a software system.

MODULE I  SOFTWARE TESTING-INTRODUCTION

Testing as an Engineering Activity - Role of Process in Software Quality - Testing as a Process - Basic Definitions, Testing Concepts and Definitions in TMM levels


MODULE II  STRATEGIES AND METHODS FOR TEST CASE DESIGN


MODULE III  LEVELS OF TESTING AND TESTING GOALS, PLANS AND POLICIES

The Need for Levels of Testing - MODULE Testing - Integration testing - System Testing - types of system testing - Acceptance Testing - types of acceptance test - testing OO systems - usability and accessibility testing - Testing and debugging Goals and policies - Test plan components - The role of three groups in Test Planning and Policy Development.

MODULE IV  CONTROLLING & MONITORING

Introducing the test specialist - Skills needed by a test specialist - Building a Testing Group - Structure of the testing group - Measurements and milestones for controlling and monitoring - Criteria for test completion - software configuration management-
Controlling and Monitoring: Three critical views.

**MODULE V  TEST MEASUREMENTS**


**MODULE VI  TESTERS WORKBENCH**


Total Hours: 45

**TEXT BOOKS:**


**REFERENCES:**


**OUTCOMES:**

Students who have completed this course would have learned

- Various test processes and continuous quality improvement
- Types of testing techniques and developing test case design
- Writing proper test plan for an application
- Build a test group and how to control and monitoring the testing process.
- Various test measurement techniques and review techniques
- The use of various test tools
OBJECTIVES:

- To learn about cloud computing basics.
- To know the various technologies available for cloud platforms.
- To understand the cloud storage service and standards to access cloud service providers.
- To learn virtualization technology over various open source cloud tools to monitor the cloud performance.
- To understand security and challenges in cloud.

MODULE I  CLOUD COMPUTING BASICS  8


MODULE II  CLOUD COMPUTING TECHNOLOGY  7

Hardware and Infrastructure - Thick and thin clients - Cloud providers and consumers - Cloud services - Accessing the cloud - Cloud Platforms and Frameworks - Web Applications - Web API's - Web Browsers - Google App Engine.

MODULE III  CLOUD STORAGE AND STANDARDS  8

Storage as a Service - Cloud Storage Providers - Cloud File Systems - GFS and HDFS - Big Table, HBase and Dynamo DB - Cloud Data Store - Simple Storage Service.

MODULE IV  VIRTUALIZATION TECHNOLOGY  7


MODULE V  DATA CENTER TECHNOLOGY  7


MODULE VI  CLOUD SECURITY  8

Insufficient Authorization - Virtualization Attack - Overlapping Trust Boundaries – Case Study example for IaaS, PaaS, SaaS.

Total Hours : 45

TEXT BOOKS:

REFERENCES:

OUTCOMES:
- Discuss the core concepts of cloud computing paradigm.
- Analyze services, systems, platforms, frameworks to support cloud computing.
- Illustrate the concepts of cloud storage system services.
- Assess virtualization technology services in open source cloud computing environment.
- Understand data center technology from industry centric perspective.
- Identify cloud security issues to demonstrate real time applications.
OBJECTIVES:

- To understand the components and types of distributed systems.
- To give insight into the basic principles of how distributed computer systems are working.
- To provide knowledge and skills in design and development of distributed computing systems.

MODULE I | TYPES OF DISTRIBUTED SYSTEMS

Introduction - Goals - hardware concepts - bus based multiprocessor - switched multiprocessor - bus based multicomputer - switched multicomputer - software concepts - network operating systems - Multiprocessor time sharing system- True distributed system- Design issues.

MODULE II | COMMUNICATIONS


MODULE III | SYNCHRONIZATION

Synchronization-Clock Synchronization - Mutual Exclusion - Election Algorithms - Atomic transactions.

MODULE IV | SCHEDULING

Deadlock - System models - Processor Allocation ï Scheduling.

MODULE V | DISTRIBUTED FILE SYSTEMS

Introduction to Distributed file systems- Distributed file system design ï implementation ï file models ï fault tolerance ï file replication.

MODULE VI | DISTRIBUTED SHARED MEMORY

Consistency models ï page based distributed shared memory - shared variable distributed shared memory ï Case studies.

Total Hours : 45

TEXT BOOK:

REFERENCES:

OUTCOMES:
The students completing the course are expected to possess the following skills and abilities:

- Understand and be familiar with hardware and software concepts of the distributed operating systems.
- Describe the models and solve the issues associated with the design of distributed systems.
- Implement efficient algorithms for distributed computing application.
- Design and implement scheduling algorithms in distributed application.
- Gain the understanding of distributed file system.
- Discuss the different types of shared memory distributed systems.
OBJECTIVES:

- To help demystify the tools in Open source technologies.
- To explain the impact of open source technology in programming.
- To expose students to open source environment and introduce them to use open source Packages.
- To develop GUI processing using Python and PHP.
- To create back end server using MySQL.

LIST OF EXERCISES:

1. Case study: Proprietary Vs Open Source tools
2. Deploy a LAMP stack in Linux
3. Create an application that uses all the LAMP stack components
4. OPEN SOURCE TOOLS AND TECHNOLOGIES: WEB SERVER: Apache
   - Working with Web server
   - Configuring and using Apache Web services
   - Execution Environment
5. Open Source Software tools and processors: Eclipse IDE platform
6. Creation of Simple application using GIMP tool.
7. Demonstration of GitHub.
8. OPEN SOURCE PROGRAMMING LANGUAGES: PHP: Introduction-
   - Programming in Web Environment and SQL database.
9. OPEN SOURCE PROGRAMMING LANGUAGES: PYTHON: Python objects-
   - Numbers-Sequences-Strings-Lists and Tuples
   - Dictionaries-Conditionals and loops
10. OPEN SOURCE DATABASE: MySQL: Introduction-Setting up account-
    - Starting, terminating and writing your own SQL programs
    - MySQL and Web.

Total Hours: 45
OUTCOMES:
Students who complete this course will be able to:

- Analyze the difference between the open source model and commercial proprietary model.
- Expertise on using a variety of open source software.
- Develop and deploy a project based purely on open source tools.

ITC3215 SOFTWARE DEVELOPMENT LAB  L  T  P  C
0 0 3 1

OBJECTIVES:

- Create a project team and appoint a project leader.
- Assume the role of client. Discuss, evaluate and propose the requirements for a real world problem.
- Discuss the software requirement with team lead.
- Use the template to write requirements.
- To take part in ongoing project development process such as requirement analysis, design, implementation and testing.
- Learn where and how to make improvements in the software development process through developing projects.

LIST OF EXERCISES

Note: List of exercises will be framed based on the professional elective chosen.

The project should be carried out with the following supporting documents

a) Requirement Analysis
b) Software Requirement Specification
c) Design
d) Implementation
e) Testing

Any one of the projects listed below should be carried out in detail

1. Software for a Game
2. Digital Classroom (Smart Class)
3. Course Scheduler
4. Stock Management
5. Photography Studio
6. Buy Big Mobile App
7. Online Quiz System
8. Entrance Exam System
9. Micro Social University Web App
10. Internal Assessment
11. Tourist Management System
12. Airline Reservation System
13. Payroll processing System

Total Hours : 45

OUTCOMES:

- Discuss, evaluate and propose the requirements to solve real world problem with team members.
- Analyze software requirements and prepare software design using common template.
- Implement and test software module in coordination with other team members.
OBJECTIVES:

- To introduce the basics of Internet of things.
- Utilize IoT features and create applications based on IoT protocols.
- To discuss the features of cloud of things and web of things.
- Outline the embedded prototyping and design and apply the use of Devices in IoT Technology.
- To explain Real World IoT Design and compile the same.

MODULE I  INTRODUCTION  8
Definitions and Functional Requirements ï Motivation ï Architecture - Web 3.0 View of IoT ï Ubiquitous IoT Applications ï Four Pillars of IoT ï DNA of IoT ï The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview ï Communication middleware for IoT.

MODULE II  IOT PROTOCOLS  8

MODULE III  WEB OF THINGS  8
Web of Things ï Web of Things versus Internet of Things ï Two Pillars of the Web ï Architecture Standardization for WoT ï Platform Middleware for WoT ï Unified Multitier WoT Architecture ï WoT Portals and Business Intelligence.

MODULE IV  DESIGN PRINCIPLES OF CONNECTED DEVICES  7
Technology for design ï Privacy in storing data ï Internet principles for connected devices-Prototypes and production ï Changing embedded platform ï Open source versus closed source.

MODULE V  PROTOTYPING EMBEDDED DEVICES  7

MODULE VI  PROTOTYPING ONLINE COMPONENTS AND EMBEDDED CODING  8
Sketch ï Iterate and Explore ï Preparation of physical prototype ï Getting started with API ï Writing New API ï Writing New API ï Real Time Reactions ï Other
Protocols, Techniques for Writing Embedded code, Memory Management, Performance and Battery Life, Libraries and Debugging.

Total Hours: 45

LAB COMPONENT - LIST OF EXERCISES

1. Integration of Sensors and Actuators with Arduino-Traffic Control System
2. Working of Basic IoT Kit with Python Programming Networking
3. Implementation of IoT with Raspberry Pi - Raspbian OS - Blinking LED
4. Home Automation - Controlling lights using ESP8266
5. Sending Gmail notification when the door is opened or closed-sensed using Magnetic door sensor
6. Sensing the room temperature and monitoring it using temperature sensor in ZigBee kit
7. Calculating distance using ultrasonic sensor
8. Program on RESTFUL API and XMAPP
9. IP based lighting control through Data Acquisition Card
10. Study on Industrial IoT

Practical: 30 Hours

T: 45, P: 30, Total: 75 Hours

REFERENCES:


OUTCOMES:

Upon Completion of course the students will be able to:

- Identify and design the new models for market strategic interaction
- Analyze various protocols for IoT
- Analyze and compare Cloud of things and Web of things
- Design a middleware for IoT
- Identify the prototyping with various embedded devices
- Analyze and design different models for embedded devices and API techniques
OBJECTIVES:
- To understand the basics of cryptography techniques.
- To explore the technological aspects of program and web security.
- To know the security mechanism given by operating system.
- To discover the network level security.
- To study the critical need for ensuring Information Security in database.
- To know the legal, ethical and professional issues in Information Security.

MODULE I \hspace{1cm} CRYPTOGRAPHY
9
Introduction - Computer Security  
- Threats - Harm  
- Vulnerabilities  
- Controls - Authentication - Access Control  
- Cryptography  
- Symmetric key & Asymmetric key encryption  
- Digital signatures.

MODULE II \hspace{1cm} PROGRAM & WEB SECURITY
7

MODULE III \hspace{1cm} OPERATING SYSTEM SECURITY
7

MODULE IV \hspace{1cm} NETWORK SECURITY
8

MODULE V \hspace{1cm} DATABASE SECURITY
7
Introduction - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

MODULE VI \hspace{1cm} ADMINISTERING SECURITY AND ETHICAL ISSUES
7

Total Hours : 45

TEXT BOOK:

REFERENCES:

OUTCOMES:
- Analyze the various cryptographic techniques in Information Security.
- Identify program level malicious code and provide control measures.
- Discuss operating system level security to assess trusted operating systems.
- Explain threats in network level scenarios.
- Outline database security requirements in multilevel databases.
- Discuss organizational security policies and ethical issues.
OBJECTIVES:

- To learn the fundamental concepts of wireless, mobile and personal telecommunication system.
- To understand the wireless network topologies, cellular concepts and its operational characteristics.
- To explain the evolution of WLAN and the channel access mechanisms.
- To gain knowledge about the different routing protocols in adhoc wireless networks.
- To understand WPAN and geo-location systems.

MODULE I  PHYSICAL LAYER ALTERNATIVES FOR WIRELESS NETWORKS  

MODULE II  PRINCIPLES OF WIRELESS NETWORK OPERATION  
Wireless networks topologies, cellular topology, cell fundamentals signal to interference ratio calculation, capacity expansion techniques, cell splitting, use of directional antennas for cell sectoring, micro cell method, overload cells, channels allocation techniques and capacity expansion FCA, channel borrowing techniques, DCA, mobility management, radio resources and power management securities in wireless networks.

MODULE III  GSM, CDMA AND TDMA TECHNOLOGY  
Mechanism to support a mobile environment, communication in the infrastructure, IS-95 CDMA forward channel, IS - 95 CDMA reverse channel, pallet and frame formats in IS - 95; forward channel in W-CDMA and CDMA 2000, reverse channels in W-CDMA and CDMA 2000.

MODULE IV  LOCAL BROADBAND NETWORKS  
Historical overviews of the LAN industry, evolution of the WLAN industry, wireless home networking, IEEE 802.11, Physical Layer, Basic MAC Layer Mechanisms, CSMA/CA Mechanisms, other MAC Layers functionalities.
MODULE V  AD HOC NETWORKS  
Overviews of Ad hoc networks, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Proactive, Reactive and Hybrid routing protocols - DSDV, AODV, DSR, ABR, TORA, ZRP.

MODULE VI  WPAN AND GEOLOCATION SYSTEMS  
IEEE 802.15 WPAN, Home RF, Bluetooth, interface between Bluetooth and 802.11, wireless geo location technologies for wireless geo location, geo location standards for E.911 service.

Total Hours : 45

TEXT BOOK:

REFERENCES:

OUTCOMES:
- Explain the various wireless transmission and coding techniques.
- Discuss the principle of operation of wireless networks and its issues.
- Analyze the IEEE 802.11, ITU, and IS-X standards for multiple access wireless networks.
- Discuss about the application of wireless technology in real world applications.
- Compare the different routing protocols for adhoc networks.
- Analyze the available commercial implementations of several wireless technologies.
ITC4104     PROGRAMMING IN HADOOP     L T P C
                      0 0 3 1

OBJECTIVES:
- To make the students familiar with Hadoop distributed file system and can learn how to configure Hadoop.
- To create single node and multinode using Hadoop and to learn programming using Map Reduce paradigm.
- To provide a complete knowledge about Hadoop echo system with key components like Pig, Hive and Sqoop.
- To Install Apache Spark and explore the components in it

List of exercises:
1. Introduction to HDFS and Hadoop Ecosystem. Configuration and Installation of Hadoop 1.0 Single node with Name node and Data node.
2. Configuration of Hadoop 1.0 with SSH key for security for Name and Data Node with Demo of Pseudo distributed Node and Case Study of Multinode set up.
3. Study of Map reduce Java API. Simple programs in Map Reduce paradigm with java concepts.
4. Working on Input functions, mapper & reducer functions. Simple program for text extraction and title extraction.
5. Program for searching key word and extract it from the given text paragraph.
6. Program for extracting link from a HTML page using Map and Reduce.
7. Implementation of Pig using Hadoop Ecosystem for processing structured Data.
8. Implementation of Sqoop for transferring schema format to NOSQL format.
9. Implementation and configuration of Hive in Hadoop ecosystem for querying.
10. Apache Spark Installation and implementation of simple programs in it.

Total Hours : 45

OUTCOMES:
Upon Completion of this course the student will be able to
- Demonstrate single node and multinode Hadoop 1.0 with installation and configuration.
- Compute simple programs in Hadoop using Map reduce Paradigm.
- Analyze Hadoop Ecosystem using simple components like Pig, Hive and Sqoop.
- Exploring Apache Spark and analyzing the components in it.
Programme Elective – I
Semester – IV

ITCX201 ANDROID APPLICATION DEVELOPMENT L T P C
1 0 2 2

OBJECTIVES:
Â To know the importance of mobile applications.
Â To learn the fundamentals of Android application development.
Â To develop simple mobile applications using Android.

THEORETICAL STUDY

ANDROID APPLICATION DEVELOPMENT 15

LABORATORY PRACTICE 30
• Developing Simple Android Applications (4 exercises)
• Mobile application development in Android. (Students can select their own problem to develop an Application)

Sample applications
o Scientific calculator
o Online shopping
o Student attendance and marks maintenance
o Bus route management
o Games

Total Hours : 45

REFERENCES:
OUTCOMES:
On completion of the course students will be able to:

- Describe the limitations and challenges of working in a mobile and wireless environment as well as the commercial and research opportunities presented by these technologies.
- Apply the different types of application models/architectures used to develop mobile software applications.
- Describe the components and structure of a mobile development frameworks (Android SDK and Eclipse Android Development Tools (ADT)) and learn how and when to apply the different components to develop a working system.
- Work within the capabilities and limitations of a range of mobile computing devices.
- Design, implement and deploy mobile applications using an appropriate software development environment.

ITCX202 NEXTGEN TECHNOLOGIES L T P C
3 0 0 3

OBJECTIVES:
- To understand the concepts of Next Generation Technologies like Cloud, Big Data, IoT and Social Media and Mobility, Machine learning, Artificial Intelligence and their impact on the industry.
- To study the concepts of cloud architecture and various services, technologies offered in Cloud, Big Data (Hadoop), Data Sciences, Data analyzing techniques, Structured data, Unstructured data.
- To learn the concepts of social media and how social Media is used for business
- To understand the development of various mobile platforms, mobile apps and their operating systems.
- To discuss IoT, IPV6, and future of IoT and its uses across various industries.
- To acquire knowledge of AI - Machine Learning Algorithms and uses of AI in the various industries.

Prerequisites: Programming in Python, Java Programming, Computer Programming

MODULE I INTRODUCTION TO NEXT GENERATION TECHNOLOGIES 7
Introduction î Next-Generation Sequencing Technology î Computing Technology - Cloud Computing, Data Science Technology - Big Data, Internet of Things (IoT), Social Media and Mobility, Machine Learning-Artificial Intelligence (AI) î Diverse applications.
MODULE II  CLOUD & BIG DATA  8
Cloud architectural overview  Cloud deployment models  Cloud service models  Cloud platforms  Managing data in the cloud  Computing in the cloud  Data Analytics in the cloud  Amazon Elastic Compute Cloud  Privacy and Security in Cloud  Data Visualization  Big data value for the enterprise  Structured and Unstructured data  Hadoop components  HDFS  Map reduce.

MODULE III  SOCIAL MEDIA  7

MODULE IV  MOBILE APP DEVELOPMENT  7
Introduction  Mobile Platforms  Android Development Environment  XCode, Eclipse, VS2012, PhoneGAP  Multichannel and Multimodel UIs  App store, Google Play, Windows Store  Mobile device application programming interfaces  Android/iOS/Win 8 Survivial and basic apps  Impact on business cases.

MODULE V  INTERNET OF THINGS (IOT)  8

MODULE VI  ARTIFICIAL INTELLIGENCE & MACHINE LEARNING  8

Text Books:

REFERENCE BOOKS:

OUTCOMES:
- Describe the concepts of Next Generation Technologies.
- Understand cloud services, Big Data, Data science, Hadoop, and their impact on industry.
- Analyze social media and impact of social media on the business.
- Understand any of the mobile platforms, and mobile programming language.
- Develop skills on IoT technologies and their contact on industry.
- Implement AI & machine learning algorithms for an application and analyze the results.
ITCX203 MULTIMEDIA TOOLS AND TECHNIQUES L T P C
0 0 2 1

OBJECTIVES:
To enable the students to
- understand and gain knowledge about the various multimedia tools.
- learn to do Image Editing using Adobe Photoshop.
- design animation using Adobe Flash, Write Action script.
- edit text, image, audio and video

LIST OF EXERCISES

1. Create an image and demonstrate basic image editing using photoshop
2. Demonstrate rasterization and filtering of layers, blending effects, text effects using photoshop
3. Design logo using adobe illustrator
4. Create animated text effects and transition using flash.
5. Create an advertisement using guide layer, masking, morphing, and onion skin in flash
6. Generate frame by frame animation using multimedia flash
7. Create 2D/3D Animation using Flash/ Director
8. Create 3D Animation using 3dsmax/Maya
9. Editing Audio and Video

Total Hours : 30

OUTCOMES:
After successful completion of this course, the students should be able to
- design and implement an animation for various themes.
- create multimedia advertisement.
- edit audio and video using multimedia tools.
OBJECTIVES:
To enable the students to
- study about assemblers and macroprocessor.
- analyze about linkers and loaders.
- demonstrate the concept about emulators.
- learn about the tools used for system software.

Prerequisite:
To understand about assembly language programming.

MODULE I  INTRODUCTION

MODULE II  ASSEMBLERS
Definition - Machine dependent features - Types of addressing modes and types of instruction formats - Program relocation - Assembler machine independent features - Literal pool - Statements defining symbols - Expressions - Types of assemblers - example of a assembler.

MODULE III  LOADERS AND LINKERS

MODULE IV  MACRO PROCESSORS AND EMULATORS

MODULE V  COMPILER AND INTERPRETERS
Basic concepts of Compiler - Phases of Compiler - Interpreters - Benefits of Interpreters - Overview of Interpretation - A Toy Interpreter - Pure and Impure Interpreters.
MODULE VI  TEXT EDITOR


**Total : 45 Hours**

**TEXT BOOK:**


**REFERENCES:**


**OUTCOMES:**

On successful completion of the course, the students will be able to

- Outline the architecture of hypothetical computers.
- Summarize the functions of assembler.
- Discuss about the various loaders and linkers.
- Compare the different types of macroprocessors.
- Outline about compilers and interpreters.
- Design a text editor and analyze its features.
OBJECTIVES:
- To understand the basics of electronic communication.
- To gain experience about the modulation and demodulation techniques.
- To teach the importance of digital communication.
- To understand the various satellite communication systems.

MODULE I  FUNDAMENTALS OF ELECTRONIC COMMUNICATION  8

MODULE II  AMPLITUDE MODULATOR AND DEMODULATOR CIRCUITS  8
Amplitude modulation concept - Modulation index and percent modulation - sidebands and the Frequency domain - Frequency domain representation of AM - AM power - Single sideband modulation - Signal power consideration - AM modulators - low level AM modulator - high level AM modulator - Amplitude demodulators.

MODULE III  FREQUENCY MODULATION TECHNIQUE  8

MODULE IV  DIGITAL MODULATION TECHNIQUES  7

MODULE V  SPREAD SPECTRUM TECHNIQUES  7
Introduction, Pseudo noise, properties, model-spread spectrum performance of DSSS, FHSS - frequency hopping - access techniques - Comparison, Coding of speech for wireless.
MODULE VI  SATELLITE COMMUNICATION


Total Hours : 45

TEXT BOOKS:

REFERENCES:

OUTCOMES:
- On completion of the course students will be able to:
  - Outline the basics of electronic communication.
  - Analyze the basic concepts of Frequency Modulation and Phase Modulation.
  - Discuss the various Digital modulation techniques.
  - Apply suitable modulation schemes and coding for various applications.
  - Analyze the various spread spectrum transmission techniques.
  - Identify and describe different satellite communication techniques.
OBJECTIVES:
To enable the students to

- enrich the knowledge in various phases of compiler.
- design and construct a lexical analyzer.
- expand the knowledge of parser by parsing.
- construct the syntax-directed tree
- concise and design optimization of codes.
- design a compiler for a simple programming language.

Prerequisite: Programming concepts and Data structures

MODULE I INTRODUCTION

MODULE II LEXICAL ANALYSIS
The role of lexical analyzer - Input Buffering - Specification of Tokens - Recognition of Tokens - Lexical Analyzers generator Lex, Finite Automata - From a Regular Expression to automata - Design of a Lexical Analyzer Generator

MODULE III SYNTAX ANALYSIS

MODULE IV SYNTAX - DIRECTED TRANSLATION
Syntax-Directed Definitions - Construction of Syntax Trees - Syntax-Directed Translation schemes - Implementing L-Attributed SDDs.

MODULE V INTERMEDIATE CODE GENERATION
Variants of syntax trees - Three-address code - Types and declarations - Translation of Expressions - Type checking - Type Conversions - Control Flow.

MODULE VI CODE OPTIMIZATION AND CODE GENERATION
Issues in design of a code generator - The target language - Addresses in the target code - Flow graphs - Optimization of basic blocks - a simple code generator
algorithm - Peephole Optimization - Register Allocation and Assignment - Optimal code generation.

Total : 45 Hours

TEXT BOOK:

REFERENCES:

OUTCOMES:
On successful completion of the course, the students will be able to
• obtains the knowledge of modern compiler & its features.
• analyze the given program using lexical analyzer
• discuss various parsing techniques.
• evaluate the syntax directed translation.
• design and conduct experiments for intermediate code generation.
• demonstrate the compilation of a program in a regular high level language.
OBJECTIVES:

To enable the students to

- gain knowledge on the user interface design process.
- learn business functions and to understand the user interface design principles.
- Be familiar on menus and windows.
- Understand how to use messages and controls.
- acquire the knowledge about icons and images.
- learn about android.

Prerequisite: Computer Fundamentals

MODULE I DESIGN PROCESS 8


MODULE II BUSINESS FUNCTIONS AND PRINCIPLES 7

Know Your User or Client - Understand the Business Function - Understand the Principles of Good Interface and Screen Design

MODULE III MENUS AND WINDOWS 8

Develop System Menus and Navigation Schemes - Select the Proper Kinds of Windows -

MODULE IV CONTROLS AND MESSAGES 7

Screen-Based Controls - Text and Messages - Effective Feedback and Guidance and Assistance - Internationalization and Accessibility -

MODULE V VISUAL OBJECTS & TESTING 7

Meaningful Graphics, Icons, and Images - Proper Colors - Test, Test, and Retest

MODULE VI ANDROID USER INTERFACE DESIGN 8

Android UI and Material Design - Understanding Views - The UI Building Blocks - Creating Full Layouts With View Groups and Fragments - Adding App Graphics and Resources - Prototyping and Developing the App

Total: 45 Hours
TEXT BOOK:

REFERENCES:
2. Laura Klein, "UX for Lean Startups" Shroff, 2013

OUTCOMES:
On successful completion of the course, the students will be able to
- explain the design process.
- apply the design principles to develop a good user interface design.
- design a software with suitable types of menus and windows.
- develop appropriate message windows and text messages.
- choose meaningful icons and colors.
- Develop android applications.
OBJECTIVES:
To enable the students to
- To understand the evolution and significance of semantic web.
- To identify and explore tools and methods to construct and implement ontologies.
- To build and implement a micro level ontology that is semantically descriptive of chosen problem domain.
- To develop and implement applications and tools based on ontology.

Prerequisite: Web Technology, Internet Technology Fundamentals.

MODULE I INTRODUCTION TO SEMANTIC WEB

MODULE II ONTOLOGY & WEB RESOURCES

MODULE III SEMANTIC WEB TOOLS AND APPLICATIONS

Total: 30 Hours

TEXT BOOK:
REFERENCES:
   (Cooperative Information Systems) (Hardcover), MIT Press, 2008

OUTCOMES:
On successful completion of the course, the students will be able to
- Explore fundamentals of semantic web, models and tools.
- Understand semantic tools and techniques for representing ontology as XML and RDF files.
- Have hands on experience on various popular Semantic NLP tools and libraries.
PROGRAMME ELECTIVE – II (6 Credits)

ITCX101  iOS APPLICATION DEVELOPMENT  L  T  P  C
        1 0 2 2

OBJECTIVES:
- To know the fundamentals of iOS programming using Swift.
- To create swift programs in Xcode IDE.
- To develop simple iOS mobile applications.

THEORETICAL STUDY

iOS APPLICATION DEVELOPMENT  15

LABORATORY PRACTICE  30
- Developing Simple Swift programs (4 exercises)
- Mobile application development in iOS. (Students can select their own problem to develop an Application)
  Sample applications
  - Scientific calculator
  - Home Automation
  - Ecommerce App
  - Currency converter
  - Reminder
  - Games

Total Hours : 45

REFERENCES:

OUTCOMES:
On completion of the course students will be able to:

- Describe the limitations and challenges of working in a mobile and wireless environment as well as the commercial and research opportunities presented by these technologies.
- Apply the different types of application models/architectures used to develop mobile software applications.
- Describe the components and structure of an integrated development environment (XCode) and learn how and when to apply the different components to develop a working system.
- Work within the capabilities and limitations of a range of mobile computing devices.
- Design, implement and deploy mobile applications using an appropriate software development environment.
ITCX102  ORACLE DATABASE PROGRAMMING  L T P C
0 0 2 1

OBJECTIVES:

- To design and implement effective SQL queries within database applications and manipulate database data effectively.
- To demonstrate a database solution for a business or organization using Oracle Application Express (APEX).
- To implement database-driven web site with database programming with PL/SQL.
- To develop, execute and manage PL/SQL database program like procedures, functions, and database triggers.

LIST OF EXERCISES:
1. Design of database with SQL using DDL, DML, and TCL commands.
2. Implementation of Single Row Functions, JOINs, Group Functions.
4. SQL Functions, Triggers and Procedures.
5. Database and Websheet application creation in Oracle Application Express (APEX) using Application Builder.
6. Working on SQL Commands in Oracle Application Express - SQL Command Processor.
7. Transferring Schema and Data in APEX.
8. Database Programming with PL/SQL
   - Retrieving & Manipulating Data in PL/SQL
   - Using Explicit & Multiple Cursors
   - Program Structures to Control Execution Flow
   - Creating procedures and Passing parameters
   - Using dynamic SQL
   - Database Event Triggers
9. Design and Implement a basic database using the Oracle Database Management and Java Programming.

Total Hours : 30

OUTCOMES:

- Understand the use and application of the relational database model.
- Enhance skills in Oracle database programming.
- Implement database applications using Java programming.
- Design database and web sheet application creation using Application Builder.
- Expertise in relational database data management.
OBJECTIVES:
The student should be made to:
· Learn the techniques in natural language processing.
· Be familiar with the natural language generation.
· Be exposed to machine translation.
· Understand the information retrieval techniques.

MODULE I  OVERVIEW AND LANGUAGE MODELING  7

MODULE II  WORD LEVEL AND SYNTACTIC ANALYSIS  7

MODULE III  SYNTACTIC ANALYSIS AND SEMANTIC ANALYSIS  8

MODULE IV  DISCOURSE PROCESSING AND NATURAL LANGUAGE GENERATION  8

MODULE V  MACHINE TRANSLATION AND INFORMATION RETRIEVAL  8

MODULE VI  LEXICAL RESOURCES AND APPLICATIONS  7

Total Hours : 45

REFERENCES:
1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information..."


OUTCOMES:
Upon completion of the course, the student should be able to:
- Discuss the major trends and systems in Natural Language Processing.
- Explain context free grammars and the use of parsers.
- Outline the syntax of grammars and analyze the feature-based semantic systems.
- Apply statistical techniques to natural language analysis.
- Do machine translation.
- Apply information retrieval techniques.
OBJECTIVES:

- To introduce the student to the notion of a game, its solutions concepts, and other basic notions and tools of game theory.
- Appraise theoretical predictions obtained from Game Theory analyses against real world conflicts.
- To formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in modeling applications.
- Integrate increasing analytical skills into increasingly complex conflicts.
- To draw the connections between game theory, computer science, and economics, especially emphasizing the computational issues.
- To introduce contemporary topics in the intersection of game theory, computer science, and economics.

MODULE I  GRAPHICS SYSTEM FOR GAME THEORY  7

MODULE II  GAME DESIGN & GAME PROGRAMMING  8
Game Design - Game Writing - Narrative Theory - Story and Character Development - Game play - Creating the Game World - Level Design Human - Computer Interface design - Game Programming Fundamentals - C++ - Java - Scripting Languages.

MODULE III  GAMES WITH PERFECT & IMPERFECT INFORMATION  8
Games with Perfect Information - Strategic games - prisoner's dilemma, matching pennies - Nash equilibrium - mixed strategy equilibrium - zero sum games - Games with Imperfect Information - Bayesian Games - Extensive Games with Imperfect Information - Strategies - Beliefs and sequential equilibrium - Illustrations - Repeated Games - The Prisoner's Dilemma - Bargaining.

MODULE IV  NON-COOPERATIVE GAME THEORY  7

MODULE V  MECHANISM DESIGN  8
MODULE VI  GAME PRODUCTION AND BUSINESS OF GAMES  7

Game production - Project management - Game industry roles ï Economics ï Publisher - Developer relationship ï Marketing - Intellectual Property rights - Content regulation.

Total Hours : 45

TEXT BOOKS:


REFERENCES:


OUTCOMES:

- Discuss the notion of a strategic game and equilibrium, and identify the characteristics of main applications of these concepts.
- Communicate game - theoretic ideas and concepts to non - specialist audiences in a language which is accessible and comprehensible.
- Discuss the game with perfect and imperfect information with the use of Nash Equilibrium for other problems.
- Model competitive real world phenomena using concepts from non-cooperative game theory.
- Identify key strategic aspects and based on these be able to connect them to appropriate game theoretic concepts given a real world situation.
- Implement a typical Virtual Business scenario using Game theory applications.
OBJECTIVES:

- Understand the basic concepts of soft computing
- To become familiar with AI and neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- Provide the mathematical background for carrying out the optimization associated with neural network learning.
- Familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.
- Introducing the ideas of hybrid soft computing techniques and applications and use of heuristics based on human experience.
- Develop the case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing.

MODULE I  INTRODUCTION  8
Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Artificial Intelligence: Introduction to searching: breadth first search, depth first search techniques, other Search Techniques like hill Climbing, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning.

MODULE II  INTRODUCTION TO NEURAL NETWORK  8
Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb’s learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN.

MODULE III  MLP  7
Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA. Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Hopfield/ Recurrent network,
associative memory, and characteristics, limitations and applications.

MODULE IV  FUZZY LOGIC  8

MODULE V  MODULE V MACHINE LEARNING  7

MODULE VI  GENETIC ALGORITHM  7
Fundamentals, basic concepts, working principle, encoding, fitness function, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, constraints ,Generational Cycle, Real Applications & advances in GA.

Total Hours : 45

TEXT BOOKS:

REFERENCES:

OUTCOMES:
At the end of the course the student should be able to;

- Learn about soft computing techniques and their applications
- Analyze various neural network architectures
- Understand perceptrons and counter propagation networks.
- Define the fuzzy systems
- Analyze the genetic algorithms and their applications
- Familiar with the techniques of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.
OBJECTIVES:

To enable the students

- To study the components, models of machine learning.
- To discuss the various concepts related to supervised and unsupervised learning.
- To recognize the different types of machine learning models and how to use them.
- To learn the theoretical and practical aspects of tree and graph models.
- To acquire the knowledge of reinforcement learning.
- To discuss various applications in machine learning.

MODULE I INTRODUCTION TO MACHINE LEARNING


MODULE II SUPERVISED LEARNING

Linear classification - Linear Models for Regression - Univariate linear regression - Multivariate linear regression - Bayesian Linear Regression - Linear algebra review - Linear Models for Classification - Discriminant Functions - Probabilistic Generative Models - Probabilistic Discriminative Models. Learning Artificial Neural Networks - Feed-forward Network Functions - Back Propagation Network - Bayesian Neural Network - support vector machines - Ensemble methods.

MODULE III UNSUPERVISED LEARNING


MODULE IV TREE AND GRAPHICAL MODELS

MODULE V  REINFORCEMENT LEARNING  7
Passive reinforcement learning - direct utility estimation - adaptive dynamic programming - temporal-difference learning - active reinforcement learning - exploration - learning an action-utility function - Generalization in reinforcement learning - policy search - applications in game playing - applications in robot control.

MODULE VI  APPLICATIONS  7

Total Hours : 45

OUTCOMES:
On successful completion of the course, the students will be able to
- Describe the concepts, components and models of machine learning.
- Understand and design algorithms for supervised and unsupervised learning.
- Develop skills by using unsupervised learning techniques.
- Analyze the efficient tree and graphical models for solving real world problems.
- Implement reinforcement learning algorithms for an application and analyze the results.
- Apply the appropriate techniques in social network analysis and web security.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
- Understand the foundations of CLR execution.
- Know the object oriented aspects of C#.
- Learn the technologies of the .NET framework.
- Be aware of application development in .NET.
- Learn web based applications on .NET (ASP.NET).

MODULE I  INTRODUCTION TO C#  8

MODULE II  OBJECT ORIENTED ASPECTS OF C#  8
Inheritance - Namespace - Polymorphism - Interface and Overloading - Multiple Inheritance - Property - Indexes - Delegates - Publish/Subscribe Design Patterns - Operator Overloading - Method Overloading

MODULE III  C# CONCEPTS FOR FILES AND THREADS  8

MODULE IV  XML and .NET  7
Working with XML - Techniques for Reading and Writing XML Data - Using XPath and Search XML - ADO.NET Architecture - ADO.NET Connected and Disconnected Models - XML and ADO.NET - Simple and Complex Data Binding - Data Grid View Class.

MODULE V  APPLICATION DEVELOPMENT ON .NET  7

MODULE VI  WEB SERVICES  7
Web Services - Building an XML Web Service - Web Service Client - WSDL and SOAP - Web Service with Complex Data Types - Web Service Performance.

Theory Hours : 45

LIST OF EXERCISES
10. Programs using I/O Operations
11. Programs using Operators, Expressions and Statements
12. Program using Inheritance and overloading
13. Create application using Windows Forms
14. Create application using Web Forms
15. Program to access data source through ADO.NET.

Lab Hours: 30
Total Hours: 75

REFERENCES:

OUTCOMES:
After completing this course, the student will be able to:
- List the major elements of the .NET framework and discuss CLR.
- Explain how C# fits into the .NET platform.
- Analyze the basic structure of a C# application
- Debug, compile, and run a simple application.
- Develop programs using C# on .NET
- Design and develop Web based applications on .NET
OBJECTIVES:

To enable the students

1. To introduce the fundamentals of artificial intelligence.
2. To introduce various searching techniques.
3. To introduce the ideas of fuzzy sets, fuzzy logic and reasoning and use of heuristics based on human experience.
4. To provide the mathematical background for carrying out the optimization associated with learning.
5. Introduce the concept of expert systems and machine learning.
6. To understand the basic of machine learning concepts.

Prerequisite: Introduction to Algorithms

MODULE I INTRODUCTION

MODULE II SEARCH STRATEGIES

MODULE III KNOWLEDGE AND REASONING

MODULE IV PLANNING AND LEARNING
MODULE V  KNOWLEDGE ENGINEERING  8
Design and architecture of expert systems - Expert system life cycle - Knowledge acquisition difficulties - strategies - major applications areas - Qualitative study of expert systems, DENDRAL, MYCIN.

MODULE VI  MACHINE LEARNING  7
Frame work for learning - Inductive learning - Supervised, Unsupervised learning - Parallel distributed processing - Genetic Algorithms.

Total : 45 Hours

TEXT BOOK:

REFERENCES:
6. 

OUTCOMES:
On successful completion of the course, the students will be able to
• Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
• Use various searching techniques for solving various AI problems.
• Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
• Identify the production systems and the search strategies. Acquire knowledge on the representation and reasoning techniques.
• Demonstrate awareness and a fundamental understanding of various
applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

- Have an exposure on machine learning problems and applications.
OBJECTIVES:

· To provide an overview of the basic concepts of Grid Computing.
· To highlight the advantages of deploying Grid Computing.
· To study about grid security and grid resource management.
· To study about semantic grid concepts.
· To illustrate the practical adoption of a Grid deployment through real life case studies.

MODULE I  CONCEPTS AND ARCHITECTURE 8

MODULE II  STANDARDIZATION OF GRID TECHNOLOGY 8
Service Oriented Grid Architecture- Web Services-Open Grid Services Infrastructure-OGSA Services and Schema-OGSA implementations.

MODULE III  GRID SECURITY 6

MODULE IV  RESOURCE MANAGEMENT 8
Grid Scheduling and Resource Management, Gridway and Gridbus Broker-principles of Local Schedulers- Overview of Condor, SGE, PBS,LSF-Grid Scheduling with QoS.

MODULE V  KNOWLEDGE ORIENTED GRIDS 7
Knowledge for Grid applications-Meta data, Knowledge and Semantics-Architectures for Knowledge Oriented Grids-Representing Knowledge-Case study.

MODULE VI  GRID MIDDLEWARE 8
List of globally available Middlewares-Case Studies-Recent version of Globus Toolkit and gLite- Architecture, Components and Features. Features of Next generation grid.

Total Hours : 45

TEXT BOOKS:

REFERENCES:

OUTCOMES:

On completion of the course, students will be able to:

- Outline the basic concepts of Grid Computing.
- Discuss the components of OGSA framework.
- Design suitable methods for grid security.
- Compare the local and global grid scheduling mechanisms.
- Prepare a case study on knowledge oriented grid.
- Develop an application using any grid middleware.
OBJECTIVES:

- To learn the concept of information and entropy of information.
- To understand the basic Modulation and its types.
- To familiarize with text compression techniques.
- To know about video compression, H.261 and MPEG standard.

MODULE I INFORMATION ENTROPY FUNDAMENTALS

Uncertainty, Information and Entropy \(\hat{\text{v}}\) Source coding Theorem \(\hat{\text{v}}\) Huffman coding \(\hat{\text{v}}\) Shannon-fano coding \(\hat{\text{v}}\) Discrete Memory less channels \(\hat{\text{v}}\) channel capacity \(\hat{\text{v}}\) channel coding theorem \(\hat{\text{v}}\) Channel capacity theorem.

MODULE II DATA AND VOICE CODING


MODULE III BLOCK CODES

Definitions and Principles: Hamming weight - Hamming distance - Minimum distance decoding - Single parity codes - Hamming codes - Repetition codes - Linear block codes - Cyclic codes - Syndrome calculation - Encoder and decoder \(\hat{\text{v}}\) CRC.

MODULE IV ERROR CONTROL CODING

Generator polynomial \(\hat{\text{v}}\) Parity check polynomial \(\hat{\text{v}}\) Convolutional codes \(\hat{\text{v}}\) code tree trellis, state diagram - Encoding \(\hat{\text{v}}\) Decoding: Sequential search and Viterbi algorithm \(\hat{\text{v}}\) Principle of Turbo coding.

MODULE V COMPRESSION TECHNIQUES

Principles of text compression \(\hat{\text{v}}\) static Huffman coding \(\hat{\text{v}}\) dynamic huffman coding \(\hat{\text{v}}\) arithmetic coding \(\hat{\text{v}}\) image compression \(\hat{\text{v}}\) graphics interchange format \(\hat{\text{v}}\) tagged image file format \(\hat{\text{v}}\) digitized documents \(\hat{\text{v}}\) introduction to JPEG standards.

MODULE VI AUDIO AND VIDEO CODING

Linear predictive coding \(\hat{\text{v}}\) code excited LPC \(\hat{\text{v}}\) perceptual coding - MPEG audio coders \(\hat{\text{v}}\) Dolby audio coders \(\hat{\text{v}}\) video compression \(\hat{\text{v}}\) H.261 and MPEG video standards.
Total Hours : 45

TEXT BOOKS:

REFERENCES:

OUTCOMES:
On completion of the course students will be able to:
• Explain the different information coding theorems.
• Discuss the various modulation methods to encode data and voice.
• Apply the block codes and cyclic codes to detect errors.
• Discuss how error control coding techniques are applied in communication systems.
• Demonstrate the various text and image compression techniques.
• Demonstrate the various audio and video compression techniques.
ITCX111 MOBILE ADHOC NETWORKS L T P C
3 0 0 3

OBJECTIVES:
- To know the difference between wired and adhoc networks.
- To gain the knowledge about the applications of adhoc networks.
- To learn about the proactive and reactive protocols.
- To understand the concepts of reactive protocols in less mobile environment.
- To explain the concepts of reactive protocols in high mobile environment.
- To realize the importance of hybrid and hierarchical protocols

MODULE I INTRODUCTION

MODULE II CHANNEL ALLOCATION
Channel allocation methods- 802-11 WLAN- MACA- MACAW- MACABI- CSMA- TSMA.

MODULE III DESTINATION SEQUENCED DISTANCE VECTOR PROTOCOL
Introduction- Overview of Routing Methods- Link-State- Distance-Vector-Destination-Sequenced Distance Vector Protocol- Protocol Overview- Route Advertisements- Route Table Entry Structure- Responding to Topology Changes- Route Selection Criteria- Operating DSDV at Layer 2- Extending Base Station Coverage- Performance evaluation using simulators.

MODULE IV DYNAMIC SOURCE ROUTING PROTOCOL FOR MULTI HOP WIRELESS NETWORK
Ad Hoc Networks Assumptions- DSR Protocol Description- Overview and Important Properties- DSR Route Discovery- DSR Route Maintenance- Additional Route Discovery Features- Additional Route Maintenance Features- Support for Heterogeneous Networks and Mobile IP- Multicast Routing with DSR-
Location of DSR Functions in the ISO Network Reference Model-Performance evaluation using simulators.

**MODULE V AD HOC ON-DEMAND DISTANCE-VECTOR PROTOCOL**

AODV Properties- Unicast Route Establishment- Route Discovery- Expanding Ring Search- Forward Path Setup- Route Maintenance- Local Connectivity Management- Multicast Route Establishment- Route Discovery- Forward Path Setup- Multicast Route Activation/Deactivation- Multicast Tree Maintenance- Performance evaluation using simulators.

**MODULE VI HYBRID AND HIERARCHICAL ROUTING PROTOCOLS**


Total Hours : 45

**TEXT BOOKS:**

**REFERENCES:**

**OUTCOMES:**
- Acquaint the basic knowledge of adhoc networks.
- Analyze the various channel allocation algorithms used in MAC layer.
- Explain the DSDV, DSR and AODV protocols.
- Compare the performance of DSDV, DSR and AODV protocols and implement any one protocol using simulator.
- Identify the difference between the protocols & practical issues.
- Evaluate the ZRP and Fisheye Routing Protocol.
PROGRAM ELECTIVES – III (6 Credit)

ITCX212 HYBRID APPLICATION DEVELOPMENT

OBJECTIVES:
- To know the importance of hybrid applications.
- To learn the fundamentals of hybrid application development.
- To develop simple hybrid applications using AngularJS.

THEORETICAL STUDY

HYBRID APPLICATION DEVELOPMENT


LABORATORY PRACTICE

- Developing Simple Hybrid Applications using AngularJS (4 exercises)
- Hybrid application development in AngularJS. (Students can select their own problem to develop an Application)

Sample applications
  - Simple Conversion Apps
  - ToDo App
  - Employee Directory
  - Tourism App
  - Games

Total Hours : 45
OUTCOMES:
On completion of the course students will be able to:

- Create mobile apps with HTML, JavaScript, and CSS.
- Describe the components and structure of a hybrid application development frameworks (Ionic, phonegap, etc.) and learn how and when to apply the different components to develop a working system.
- Design complex interfaces with Ionic’s UI controls.
- Build once and deploy for both iOS and Android.
- Design, implement and deploy hybrid applications using an appropriate software development environment.

REFERENCES:
ITCX213 DATA WAREHOUSING, DATA MINING AND DATA MINING TOOLS

OBJECTIVES:

Â To introduce the concept of data mining with a detail coverage of basic tasks, metrics, issues and implication.
Â To explain core topics like classification, clustering and association rules are exhaustively dealt with.
Â To provide knowledge on data mining tools.

MODULE I INTRODUCTION TO DATA WAREHOUSING
Need for Data warehousing - Operational database systems vs Data warehouses - Data warehouse architecture - Data warehousing components - A Multidimensional data model - Need for OLAP - OLAP Operations 
Types of OLAP servers.

MODULE II DATA PREPARATION AND CONCEPT DESCRIPTION
Data Collection and Pre-processing - Outliers - Mining Outliers - Missing Data - Types of Data - Computing Distance - Data Summarising Using Basic Statistical Measurements - Displaying Data Graphically - Multidimensional Data Visualisation - Data Integration and Transformation - Concept hierarchy.

MODULE III ASSOCIATION RULE MINING
Introduction - Basics - The Task and a Naïve Algorithm - The Apriori Algorithm - Improving the Efficiency of the Apriori Algorithm - Apriori-TID - Direct Hashing and Pruning - Dynamic Itemset Counting - Mining Frequent Patterns without Candidate Generation - Performance Evaluation of Algorithms.

MODULE IV CLASSIFICATION
Decision Tree - Building a Decision Tree - The Tree Induction Algorithm - Split Algorithm Based on Information Theory - Split Algorithm Based on the Gini Index - Overfitting and Pruning - Decision Tree Rules - Decision Tree Summary - Naïve Bayes Method - Estimating Predictive Accuracy of Classification Methods - Improving Accuracy of Classification Methods - Other Evaluation Criteria for Classification Methods - Classification Software.

MODULE V CLUSTER ANALYSIS
Desired Features of Cluster Analysis - Types of Cluster Analysis Methods.
Partitional Methods - Hierarchical Methods - Density-Based Methods - Dealing with Large Databases - Quality and Validity of Cluster Analysis Methods - Cluster Analysis Software -

**MODULE VI**
ADVANCED CLUSTER ANALYSIS ANS DATA MINING TOOLS 10

Probabilistic Model-Based Clustering ; Clustering High-Dimensional Data ; Clustering Graph and Network Data ; Clustering with Constraints ; Trends and social impacts of data mining ; Introduction to WEKA tool ; Introduction to R.

**Theory:** 45

**Practical Session:**
1. Prepare data warehouse for mobile user.
2. Perform OLAP operations
3. Calculate overall statistics such as distribution of mobile users over gender-age groups, distribution of used smartphone brands, distribution of app-category-usage
4. Preprocess data and extract meaningful features
5. Prepare a recommendation system for online shopping
6. Clustering of music files and automatic playlist generation

**Note:** Use R Tool or Weka Tool.

**Lab:** 30

Total Hours : 45 + 30 = 75

**TEXT BOOKS:**
1. Jiawei Han, Micheline Kamber, Jian Pei, *Data Mining Concepts and Techniques* Third Edition, Elsvier Inc., 2012.

**REFERENCES:**
OUTCOMES:

On successful completion of the course, the students will be able to

- Explain the concept of data warehousing
- Preprocess the data
- Discuss the association rule mining
- Cluster and classify the given data
- Demonstrate the data mining tools
OBJECTIVES:
- To understand the basics of Cryptography.
- To know the impact of various cybercrimes and cyber offenses.
- To understand cybercrimes in mobile devices.
- To know the tools and techniques used to secure from cybercrimes.
- To understand the basics of Cyber Security Standards and Policies.
- To learn about the basics of cyber forensics.

MODULE I FUNDAMENTALS OF CRYPTOGRAPHY

MODULE II CYBERCRIME AND CYBER OFFENSES
Cybercrime and Information Security ï Cybercriminals ï Classifications of Cybercrimes ï Email Spoofing ï Spamming ï Cyber defamation ï Internet Time Theft ï Forgery ï Web jacking ï Hacking ï Online Frauds ï Software Piracy ï Mail Bombs ï Password Sniffing ï Cyberoffenses ï Categories ï Planning the attacks ï Cyberstalking ï Cybercafe and Cybercrimes ï Botnets.

MODULE III CYBERCRIME: MOBILE AND WIRELESS DEVICES
Proliferation of Mobile and Wireless Devices ï Trends in Mobility ï Credit card frauds in Mobile and Wireless Computing ï Security Challenges ï Authentication Service Security ï Attacks on Mobile Phones.

MODULE IV TOOLS AND METHODS USED IN CYBERCRIME
Proxy Servers and Anonymizers ï Phishing ï Password Cracking ï Keyloggers and Spywares ï Virus and Worms ï Trojan Horses and Backdoors ï Steganography ï DoS and DDoS Attacks.

MODULE V SECURITY POLICIES
MODULE VI
COMPUTER FORENSICS


**TEXT BOOK:**

**REFERENCES:**

**OUTCOMES:**
- Explain the general security issues.
- Discuss various cybercrimes and offenses.
- Cybercrime in mobile and wireless environment.
- Use relevant tools and methods in cybercrime
- Apply security policies in cyber forensics.
- Outline the strategies adopted in computer forensics.
OBJECTIVES:
- To learn the basic concepts of software requirements.
- To learn the software requirements management concepts.
- To learn the basic concepts of software project management and software estimation methods.
- To know the software product estimation techniques.
- To learn how to manage risks and allocate resources for software projects.

MODULE I  INTRODUCTION TO SOFTWARE REQUIREMENTS  7
The essential software requirement - Good practices for requirements engineering - The business analyst role - Requirements elicitation - Documenting the requirements

MODULE II  SOFTWARE REQUIREMENTS MANAGEMENT  8
Requirements management practices: Requirements management process - The requirements baseline - Requirements version control - Requirement attributes - Tracking requirements status - Resolving requirements issues - Measuring requirements effort - Managing requirements on agile projects - Why manage requirements? - Change happens - Tools for requirements engineering

MODULE III  PROJECT MANAGEMENT CONCEPT  9  RISK MANAGEMENT  8
Introduction to software project Management - Project evaluation and programme Management - An overview of project planning

MODULE IV  SOFTWARE ESTIMATION & COSTING  8
Selection of an appropriate project Approach - Software effort estimation - Activity planning

MODULE V  RISK MANAGEMENT  7
Risk management - Resource allocation - Monitoring and control - Managing contracts

MODULE VI  PEOPLE MANAGEMENT  7
Managing people in software Environments - Working in teams - Software quality

TEXT BOOKS:
2. Bob Hughes and Mike Cotterell, “Software Project management” 5th edition, Mc
REFERENCES:

OUTCOMES:
- Students will explain the concepts of software requirements elicitation.
- They will be able to explain how to change and control the requirements.
- Students will know the software project management and software estimation methods.
- They will have capability to prepare project plan.
- Students will be ready to identify and analyze risks.
- They will express how to manage people.
OBJECTIVES:
- To gain an understanding of business analytics to formulate and solve business problems and to support managerial decision making.
- To become familiar with data analysis techniques to develop, report, and analyze business data.
- To learn to use advanced analytics and model evaluation to solve business problems.

MODULE I  INTRODUCTION
Introduction to Business Analytics, data mining, Big Data and data science, steps in data mining, preliminary steps.

MODULE II  BUSINESS ANALYTICS LIFE CYCLE
Business Analytics Process, CRISP-DM, predictive power and over fitting, using JMP, automated data mining solutions.

MODULE III  DATA EXPLORATION AND DIMENSION REDUCTION
Uses of data visualization, basic charts, multidimensional visualization, curse of dimensionality, practical considerations, correlation analysis, principal component analysis, dimension reduction using regression models, classification and regression trees.

MODULE IV  PERFORMANCE EVALUATION

MODULE V  ADVANCED ANALYTICS
Multiple linear regression, k-nearest neighbors, classification and regression trees, logic regression, neural nets, discriminative analysis.

MODULE VI  MODEL EVALUATION TECHNIQUES

**Total Hours: 45**

**TEXT BOOKS:**

**REFERENCES:**

**OUTCOMES:**
On completion of the programme students will be able to:

- Explain the business analytics and data mining concepts
- Understand the life cycle of business analytics
- Apply data visualization and dimension reduction techniques
- Evaluate the performance of prediction methods
- Apply the knowledge of advanced analytic techniques
- Discuss on various model evaluation techniques
OBJECTIVES:
- To learn the XML based standards for creating XML application.
- To understand the architecture of web services and its underlying infrastructure.
- To gain knowledge about SOAP, WSDL and UDDI.
- To explore HTTP, from the request/response cycle to its verbs, headers, and cookies.
- To choose the service that works best for an application.

MODULE I  XML TECHNOLOGY FAMILY  8
XML benefits Advantages of XML over HTML, Databases XML based standards Structuring with schemas - DTD XML Schemas XML processing DOM SAX presentation technologies XSL XFORMS XHTML Transformation XSLT XPATH XQuery.

MODULE II  MOTIVATIONS FOR WEB SERVICES  7

MODULE III  ARCHITECTING WEB SERVICES  7
Architecting web services Implementation view web services technology stack logical view composition of web services deployment view from application server to peer to peer process view life in the runtime.

MODULE IV  WEB SERVICES BUILDING BLOCKS  7
Transport protocols for web services messaging with web services protocols SOAP describing web services WSDL Anatomy of WSDL manipulating WSDL web service policy Discovering web services UDDI Anatomy of UDDI Web service inspection Ad-Hoc Discovery Securing web services.
MODULE HTTP VERBS AND HEADERS


MODULE BUILDING API

Cookies- Cookies Mechanics – reading and writing cookies – making request with cookies- cookies and APIs – JSON- Handling JSON with PHP – Consuming JSON APIs – XML in PHP – Consuming XML APIs – Sample API application.

Total Hours : 45

TEXT BOOKS:


REFERENCES:

OUTCOMES:

On successful completion of the course, the students will be able to

- Create, validate and parse XML documents.
- Analyze the B2B and B2C real world applications.
- Explain the logical and deployment view of web service technology stack.
- Use SOAP, WSDL and UDDI for creation of a web service.
- Work with JSON and XML technologies.
- Use the best service for a given application and make it robust.
OBJECTIVES:

- To study the basic principles and concepts in digital image processing.
- To provide the application of digital image analysis moving towards image interpretation.
- To know the techniques and tools for digital image processing, and finally also introduce image analysis techniques in the form of image segmentation.
- To study the image fundamentals and mathematical transforms necessary for image processing.

MODULE I  DIGITAL IMAGE FUNDAMENTALS  8
Digital image fundamentals — Examples of fields that use image processing — Components of image processing systems — Elements of Visual Perception — Light and the Electromagnetic Spectrum — Image Sensing and Acquisition — Image Sampling and Quantization — Relationship between Pixels — Mathematical tools used in image processing.

MODULE II  DIGITAL IMAGE TRANSFORMS  8

MODULE III  IMAGE ENHANCEMENT TECHNIQUES  7

MODULE IV  IMAGE RESTORATION  7
Model of Image Degradation/restoration process, Noise models, Inverse filtering, Least mean square filtering, Constrained least mean square filtering, Blind image Restoration, Pseudo inverse, Singular value decomposition.

MODULE V  IMAGE COMPRESSION  8
MODULE  IMAGE SEGMENTATION AND REPRESENTATION  7 VI

Edge detection, Thresholding, Region Based segmentation, Boundary representation: chair
Codes i Polygonal approximation, Boundary segments, boundary descriptors: Simple descriptors i Fourier descriptors, Regional descriptors, Simple descriptors.

REFERENCES:

OUTCOMES:
On successful completion of the course, the students will be able to

- Explain the basic elements and applications of image processing.
- Create Gray level transformations for image enhancement.
- Design and implement two-dimensional spatial filters for image enhancement.
- Select Wiener filtering for de-blurring and noise removal.
- Analyze the techniques for image compression and segmentation.
- Apply digital image analysis techniques and enhance their critical thinking skills in digital color images.
OBJECTIVES:

- To study the basic concepts of expert systems.
- To know the languages and tools for building expert systems.
- To study about representing knowledge & knowledge acquisition.
- To understand the various heuristics for building expert systems.

MODULE I  INTRODUCTION TO EXPERT SYSTEMS  7
Definition, Features of an expert system, Organization, Characteristics, Uses, Basic activities of expert systems, Prospector, Knowledge Representation in expert system, an overview of Artificial Intelligence.

MODULE II  RULE-BASED EXPERT SYSTEM  8
Introduction to Rule-based systems i.e. Canonical systems, production systems for problem solving, the syntax of rules, working memory, controlling behavior of the interpreter, conflict resolution, forward and backward chaining, rules and meta-rules.

MODULE III  LANGUAGES TO BUILD AN EXPERT SYSTEM  8
Symbolic computation-Symbolic representation, Physical symbols systems, Introduction to LISP, LISP data structures, LISP programs, List processing, pattern matching. Logic Programming- Formal languages, propositional calculus, the predicate calculus, the PROLOG language, PROLOG and MBASE, PROLOG’s search rules, Object-oriented analysis and design for expert systems.

MODULE IV  EXPERT SYSTEMS TOOLS  7
Overview of expert systems tools, expert system shells, high-level programming languages, constraints of production rule languages, evaluating object-oriented approaches, logic programming for expert systems, multiple-paradigm programming environments, potential implementation problems, More maxims on expert system development, Building an Expert System-MYCIN, EMYCIN.

MODULE V  KNOWLEDGE ACQUISITION  8
Theoretical analysis of knowledge acquisition, Stages of knowledge acquisition, Ontology analysis, Expert system shells, Knowledge acquisition methods, Knowledge-based knowledge acquisition, Introduction to Machine Learning.
MODULE VI CLASSIFICATIONS OF EXPERT SYSTEM TASKS

Classification of expert system tasks, heuristic matching, classification, The generality of heuristic classification, Classification versus construction, mapping tools to tasks, knowledge acquisition strategies, Managing complexity, classification problem solving.

Total Hours: 45

TEXT BOOKS:

REFERENCES:

OUTCOMES:
On completion of the course, students will be able to:
- Explain the concepts of expert systems.
- Write the rules for designing expert system
- Develop programs using LISP and PROLOG
- Analyze the knowledge acquisition in expert system
- Develop programs using machine learning concepts
- Build a new expert system using various tools
ITCX220 SERVICE ORIENTED ARCHITECTURE  
L T P C
3 0 0 3

OBJECTIVES:
- To gain understanding of the basic principles of service orientation.
- To understand web services and service abstraction.
- To learn service oriented analysis and coordination techniques.
- To use the concepts of SOAP and WSDL for designing applications.
- To learn technologies underlying the design of xml based web services.
- To know about various WS-* specification standards, web service security and service transaction.

MODULE I SOA FUNDAMENTALS  

MODULE II WEB SERVICES & SERVICE ABSTRACTION  
Web services ï Service descriptions ï Messaging with SOAP ï Message exchange Patterns ï Coordination ï Atomic Transactions ï Business activities ï Orchestration ï Choreography - Service layer abstraction ï Application Service Layer ï Business Service Layer ï Orchestration Service Layer.

MODULE III SERVICE-ORIENTED ANALYSIS & DESIGN  
Service oriented analysis ï Business-centric SOA ï Deriving business services- service modeling - Service Oriented Design ï WSDL basics ï SOAP basics ï SOA composition guidelines ï Entity-centric business service design ï Application service design ï Task centric business service design.

MODULE IV XML BASED WEB SERVICES  
SOA platform basics ï SOA support in J2EE ï Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) ï Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET ï Common Language Runtime - ASP.NET web forms ï ASP.NET web services ï Web Services Enhancements (WSE).

MODULE V SERVICE COORDINATION AND WEB SERVICES SECURITY  
MODULE VI
SOA TRANSACTION & PROTOCOL COORDINATION

Transaction processing paradigm protocols and coordination transaction specifications SOA in mobile research issues.

Total Hours: 45

REFERENCES:

OUTCOMES:

On completion of the course, students will be able to:

- Compare service oriented architecture with other internet architectures.
- Analysis about web services and service abstraction.
- Discuss about service-oriented analysis and design.
- Design a web service using SOAP and WSDL to support SOA based applications.
- Identify research issues in service coordination, web services security and choreography in service layers.
- Explain the various WS-* specification standards and research issues in SOA.
### OBJECTIVES:
- To know about the applications of pervasive computing.
- To understand the use of pervasive computing on web applications.
- To study about PDA's using pervasive computing.
- To learn the user interface issues and web applications in pervasive computing.

### MODULE I  INTRODUCTION
Pervasive Computing Application- Pervasive Computing devices and Interfaces
Device technology trends, Connecting issues and protocols. Pervasive Computing
Market -m-Business ũ Application examples: Retail, Airline -check- in and booking ũ
Health care ũ Car information system ũ E-mail access via WAP and voice.

### MODULE II  WEB APPLICATION CONCEPTS
Pervasive Computing and web based Applications- XML and its role in Pervasive Computing-
Wireless Application Protocol (WAP) Architecture and Security-
Wireless Mark-Up language (WML)ũ Introduction.

### MODULE III  VOICE TECHNOLOGY
Voice Enabling Pervasive Computing- Voice Standards- Speech Applications in
Pervasive Computing and security ũ java for pervasive devices, Biometrics.

### MODULE IV  PERSONAL DIGITAL ASSISTANTS
User Interface Issues in Pervasive Computing, Architecture - Smart Card-based
Authentication Mechanisms- Wearable computing Architecture. Case study-
Wearable computing / Cyber physical system.

### MODULE V  USER INTERFACE ISSUES
User Interface Issues in Pervasive Computing, Architecture - SmartCard-based
Authentication Mechanisms- Wearable computing Architecture. Case study-
Wearable computing / Cyber physical system.

### MODULE VI  PERVERSIVE WEB APPLICATION ARCHITECTURE
Introduction-scalability and availability- Development of Pervasive computing Web
Applications-Pervasive application architecture. Example applicationũ User interface
over view Architecture Implementation.

**Total Hours : 45**

**TEXT BOOKS:**

**REFERENCES:**

**OUTCOMES:**
On completion of the course students will be able to:
- Outline the basics of pervasive computing device technologies.
- Identify the protocols used in pervasive computing.
- Assess the voice standards and applications in pervasive computing.
- Compile the characteristics of PDA devices.
- Discuss various user interface issues in pervasive computing.
- Develop a Pervasive computing Web Application.
ITCX222 KNOWLEDGE BASED DECISION SUPPORT SYSTEM L T P C

3 0 0 3

OBJECTIVES:

A. To become familiar with the theoretical perspectives of knowledge creation, knowledge transfer, knowledge sharing, and knowledge leadership roles and skills.

B. To understand how the study of communication relates to knowledge development and knowledge sharing in organizations.

C. To read about and discuss the relationship between knowledge management and a learning organization, Development of support system Methods of managing knowledge Intelligent decision system development.

MODULE I INTRODUCTION


MODULE II DECISION SUPPORT SYSTEM DEVELOPMENT


MODULE III KNOWLEDGE MANAGEMENT

Introduction - Organizational learning and memory - Knowledge management - Development - methods, Technologies, and Tools - success - Knowledge management and Artificial intelligence - Electronic document management. Knowledge acquisition and validation: Knowledge engineering - Scope -
Acquisition methods - Interviews - Tracking methods - Observation and other methods - Grid analysis - Machine Learning: Rule induction, case-based reasoning - Neural computing - Intelligent agents - Selection of an appropriate knowledge acquisition methods - Multiple experts - Validation and verification of the knowledge base - Analysis, coding, documenting, and diagramming - Numeric and documented knowledge acquisition - Knowledge acquisition and the Internet/Intranets.

**MODULE IV KNOWLEDGE REPRESENTATION AND INFERENCE**


**MODULE V INTELLIGENT SYSTEM DEVELOPMENT**


**MODULE VI MANAGEMENT SUPPORT SYSTEMS**

TEXT BOOK:

REFERENCES:

OUTCOMES:
- Outline the relationship between business information needs and decision making
- Explain the development of decision support systems.
- Discuss the role of knowledge management.
- Identify the various knowledge representation and inference techniques.
- Analyze the working of an intelligent system development.
- Evaluate the function of management support systems.
OBJECTIVES:

- To have an awareness about security and legal issues in ecommerce to investigate the strategic implications of e-commerce with emphasis on existing companies
- To navigate positioning strategies available within the e-commerce landscape
- To develop the ability to quickly and effectively research Internet companies and strategies
- To learn to distinguish between temporary tremors and seismic shifts in the unstable e-commerce landscape

MODULE I  INTRODUCTION

Introduction  Electronics Commerce Framework  The Anatomy of E-Commerce Applications  The Network Infrastructure for E-Commerce  The Internet as a Network Infrastructure  World of Blogs.

MODULE II  ELECTRONIC COMMERCE AND EDI

Electronic Payment Systems  Interorganizational Commerce and EDI  EDI Implementation  MIME and Value added Networks  ecommerce security and fraud detection.

MODULE III  ADVERTISING AND MARKETING

Advertising and Marketing on the Internet  Computer Based Education and Training  Technological Components of Education on-Demand  Digital Copy rights and Electronic Commerce  Software Agent  Website Design Issues  Factors that Make People Return to Your Site  Strategies for Website Development.

MODULE IV  CORPORATE DIGITAL LIBRARY

MODULE V  DOCUMENT TYPES  8

MODULE VI  MULTIMEDIA AND ECOMMERCE  5

Total Hours : 45

TEXT BOOK:

REFERENCES:

OUTCOMES:
On completion of the programme students will be able to:
- Demonstrate an understanding of the foundations and importance of ECommerce
- Demonstrate an understanding of the impact of eCommerce on business models and strategy
- Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational.
- Describe the infrastructure for ECommerce
- Demonstrate an understanding of eCommerce related programming, database, and networking issues.
- Recognize legal, global, privacy, security and risk management issues in ECommerce
PROFESSIONAL ELECTIVES IV  (9 Credits)

ITCX117   CLOUD MIDDLEWARE TOOLS              L  T  P  C
                1  0  2    2

OBJECTIVES:

- To understand the datacenter resources in cloud middleware environment.
- To implement creation of virtual machines and accessing cloud services.
- To create virtual machines with different operating systems using open source middleware technologies.
- To design and access private, public and hybrid clouds.
- To analyze various cloud middleware tools and their functionalities.

THEORY COMPONENT

MODULE I   INTRODUCTION

Introduction to Physical and Virtual Machine resources; Virtualization; Hypervisor - Data Center - Cloud Services - IaaS, PaaS, SaaS, Operating systems - Virtual Appliances - vApps & AppV

MODULE II   PRIVATE, PUBLIC AND HYBRID CLOUD

Private Cloud Tools - VMware workstation, VirtualBox, VMware vCenter Convertor, vApps, Open Source Cloud Middleware Tools & Technologies - Eucalpytus, OpenNebula, and Openstack Cloud IaaS, Public Cloud - Amazon EC2, Hybrid Cloud, Oracle Fussion

LAB COMPONENT - LIST OF EXERCISES

1. Study of Physical Machine & virtual machines resources
2. Creation of Virtual Machines using VMware workstation, VirtualBox, VMware vCenter Convertor
3. Virtual Appliances - vApps & AppV
5. Cloud service provisioning - IaaS, PaaS, SaaS
6. Openstack Cloud IaaS solution-nova, neutron, cinder, glance, swift
7. Amazon EC2
8. Hybrid cloud
9. Cloud Middleware Integration Consulting - .NET/JAVA SOAP/REST
10. Database Middleware Automation
11. Oracle Fussion Middleware

Total Hours : 45

OUTCOMES:

- Analyze physical and virtual machines management in remote cloud servers.
- Design virtual machines using various hypervisors and cloud middleware products.
- Demonstrate Windows and Ubuntu virtual machines using open source middleware technologies.
- Identify and evaluate private, public and hybrid clouds and IaaS, PaaS, SaaS service provisioning.
- Build cloud platform for digital business.
ITCX118 BIG DATA TOOLS AND TECHNOLOGIES L T P C
0 0 3 1

OBJECTIVES:
- To make the students familiar with Hadoop distributed file system and can learn how to configure Hadoop.
- To install and configure various tools in hadoop ecosystem.
- To provide a complete knowledge about Hadoop echo system with key components like Pig, Hive and Sqoop.
- To Install Apache Spark and explore the components in it.

List of exercises:
1. Introduction to HDFS and Hadoop Ecosystem. Configuration and Installation of Hadoop 1.0 Single node with Name node and Data node.
2. Implementation and configuration of Hive in Hadoop ecosystem for querying.
3. Implementation of Pig using Hadoop Ecosystem for processing structured Data.
4. Implementation of Sqoop for transferring schema format to NOSQL format.
5. Configure Flume and Working flume for logdata.
6. Install HDFS 2.0 and explore YARN for scheduling.
7. Apache Spark Installation and implementation of simple programs in it.
8. Connect MongoDB with Hadoop as store data from MongoDB to HDFS.
9. Connect MYSQL with Hadoop and store data form MYSQL to HDFS
10. Work With RANGER and configure Hadoop for security features.
11. Install IBM BigInsights, hortonworks HDP on virtual machines

Total Hours : 45

OUTCOMES:
Upon Completion of this course the student will be able to
- Demonstrate single node and multinode Hadoop 1.0 and 2.0 with installation and configuration.
- Compute the dataset with different tools in hadoop ecosystem.
- Analyze Hadoop Ecosystem using simple components like Pig, Hive and Sqoop.
- Exploring Apache Spark and analyzing the components in it.
ITCX119  FORENSIC TOOL KITS  L  T  P  C  0  0  3  1

OBJECTIVES:

- To understand Cyber Forensics, Digital evidence and Investigation process.
- To become familiar with Computer forensics toolkits (FTK).
- To analyze the components of the Encase forensic software environment, evidence and configuration files.
- To explore methods of data storage and forensic recovery using Access Data Software.

LIST OF EXERCISES:

1. Study of computer forensic toolkits like CyberCheck Suite (C-DAC), FTK, Helix, The Coroner's Toolkit (TCT), ProDiscover.
2. Working in Windows and Linux Environment: Study of various commands in Linux like Encryption and Decryption, message digest etc.
3. Exploring Encase software.
4. Email Forensics - Tracing E-mail Finding senders IP Address of received e-mail, tracing route of e-mail received using tools available on internet using Visual Trace Route.
5. Locate a deleted mail using Forensic Tool Kit.
7. Image Analysis & Steganography using tools like Merge Streams, Image Hide, Stealth Files, Blindside, Stools.
9. Digital evidence imaging using R-Drive Imag, Drive Image Pro.

Total Hours : 45

OUTCOMES:

- To do the cross validation of computer forensic case data using Encase Access Data and computer forensic tools.
- Analyze the storage media forensics and email forensics.
- The ability to quantitatively assess and measure threats and forensic challenges to information assets.
- Analyze network forensic analysis using capturing and monitoring tools.
- To protect data assets against attacks from the Internet and investigate and mitigate data risk.
OBJECTIVES:

- To explore NoSQL database and learn installation of MongoDB.
- To practice hands-on session on Mongo Shell
- To learn the CURD operations in MongoDB.
- To acquire knowledge in sharding and replication.

List of exercises:

Introduction and Overview
Overview, Design Goals, the Mongo Shell, JSON Intro, Installing Tools, Overview of Blog Project. Maven, Spark and Free marker Intro.
Creating, Reading and Updating Data (CRUD)
Mongo Shell, Query Operators, Update Operators and a Few Commands

Schema Design
Patterns, Case Studies & Tradeoffs

Performance
Using Indexes, Monitoring and Understanding Performance. Performance in Sharded Environments/

Aggregation Framework
Goals, the Use of the Pipeline, Comparison with SQL Facilities.

Application Engineering
Drivers, Impact of Replication and Sharding on Design and Development.
Case Studies

Total Hours : 45

OUTCOMES:

At the end of this MongoDB course you will be able to:
- Develop an expertise in writing Java applications using MongoDB
- Perform installation, configuration and maintenance of MongoDB environment
- Get hands-on experience in creating and managing different types of indexes in MongoDB for query execution
- Develop skillsets in processing huge amounts of data using MongoDB tools
- Proficiently store unstructured data in MongoDB
- Acquire in-depth understanding of managing DB Nodes, replica set & Master-Slave concepts.
OBJECTIVES:

- To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
- To learn to minimize energy consumption.
- To examine technology that can reduce paper and other consumables usage.

MODULE I  GREEN COMPUTING FUNDAMENTALS, ASSETS & MODELING


MODULE II  GREEN IT FRAMEWORK & GREEN COMPLIANCE


Total Hours : 15

TEXT BOOKS:


REFERENCES:

OUTCOMES:

- Discuss Green Computing concepts, assets and business process management.
- Outline Green IT data center framework, Green compliance in IT systems.
OBJECTIVES:
- To become familiar with various aspects of XML.
- Able to develop complex XML applications

LIST OF EXERCISES:

1. XML Document Creation.
2. Creating Inline Cascading Style Sheets, Embedded Cascading Style Sheets and External Cascading Style Sheets.
4. Internal and External DTD Creation.
5. Importing and Exporting XML document in Database.
6. XSL Transformation- Displaying data with XSLT using XPath functions
7. Demonstrate X Query, X Link and XML Namespaces
8. XML Schema Creation- Working with simple types & Working with complex types
10. Fetching data from XML using Java Applications.

Total Hours : 15

OUTCOMES:
On completing this course students will,

- Analyse the different scripting languages and learn to apply the same in different context in web technology
- Implement dynamic applications and apply it for real time problems.
OBJECTIVES:
- Understand big data analytics
- Discuss data analytic methods
- To learn technology and tools for analytics

MODULE I  INTRODUCTION TO BIG DATA ANALYTICS  7
Big Data Overview i State of the Practice in Analytics i Data Analytics Lifecycle Overview i data analytics life cycle-discovery i Data preparation i Model planning i Model building i Communicate results i Operationalize.

MODULE II  DATA ANALYTIC METHOD  8
Introduction to R - Exploratory data analysis i Statistical methods for evaluation i Clustering i k-means i Association rules.

MODULE III  ADVANCED ANALYTICS  7
Regression i Linear regression i Logistic regression i Classification i Data Visualization - Decision trees i Regression - Naives Bayes - Diagnostics of classifiers.

MODULE IV  TIME SERIES AND TEXT ANALYSIS  8
Overview of Time Series Analysis - ARIMA Model - Text Analysis - Text Analysis Steps - A Text Analysis Example - Collecting Raw Text - Representing Text - Term Frequency i Inverse Document Frequency - Categorizing Documents by Topics - Determining Sentiments.

MODULE V  TECHNOLOGY AND TOOLS  8
Analytics of unstructured data - The Hadoop Ecosystem i NoSQL - SQL Essentials - In-Database Text Analysis - Advanced SQL i MADlib.

MODULE VI  RECOMMENDATION SYSTEM  7
Recommendation System and their Types i Content Based Recommendation System i Collaborative Recommendation System.

Total Hours : 45
TEXT BOOKS:

REFERENCES:

OUTCOMES:
On successful completion of the course, the students will be able to
- Discuss the basics of big data analytics
- Explain the methods of analytics
- Describe the advanced analytics methods
- Perform time series and text mining
- Setup environment using technology and tools for analytics
- Carry out the analytic projects
ITCX124  PROGRAMMING IN SCALA  L T P C
         0 0 2 1

OBJECTIVES:
- To explore a multiparadigm programming language equivalent to java.
- To install and set up the environment to execute the scala programs.
- To develop simple scala programs and implement in the scala environment.
- To demonstrate the scala based web frameworks.

PRE-REQUISITES
1. Basic knowledge of Object Oriented Programming systems.
2. Fundamentals of Java Programming and Internet Programming.

LIST OF EXERCISES
1. Overview of Scala and environmental setup.
2. Creation of simple programs with basic syntax, variables and data types.
3. Implementation of class and extension of class and objects.
4. Implementation of classes using access modifiers and operators.
5. Implementation of looping statements and branching statements.
6. Implementation of programs in Arrays and Collections.
7. Implementation of strings, traits, pattern matching.
8. Implementation of pattern matching with extractors.
9. Program with regular expressions and exceptional handling.
10. A case study of different web frameworks with scala.

Software Required
- Java Environment - Java SDK version 1.8.0_31
- Scala - Code Runner Version- 2.11.5.

OUTCOMES:
On completion of the programme students will be able to:
- Install and set the environment to run scala programs.
- Develop and implement scala programs with arrays, classes and objects.
- Implement pattern matching based programs
- Explore scale based web frameworks
ITCX125 R PROGRAMMING

L T P C
1 0 2 2

OBJECTIVES:
- To understand the fundamentals of R programming.
- To analyze the data and draw graph

MODULE I INTRODUCTION TO R PROGRAMMING

Introduction ï R Programming Structures - Doing Math and Simulations in R

MODULE II DATA ANALYSIS AND DATA MINING


LIST OF EXERCISE:
1. Store data in textual and binary format.
2. Subsetting R objects
3. Vectorized Matrix Operation
4. Text mining
5. Recommender System
6. Crime data analysis
7. Social network analysis

Total Hours : 45

Text Book:

OUTCOMES:
On completion of the programme students will be able to:
A Æ Develop a simulation model in R programming.
A Æ Analyze the data and perform knowledge mining.
ITCX126 VIRTUAL REALITY

OBJECTIVES:
- To make students know the basic concept and framework of virtual reality.
- To study of virtual reality systems, transformations, graphical rendering, human vision.
- To discuss VR system framework and development tools.
- To design a virtual environment and compelling virtual reality experience.

THEORY COMPONENT

MODULE I INTRODUCTION TO VIRTUAL REALITY
Introduction — Goals and VR definitions — History of VR and AR — The Graphics Pipeline and OpenGL: Overview and Transformations — Rotation, Translation, Scaling, Modelview matrix, and Projection matrix — Lighting and Shading with GLSL — Stereo Rendering - Human visual system

MODULE II VI: TRACKING SYSTEMS & VR INTERFACES

MODULE III VR DEVELOPMENT TOOLS AND FRAMEWORKS

LAB COMPONENT - LIST OF EXERCISES
1. Hello, Web GL!
2. Lighting and Shading with GLSL
3. Stereo Rendering, Depth of Field and Anaglyph
4. Build your own HMD
5. Orientation Tracking with IMUs Arduino Programming
6. Pose Tracking
7. VRML Programming
8. Work on augmented reality
9. Demo on Digital Entertainment by VR
10. Case study - Virtual Reality Applications

L: 30; P: 15 Total Hours : 45

REFERENCES:
2. Burdea, G.C. and P. Coiffet, "Virtual Reality Technology" Second edition,

OUTCOMES:
- Provides students the fundamental knowledge of virtual reality required for their professional career in this field, and applied to various applications such as digital entertainment.
- Apply visual rendering and audio in VR systems in real time standards.
- Design of VR interfaces using interactive techniques.
- Analyze frameworks of Software Development & modeling Tools in VR.
OBJECTIVES:
The objective of this course is to enable the students:
- To understand the fundamental concepts of quality management.
- To acquire the knowledge of understanding the "widely-used" quality analysis tools and techniques.
- To have the exposure about software quality assurance, quality measures, and quality control.
- To introduce philosophies and strategies to quality related issues.

MODULE I  INTRODUCTION  7

MODULE II  SOFTWARE QUALITY MEASUREMENTS  7

MODULE III  SOFTWARE QUALITY MANAGEMENT MODELS  8

MODULE IV  SOFTWARE QUALITY METRICS  8

MODULE V  SOFTWARE MANAGEMENT PROCESS FRAMEWORK & DISCIPLINE  8

MODULE VI  SOFTWARE RELIABILITY AND PROCESS IMPROVEMENT  7

**TEXT BOOKS:**


**OUTCOMES:**

Upon completion of the course, the student should be able to

- Describe software quality assurance.
- Understand the measurement theory concept.
- Choose the suitable software quality model for the given software project.
- Identify various software quality metrics.
- Understand management problems, general solutions, technologies and standards.
- Describe software process improvement.
# ITCX128 CLOUD FORENSICS

**OBJECTIVES:**
- Gain knowledge on fundamental concepts of cloud forensics.
- Apply appropriate skills and knowledge in solving cloud forensics investigation.
- Apply theoretical and practical knowledge in forensic computing into the future.
- Familiarize the basics of Digital Forensics.
- Analyze the legal, ethical and professional issues in Cyber Crime.
- Know the technological aspects of Incident Response.

## MODULE I INTRODUCTION TO CLOUD FORENSICS

- History of Forensics
- Cloud Forensic Flaws and Risks
- Rules of Cloud Forensics
- Legal issues
- Digital Forensic Principles
- Digital Environments
- Digital Forensic Methodologies
- Forensics Software and Hardware tools.

## MODULE II AN OVERVIEW OF CLOUD FORENSICS INVESTIGATION

- Router Forensics and Network Forensics
- An overview of Routers
- Hacking Routers
- Investigating Routers
- Investigating Wireless Attacks
- Basics of wireless
- Wireless Penetration Testing
- Direct Connections to Wireless Access Point
- Wireless Connect to a Wireless Access Point.

## MODULE III DIGITAL FORENSICS

- Introduction
- Evidential potential of digital devices: closed vs. open systems, evaluating digital evidence potential
- Device handling: seizure issues, device identification, networked devices and contamination
- Seven element security model
- Developmental model of digital systems
- Audit and logs
- Evidence interpretation: Data content and context.

## MODULE IV NETWORK FORENSICS

- Collecting Network Based Evidence
- Investigating Routers
- Network Protocols
- Email Tracing
- Internet Fraud.

## MODULE V SYSTEMS INVESTIGATION AND ETHICAL ISSUES

- Data Analysis Techniques
- Investigating Live Systems (Windows & Unix)
- Investigating Hacker Tools
- Ethical Issues
- Cybercrime.

## MODULE VI INCIDENT AND INCIDENT RESPONSE

- Introduction to Incident
- Incident Response Methodology
- Steps
- Activities in Initial
Response Phase after detection of an incident.

Total Hours: 45

REFERENCES:

OUTCOMES:
Upon completion of this program, students will be able to:
- Have a fundamental understanding of Cloud Forensics and how resultant evidence can be applied within legal cases.
- Distinguish various types of Cloud crime, and use cloud forensic techniques to identify the digital fingerprints associated with criminal activities.
- Understand why Digital forensics is important for any modern organization. Gained theoretical knowledge in digital forensic investigations.
- Know how to apply forensic analysis tools to recover important evidence for identifying cloud crime.
- Identify and apply current practices for data discovery recovery and acquisition.
- Understand financial and accounting forensics, and explain their role in preventing various forms of fraud.
ITCX129 NETWORKING SIMULATORS

OBJECTIVES:
- Introduce various wireless systems and standards and their basic operation cases.
- Learn to simulate wireless networks and analyze the simulation results.

LIST OF EXERCISES
Experiments using NS2, Wireshark and Packet tracer.
2. Wi-Fi based Data Acquisition.
5. Signaling in wireless networks (RTS, CTS, DATA and ACK)
8. RTP protocol of VoIP.

OUTCOMES:
On completion of the course students will be able to:
- Create wireless network environment and configure virtual LAN.
- Develop various wireless network applications.
- Demonstrate different wireless network protocols.
- Identify suitable network security algorithms for a given scenario.
- Assess the performance of wireless network using packet sniffer.

Total Hours : 45

ITCX130 ENTERPRISE RESOURCE PLANNING

OBJECTIVES:
- Knowing the real time information about business field strategies and business process of an enterprise.
- Understand and how to access information and provide services through an intuitive and integrated interface, and ultimately aims to: Improve Service Experience, Enhance Competitiveness, Modernize Business Processes and Systems, Automate Business Solutions, Increase Operating Efficiency and Provide Access to Standardized College Data.
- To understand the key implementation issues.
• To know the business modules and appreciate the current and future trends.
• To be aware of some popular products available in market.
• Familiar the current and future emerging trends in erp developments.

MODULE I ERP AND TECHNOLOGY

MODULE II ERP IMPLEMENTATION
ERP Implementation Challenges - Lifecycle, Implementation Methodology, Package selection , Requirements Definition , Methodology and Frame Work Training , Data Migration, People Organization in implementation-Consultants, Vendors and Employees, Project Management and Monitoring.

MODULE III ERP IN ACTION
Operation and Maintenance of the ERP System, Measuring the Performance of the ERP System, Maximizing the ERP System. Organizational and Industrial impact, Success and Failure factors of and ERP Implementation

MODULE IV THE BUSINESS MODULES

MODULE V THE ERP MARKET
Marketplace, Dynamics, SAP AG, Oracle, PeopleSoft, JD Edwards, QAD, Inc, SSA Global, Lawson Software.

MODULE VI ERP – PRESENT AND FUTURE
Turbo Charge the ERP System, EIA, ERP and e-Commerce, ERP II, ERP and Internet, Business analytics, Future trends in ERP systems-web enabled, Wireless technologies.

Total Hours : 45

TEXT BOOKS:

REFERENCES:

OUTCOMES:
Upon completion of this course students should be able to:

- Understand how business processes are mapped (translated) into enterprise system software and how managerial decisions integrate across disciplines.
- Understand and be able to articulate the life cycle stages of any ERP implementation. Develop working knowledge of enterprise system modules to enable efficient navigation and information access for management.
- Differentiate enterprise system transactions, queries, and reports within a manager’s role and develop competence in transforming raw data into management information.
- Know and be able to apply key technical terminology in enterprise information systems as they apply in different ERP products and development methods.
- Understand key differences between the major ERP applications (such as SAP AG, and Oracle/PeopleSoft) and issues specific to these applications their configuration and management.
- Synthesize prior theoretical and experiential knowledge in IT development and project management with the current literature on Enterprise System development.
ECCX70  EMBEDDED SYSTEMS  L  T  P  C
3  0  0  3

OBJECTIVES:

- To provide a detailed overview of embedded system.
- To equip students with the software development skills necessary for practitioners in the embedded systems field.
- To understand entire software development lifecycle and examine the various issues involved in developing software for embedded systems.

PREREQUISITES:

- Basics of electronic components, circuits, processors,
- Basics of analog and digital communication, wireless communication

MODULE I  INTRODUCTION TO EMBEDDED SYSTEM  8
Introduction Embedded System -characteristics - challenges- Application areas - Real Time Examples Embedded system design process - requirements analysis- specifications- design methodologies.

MODULE II  EMBEDDED SYSTEM HARDWARE DESIGN  7
Internal processor design: ALU registers control unit - clock on chip memory processor I/O interrupts processor buses processor performance.

MODULE III  DESIGN AND DEVELOPMENT OF EMBEDDED SOFTWARE  8
Host and target machines - compilation process libraries -Linkers / Locators for Embedded Software - Debugging techniques - Integrated Development Environment - Introduction to Embedded C.

MODULE IV  PROCESSES AND OPERATING SYSTEMS  7
Tasks and processes - process timing requirements- real-time operating systems-preemptive execution- context switching- scheduling processes- priority scheduling- inter-process communication- shared-memory systems- message passing.

MODULE V  NETWORKS FOR EMBEDDED SYSTEMS  8
Multiprocessor systems, distributed embedded systems, CAN bus, I2C bus, multiprocessor system-on-chip (MPSoC), accelerators Introduction to IoT.

MODULE VI  EMBEDDED SYSTEM APPLICATION  7
Application specific embedded system case study: Embedded systems in Automobile - Smart card - Digital Camera - Smart Phone.

Total Hours –45
TEXT BOOKS:


REFERENCES:


OUTCOMES:

On completion of this course, the students will be able to

1. Identify requirements analysis and specifications to design the embedded system
2. Choose the right platform for designing an embedded system
3. Implement debugging techniques in embedded system design
4. Explore different scheduling mechanism in RTOS
5. Illustrate the concepts of embedded networking
6. Analyze different domain specific applications in embedded systems.
PHYSICS ELECTIVE COURSES
(to be offered in II Semester)

PHCX 01
FUNDAMENTALS OF ENGINEERING MATERIALS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

OBJECTIVES:

- To familiarize students with basic ideas of nanomaterials and its electrical, electronic, mechanical and magnetic properties.

- To help students acquire the properties and applications of magnetic materials and dielectric materials.

- To familiarize students with basic ideas about the properties of dielectric and its applications.

- To enable the students to correlate theoretical principles with practical applications.

MODULE I  CONDUCTING AND SEMICONDUCTING MATERIALS

Conductors: properties, Fermi distribution function, Fermi energy in metals- density of states- conducting polymers-properties-applications, semiconductors: intrinsic and extrinsic semiconductors-carrier concentrations, conductivity and energy band gap, semiconducting polymers- properties- applications.

MODULE II  DIELECTRIC MATERIALS

Polarization- dielectric constant ï electronic, ionic, orientational and space charge polarization ï frequency and temperature dependence of polarisation ï Internal field -Clausius Mosotti relation - dielectric loss ï dielectric breakdown ï applications of dielectric materials (capacitors and transformers) ï Pyroelectricity, Piezoelectricity, ferroelectricity and applications in FERAM - multiferroic materials and its applications.

MODULE III  MAGNETIC MATERIALS

MODULE IV  NANOMATERIALS  8

Properties of nanomaterials—size effect on thermal, electrical, electronic, mechanical, optical and magnetic properties—quantum confinement—classification of nanomaterials—quantum well, quantum wire, quantum dot—nanoporous materials—carbon nanotubes, grapheme—nanocomposites—applications.

PRACTICALS
1. Determination of energy band gap of a semiconductor.
2. Determination of resistivity of metals by four point probe method.
3. Determination of dielectric constant of dielectric material.
5. Determination of paramagnetic susceptibility of given liquid.
7. Analysis of size effect on the absorption spectrum of nanomaterials.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:
5. Charles P.Poole and Frank J. Owens, ÒIntroduction to nanotechnologyÓ Wiley (India), 2009.

OUTCOMES:
On completion of this course, the student will be able to
- differentiate between the properties of the nanomaterials compared to bulk materials.
- comprehend the significance of properties of magnetic materials and derive these properties from synthesized materials.
- apply the concepts of conducting and semiconducting materials for solid state devices.
- complement the knowledge acquired in the theory class and correlate the results for applications.
HEAT AND THERMODYNAMICS

PHCX 02

OBJECTIVES:
- To familiarize students with basic concepts of heat.
- To help students acquire the fundamentals of heat conduction and radiation.
- To enable students acquaint with the basics of thermodynamic concepts.
- To make students understand the fundamentals of heat based experiments.

MODULE I
CONCEPTS OF HEAT

Definition of temperature, thermal and thermodynamic equilibrium - relationship between temperature and kinetic energy - definition of solid, liquid, gas - Introduction to phase transitions, critical and triple points - definition of heat capacity, mechanical equivalent of heat - Joule's calorimeter - latent heat - Microscopic model of ideal gas - equation of state, internal energy, equipartition theorem - equation of state for non-ideal gases.

MODULE II
CONDUCTION AND RADIATION


MODULE III
FUNDAMENTALS OF THERMODYNAMICS


PRACTICALS
1. Determination of mechanical equivalent of heat by Joule's calorimeter.
2. Relation between temperature of a body and time by plotting a cooling curve - Newton's law of cooling.
3. Determination of specific heat capacity of liquid by cooling.
4. Determination of thermal conductivity of a bad conductor - Lee's disc method
5. Determination of thermal conductivity of a good conductor - Forbe's method

L – 30; P – 30; TOTAL HOURS – 60
REFERENCES:

OUTCOMES:
On completion of this course, the student will be able to
• understand the concepts of heat and its properties.
• comprehend the ideas governing the conduction and radiation processes.
• understand and apply the ideas of laws of thermodynamics in thermodynamic systems.
• perform heat based experiments and determine its various properties.
PHCX 03  INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY  

OBJECTIVES:
- To acquire basic knowledge about the nanomaterials and applications.
- To learn about the imaging techniques of nanomaterials.
- To gain the basic concepts of fabrication techniques.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I  NANOMATERIALS AND APPLICATIONS  10


MODULE II  SYNTHESIS AND IMAGING TECHNIQUES  12


MODULE III  NANOFABRICATION  8

Photolithography — electron beam lithography - X-ray and Ion beam lithography- nanoimprint lithography - soft lithography - nanoelectromechanical systems (NEMS) - nanoindentation principles.

PRACTICALS
2. Synthesis of nanomaterials by hydrothermal method.
4. Synthesis of nanomaterials by chemical bath deposition method.
5. Synthesis of nanomaterials by co-precipitation method.
7. Synthesis of nano thin films by pulsed laser deposition (PLD) method.
8. Analysis of size effect on the absorption spectrum of nanomaterials.
9. SEM characterization of nanomaterials.
10. AFM characterization of nano thin films.
11. Phase confirmation by XRD.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
At the end of the course, the students will be able to
- understand the importance and basic concepts of the nanomaterials.
- comprehend the imaging techniques for nanomaterials.
- illustrate the various nanofabrication techniques.
- complement the knowledge acquired in the theory class and correlate the results for applications.
OBJECTIVES:

- To recognize the fundamentals of laser and its characteristics.
- To comprehend and compare the different laser systems.
- To apply lasers in metrology and material processing.
- To understand the working of laser instrumentation.
- To correlate the experimental results for applications.

MODULE I  LASER THEORY

Spontaneous and stimulated emission - Population inversion \( \Delta \) Einstein\# A & B coefficients - Threshold condition \( \Delta \) super-radiance Laser \( \Delta \) Three level and four level laser systems -conditions for CW and pulsed laser action. Q-Switching - experimental methods - cavity dumping - Mode locking - experimental methods - Spatial and Temporal coherence

MODULE II  DIFFERENT LASER SYSTEMS


MODULE III  METROLOGICAL AND MATERIAL PROCESSING  APPLICATIONS

CW and Pulsed laser beam characteristics and its measurements - Beam focusing effects - spot size - Power and Energy density Measurements - Distance measurement - Interferometric techniques - LIDARS - different experimental arrangements - Pollution monitoring by remote sensing - Laser gyroscope - Laser welding, drilling, machining and cutting - Laser surface treatment - Laser vapour deposition \( \Delta \) Biophotonic applications.

MODULE IV  LASER INSTRUMENTATION

Laser for measurement of length, current and voltage \( \Delta \) Laser Doppler Velocimetry - Holography and speckle in displacement and deformation measurements - Laser for communication with fiber optics as channel.

PRACTICALS

1. Tuning of Dye Laser using DFDL Arrangement
2. Determination of Brewster Angle using He-Ne laser
3. Study of transversely Pumped Dye Lasers
4. Study of longitudinally Pumped Dye Lasers
5. Determination of power and wavelength using Distributed Feedback Dye Laser
7. Bandgap determination of a semiconductor diode.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
At the end of the course, the students will be able
Â To complement the knowledge acquired in the theory class.
Â To work with dye lasers for tunability of laser wavelength
Â To measure the loss of information involved in fibre optic communication
Â To correlate the results for application.
OBJECTIVES:

- To gain basic knowledge in conducting and semiconducting materials and their properties.
- To provide a basis for understanding properties and applications of dielectric materials.
- To impart knowledge on magnetic and optical materials and their properties & applications.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I CONDUCTING AND SEMICONDUCTING MATERIALS

Quantum free electron theory of metals and its importance - Energy distribution of electrons in metals - Fermi distribution function - Density of energy states and carrier concentration in metals - Fermi energy - Classification of solids into conductors, semiconductors and insulators on the basis of Band theory - Introduction to Elemental and Compound semiconductors - Carrier concentration derivation for Intrinsic semiconductors - Density of electrons in conduction band & Density of holes in valence band - Intrinsic carrier concentration - Fermi energy & Variation of Fermi energy level with temperature - Mobility and electrical conductivity - Band gap determination.

MODULE II DIELECTRIC MATERIALS

Introduction to dielectric materials & basic definitions - Electronic, Ionic, Orientation & space charge polarizations - Total polarization - Frequency and temperature dependence of polarization - Internal field in a dielectric material - Deduction of Clausius - Mosotti’s relation - dielectric loss & loss tangent - Different types of dielectric breakdown - Applications of dielectric materials: Capacitors and Transformers.

MODULE III MAGNETIC MATERIALS

MODULE IV  OPTICAL MATERIALS


PRACTICALS

1. Resistivity measurement of a semiconductor using four point probe method.
2. Determination of band gap of a semiconductor diode.
3. Determination of Hall coefficient of a given semiconductor material.
4. Determination dielectric constant of a given non-polar liquid.
5. Determination of magnetic susceptibility of a given paramagnetic liquid using Quincke's method.
6. Determination of energy loss of a given transformer core using hysteresis method.
7. To study the I-V characteristics of a photodiode.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
On the completion of this course, the students will be able to
- Gain knowledge about fundamentals of conducting and semiconducting materials
- Understand the concepts and applications of Dielectric, Magnetic materials
- Familiarize Optical materials and their applications in Engineering and Medical fields.
- Complement the knowledge acquired in the theory class and correlate the results for applications.
PHCX 06 NON-DESTRUCTIVE TESTING  L  T  P  C
2 0 2 3

OBJECTIVES:

- To study the process and applications of ultrasonic inspection method.
- To understand the basic concepts of radiographic inspection method.
- To acquire the knowledge about the various surface Non-Destructive Testing (NDT) techniques.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I   ULTRASONIC INSPECTION METHOD  10


MODULE II   RADIOGRAPHIC INSPECTION METHOD  10


MODULE III   SURFACE NDT TECHNIQUES  10

Liquid Penetrant Testing i Principles, Characteristics and types of liquid penetrants-developers- advantages and disadvantages of various methods- Inspection Procedure and Interpretation of results. Applications of Liquid Penetrant testing.
Magnetic Particle Testing- Principle-magnetizing technique-procedure i equipment- Interpretation and evaluation of test indications-applications and limitations-demagnetization.

PRACTICALS

1. Inspection of welds using solvent removable visible dye penetrant.
2. Inspection of welds using solvent removable fluorescent dye penetrant.
3. Inspection on non magnetic materials by eddy current method.
4. Inspection on magnetic materials by eddy current method.
5. Inspection of welds by Eddy current Testing.
6. Inspection of welds by Magnetic Particle Testing - Dry method.
7. Inspection of welds by Magnetic Particle Testing - Wet method.
8. Ultrasonic flaw detector- Inspection of defects.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:

Upon completion of this course, the students will be able to
• illustrate the ultrasonic inspection methods of NDT.
• understand the basic concept of radiographic inspection method.
• test the surfaces by the various surface NDT techniques.
• complement the knowledge acquired in the theory class and correlate the results for applications.
PHCX 07 PROPERTIES OF MATTER AND ACOUSTICS

OBJECTIVES:

- To understand principles and properties of elasticity.
- To understand the basic concepts and application of viscosity.
- To analysis acoustic of building.
- To know about photoelasticity and its applications.

MODULE I ELASTICITY

Stress and strain - Hooke's Law of elasticity - Elastic moduli - Stress-Strain Diagram - Poisson's Ratio - Relation between elastic constants - Work done in stretching and twisting a wire - Twisting couple on a cylinder - Expression for bending moment - Cantilever Ring Expression for depression - Uniform bending and Non-uniform bending of beams (theory & experiment) - I form Girders (qualitative treatment) and applications.

MODULE II VISCOSITY


MODULE III ACOUSTICS OF BUILDING

Basic requirement for the acoustically good halls - Reverberation and time of reverberation - Sabine's formula for reverberation time - Absorption coefficient and its measurement - Transmission of sound and transmission loss - Factors affecting the architectural acoustics and their remedy - sound absorbing materials - vibration and noise control systems for buildings.

MODULE IV PHOTOELASTICITY

Polarization - double refraction - Theory of Plane, Circularly and Elliptically polarized light - Quarter wave plate and half wave plate - photo elasticity - Theory of photo-elasticity - Stress optic relations - model materials-analysis techniques - Photo elastic bench - Three dimensional photo elasticity - Digital photo elasticity - Photo elastic coatings.

PRACTICALS

1. Determination of viscosity of liquid by Poiseuille's method.
2. Determination of viscosity of liquid by Stoke's method.
4. Verification of Hooke’s law by spring method.
5. Determination of Young’s modulus of the cantilever beam.
6. Determination of rigidity modulus by static torsion method.
7. Visit to acoustically good auditorium and identifying the sound absorbing materials in the auditorium.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
Upon completion of this course, the students will be able to
- understand the basic concepts of the elasticity of materials.
- comprehend the concepts of viscosity of liquid and measurement.
- demonstrate the acoustical aspects of building and its importance in construction.
- illustrate the fundamental concept of photo elasticity and its use for the stress analysis of the object.
PHCX 08  PROPERTIES OF MATTER AND NONDESTRUCTIVE TESTING  L T P C

OBJECTIVES:

- To impart knowledge about the principles and properties of elasticity.
- To learn the laws governing the dynamic of rigid bodies.
- To acquire the knowledge of the various techniques of Non-Destructive Testing (NDT) of materials.
- To understand the principle and basic concept of low temperature applications.

MODULE I  ELASTICITY  8

Stress and strain - Hooke’s Law of elasticity - Elastic moduli - Stress-Strain Diagram - Poisson’s Ratio - Relation between elastic constants - Work done in stretching and twisting a wire - Twisting couple on a cylinder - Expression for bending moment-Cantilever - Expression for depression - Uniform Bending and Non-uniform bending of beams (theory & experiment) - I form Girders (qualitative treatment) and applications.

MODULE II  DYNAMICS OF RIGID BODIES  8


MODULE III  NDT TECHNIQUES  6


MODULE IV  LOW TEMPERATURE PHYSICS  8

PRACTICALS
1. Verification of Hooke’s law by spring method.
2. Determination of Young’s modulus of the beam by bending method.
3. Inspection of welds using solvent removable visible dye penetrant.
4. Inspection of welds using solvent removable fluorescence dye penetrant.
5. Inspection of welds by Magnetic Particle Testing.
7. Determination of moment of inertia of the disc by static torsion method.
8. Demonstration of working of flywheel.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
Upon completion of this course, the students will be able to
- understand the basic of concept of elasticity of materials.
- comprehend the basic concepts of motion of rigid bodies and its applications.
- Demonstrate the various NDT techniques and its importance.
- Illustrate the low temperature systems and its applications.
OBJECTIVES:

- To understand the Physics of Semiconductor devices.
- To make the students learn the fundamentals of Photoluminous - semiconductors, Optoelectronic devices, Optical modulators/detectors.
- To make them understand the technology behind latest Display devices like LCD, Plasma and LED Panels.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I PHYSICS OF SEMICONDUCTORS

Elemental and compound semiconductors - Drift and diffusion current - Intrinsic semiconductors - Carrier concentration (derivation) - Fermi energy - Variation of Fermi energy level with temperature - Mobility and electrical conductivity - Band gap determination - Extrinsic semiconductors - Carrier concentration in n-type and p-type semiconductor (derivation) - Variation of Fermi level with temperature and impurity concentration - Variation of Electrical conductivity with temperature - Hall effect - Experiment and applications of Hall effect.

MODULE II OPTOELECTRONIC DEVICES

Light Emitting Diodes (LED) - power and efficiency - double hetero LED - LED structure - LED characteristics - White LED - Applications. Liquid crystal displays - Dynamic scattering and Twisted nematic display, Semiconductor Lasers, Homojunction and Heterojunction laser diodes - Optical processes in semiconductor lasers.

MODULE III OPTICAL MODULATORS


MODULE IV OPTICAL DETECTORS

Photo detectors - photodiodes - phototransistors - noise characteristics - PIN diode - Avalanche Photodiode (APD) characteristics - APD design of detector arrays - Charged Couple Device - Solar cells - Materials and design considerations, Thin film solar cells, amorphous silicon solar cells.

PRACTICALS

1. Resistivity measurement of a semiconductor using four point probe
method.
2. Determination of band gap of a semiconductor diode.
3. Determination of Hall coefficient of a given semiconductor material.
4. Determination of the wavelength of a given laser source using diffraction grating.
5. Determination of Planck's constant using LED.
6. To study the I-V characteristics of photodiode and phototransistor.
7. To study the characteristics of a solar cell.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:

On completion of this course, the student will be able to
- Understand the principles of Physics behind semiconductor devices.
- Choose the correct semiconductors for electronic devices and display.
- Differentiate the working principle of LED and Diode Laser.
- Apply the knowledge of modulation of light for different types of optical modulators.
- Select suitable photodetectors for different types of applications.
- Complement the knowledge acquired in the theory class and correlate the results for applications.
Chemistry Elective Courses  
(to be offered II Semester)

CHCX01  ANALYTICAL INSTRUMENTATION  L  T  P  C
2  0  2  3

OBJECTIVES:
To make the student conversant with

- principles, instrumentation and applications of different electroanalytical techniques
- different chromatographic techniques
- principles, instrumentation and applications of various types of absorption and emission spectroscopy
- different thermal analytical methods and their applications

MODULE I  ELECTROANALYTICAL TECHNIQUES  7

MODULE II  CHROMATOGRAPHY  8

MODULE III  SPECTROSCOPY  8

MODULE IV  THERMAL ANALYSIS  7
Principle, instrumentation and applications: Thermogravimetric analysis – Differential thermal analysis – Differential scanning calorimetry

PRACTICALS
1. Conductometric titrations: acid-base and precipitation titrations
2. Potentiometric titrations
3. Determination of pH of the unknown solution
4. Estimation of alkali metals using flame emission spectroscopy
5. Estimation of metal ions of coloured solutions using colorimetric analysis
6. Separation of compounds using gas chromatography
7. Separation of compounds using high performance liquid chromatography
8. Analysis of the given sample and interpretation of the data using IR, UV-Visible spectroscopy
9. Demonstration of TGA/DTA and DSC and interpretation of data.

**REFERENCES:**

**OUTCOMES:**
The student will be able to
- state the principle and applications of various electro-analytical techniques
- identify the right separation method for a given sample using different chromatographic techniques
- explain the principle, instrumentation & applications of various spectroscopic methods and also to interpret the data
- elaborate the principle, instrumentation and applications of various thermal analytical techniques and interpret the data.
OBJECTIVES:
The students should be conversant with the
- Basic concepts, principles and factors affecting corrosion
- Types and mechanism of corrosion
- Control measures of corrosion by material selection, proper design and by applying organic coatings
- Control of corrosion by applying inorganic coating

MODULE I  BASIC CONCEPTS OF CORROSION

Corrosion causes and impacts of corrosion mechanism of corrosion:
Dry corrosion- oxidation corrosion - corrosion by other gases Pilling-Bedworth rule Corrosion by hydrogen: hydrogen blistering, hydrogen embrittlement, decarburization and hydrogen attack corrosion of silver and copper by sulphur compounds liquid metal corrosion (embrittlement or cracking) Wet corrosion: hydrogen evolution presence and absence of oxygen and absorption of oxygen difference between dry and wet corrosion factors influencing corrosion-polarization-passivity-emf series and galvanic series rate of corrosion.

MODULE II  FORMS OF CORROSION

Forms of corrosion- conditions for electrochemical corrosion galvanic corrosion differential aeration corrosion: pitting, water line, wire fencing, crevice and filiform corrosion stress corrosion Intergranular corrosion erosion corrosion soil corrosion microbiological corrosion fretting corrosion in composites.

MODULE III  CORROSION CONTROL AND ORGANIC COATINGS

Corrosion control selection of materials and designing cathodic protection sacrificial anode and impressed current cathodic protection corrosion inhibitors: anodic, cathodic and vapour phase inhibitors.
Organic protective coatings paints: constituents functions varnishes: types-constituents functions lacquers: constituents functions enamels constituents functions special paints: fire retardant, water repellent, heat resistant, temperature indicating and luminous paints.
MODULE IV  INORGANIC COATINGS

Treatment of metal surface-inorganic coatings- classification- metallic coatings : anodic and cathodic coatings-hot dipping : galvanizing and tinning- electroplating electroless plating i cementation (diffusion) : sherardizing, calorizing and chromizing i metal cladding-metal spraying i non metallic coatings (chemical conversion coatings) : phosphate, chromate, oxide coatings and anodizing i comparison of anodic and cathodic protection.

PRACTICALS

1. Determination and comparison of rate of corrosion of metals in the presence of acid, base and neutral medium by weight loss method.
2. Determination of rate of corrosion of iron in the presence of various acids by weight loss method.
3. Determination of rate of corrosion of iron in the presence and absence of anodic Inhibitor by weight loss method.
4. Determination of rate of corrosion of iron in the presence and absence of cathodic Inhibitor by weight loss method.
5. Electroplating of base metal with copper.
6. Electrolessplating of base metal with copper
7. Chemical conversion coatings such as chromate and phosphate coatings.
8. Demonstration on the study of rate of corrosion by using cyclic voltametry.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:


OUTCOMES:

Students will be able to
➢ explain the mechanism, compare and enumerate the factors affecting corrosion
➢ describe and identify the place and types for a given situation.
➢ choose and elaborate the suitable organic coating method for a given real time situation.
➢ apply a suitable metallic coating for a given situation
OBJECTIVES:
The students should be conversant with
➢ preparation, properties and applications of plastics used in electrical and electronic applications
➢ properties and uses of electrical engineering materials
➢ classification and description of different types of batteries.
➢ classification and types of fuel cells

MODULE I POLYMERS FOR ELECTRICAL AND ELECTRONIC APPLICATIONS

Preparation, properties and applications: polyethylene, polypropylene, EPDM, Nylon-6,6, PVC, PTFE, polycarbonates, ABS, phenol formaldehyde, urea formaldehyde, epoxy resins, polymer blends and alloys.

MODULE II ELECTRICAL ENGINEERING MATERIALS

Conductors: Silver, Copper, Gold, Aluminum; Semiconductors: Germanium, Silicon, Gallium Arsenic; Insulating Materials: Rubbers, Mica, Plastics, Ceramics, Insulating papers; Magnetic Materials: ferromagnetic materials, paramagnetic materials, diamagnetic materials, antiferromagnetic materials, ferrites

MODULE III BATTERIES

Electrochemical and electrolytic cell: batteries: types (primary, secondary and flow cell) - primary batteries: dry cells, alkaline batteries - secondary batteries: nickel-cadmium cell - lead acid storage cell, lithium battery: primary and secondary type - solar cell - dye sensitized solar cell.

MODULE IV FUEL CELLS

Difference between batteries and fuel cells - chemistry of fuel cells - types of fuel cell (based on temperature and electrolyte) - principle, characteristic
features, advantages, disadvantages and applications of polymer electrolyte membrane or proton exchange membrane fuel cell (PEMFC), direct methanol fuel cell (DMFC), alkaline fuel cell (AFC), phosphoric acid fuel cell (PAFC), molten carbonate fuel cell (MCFC) and solid oxide fuel cells (SOFC).

PRACTICALS

1. Free radical polymerization of styrene.
2. Free radical polymerization of PMMA.
4. Preparation of urea-formaldehyde.
5. Synthesis of epoxy resin.
6. Demonstration of mechanical properties of insulating materials using UTM
7. Demonstration of electrical properties of insulating materials
8. Construction of batteries using natural resources
9. Measurement of EMF for different batteries.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:


OUTCOMES:

The student will be able to

- summarise the preparation, properties and applications of plastics used in electrical and electronic applications
- enumerate the properties and uses of electrical engineering materials
- illustrate various types of batteries with the aid of a diagram
- classify the fuel cells and elaborate the different types of fuel cells.
OBJECTIVES:
The students should be conversant with
- properties and uses of different types of refractories and abrasives
- adhesives, cements and lime, setting of cements and their chemical behaviors.
- types, properties and uses of lubricants.
- various types of composite materials.

MODULE I  REFRACTORIES AND ABRASIVES

Introduction refractory: - classification - based on chemical nature-
characteristic and selection of good refractory - general manufacture of
refractory- preparation properties and uses of: silica refractory - magnesite
refractory - zirconia refractory, properties of refractories: refractoriness
refractoriness under load - thermal spalling - porosity and dimensional
stability, Cerments - super refractory.
Abrasives: introduction - Moh's scale - natural abrasives: diamond ĭ
 corundum ĭ emery - garnet and quartz, synthetic abrasives: preparation
properties and uses: carborundum (silicon carbide) ĭ alundum - boron
(norbide) carbide

MODULE II  ADHESIVES AND BINDING MATERIALS

Introduction  classification of adhesives ĭ advantage ĭ limitation of
adhesive bonding ĭ development of adhesive- factors influencing adhesive
action: chemical and physical, application techniques of adhesive ĭ Lime:
classification ĭ manufacture - setting and hardening, Gypsum:
Manufacture and properties and uses - Cement : chemical composition-
Manufacture ĭ setting and hardening ĭ concrete ĭ weathering of cement
and concrete and its prevention- special cements: high alumina cement
sorel cement - white portland cement ĭ water proof cement.

MODULE III  LUBRICANTS

Introduction ĭ functions of lubricant- mechanism of lubrication
classification of lubricant ĭ liquid lubricant: vegetable and animal oils ĭ
mineral oils, semisolid: grease( calcium, lithium, aluminium) ĭ petroleum
jelly, solid lubricant: graphite - molybdenum disulphide, Properties of
lubricant: viscosity - viscosity index - flash point and fire point - cloud point
and pour point ĭ oiliness - aniline point - carbon residue
MODULE IV  COMPOSITE MATERIALS

Introduction to advantageous characteristics of composites, applications of composites, main constituent of composites, types and applications of composites: RCC fibre-reinforced plastics (glass, carbon and aramid) - particulate composite - metal matrix composite - layered composites - failures in fibre-reinforced composites, ceramic matrix composites (CMC) - properties and applications.

PRACTICALS

1. Preparation of refractory bricks
2. Preparation of abrasive papers/cloth
3. Preparation of simple adhesives
4. Estimation of alkalinity in cements
5. Determination of cloud point and pour point
6. Determination of flash point and fire point
7. Preparation of fibre-reinforced composite

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:
3. Engineering Chemistry, Wiley India Editorial Team, Willey India Publisher, New Delhi, 2011.

OUTCOMES:

The student will be able to

- classify and describe the manufacture the refractories and enumerate the properties and uses of abrasive materials.
- elaborate the manufacture, properties and uses of various adhesives and binding materials.
- classify lubricants and describe the properties and uses of them
- enumerate the properties and uses of various composite materials.
OBJECTIVES:
To make the students conversant with the
- three types of fuels available and the different processes involved in it.
- analysis of fuel characteristics and manufacture of fuels
- calculations involved in calorific values and minimum air requirement for complete combustion.
- classification, functions, mechanism and properties of lubricants.

MODULE I SOLID FUELS

MODULE II LIQUID AND GASEOUS FUELS
Liquid fuel: Petroleum: Refining of petroleum, Liquid fuels derived from petroleum - Cracking: Thermal (Liquid and Vapour phase) - Catalytic (fixed bed and moving bed cracking - Synthetic petrol: Fischer-Tropsch method - Knocking in petrol and diesel engine: octane number and antiknocking - cetane number and improvement of cetane number - biodiesel (trans-esterification) - Gaseous fuels: Compressed natural gas (CNG) - LPG - oil gas - producer gas - water (blue) gas - biogas.

MODULE III COMBUSTION
Calorific value: Gross and net caloric value - Bomb Calorimeter, Gas calorimeter - Definition of combustion - calculation of minimum requirement of air (problems) - theoretical calculation of calorific values (Dulong's formula), Gross and net calorific values (problems) - Analysis of flue gas: Orsat's gas analysis method, explosive range, Ignition temperature. Introduction to air pollution from IC (Internal combustion) engines, photochemical smog, primary and secondary pollutants.

MODULE IV LUBRICANTS
Friction and wear - lubricants: definition, functions and mechanism of lubrication (thick film and thin film) - classification: liquid lubricants: animal and vegetable origin, mineral oil, blended oils, lubricating
emulsions and silicones — properties of lubricating oils: viscosity and viscosity index; Flash and fire-point, Cloud and pour point, oiliness, emulsification number, volatility, carbon residue, aniline point — semisolid lubricant: greases and waxes — solid lubricant: graphite and molybdenum disulphide — nanolubricants.

PRACTICALS

1. Testing of fuels - proximate analysis (moisture, volatile matter, ash content and fixed carbon present in coal, coke, charcoal etc)
2. Ash content and carbon residue test
3. Biodiesel synthesis by trans-esterification method (from coconut, groundnut, mustard oil, palm oil)
4. Determination of calorific value of a solid fuel using Bomb calorimeter (coal, charcoal, coke etc)
5. Determination of calorific value of a liquid fuel using Bomb calorimeter (petrol, diesel, biodiesel etc)
6. Determination of cloud point and pour point of a lubricant
7. Determination of flash and fire point of diesel.
8. Aniline Point of diesel
9. Viscosity Index of lubricants and Fuels by Viscometer
10. Flue gas analysis by Orsat’s gas analysis method — Demonstration
11. Working of internal combustion engine - Demonstration

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

2. Engineering Chemistry, Wiley India Editorial Team, Willey India Publisher, New Delhi, 2011.
OUTCOMES:

The students will be able to

- compare and contrast the solid, liquid and gaseous fuels and also describe the processes involved in liquid and gaseous fuels.
- analyse the fuel properties such as moisture, volatile matter, ash content, calorific value etc.
- calculate minimum air required for complete combustion and calorific values of fuels.
- Categorize different lubricants into three types, explain the preparation and determine their properties.
OBJECTIVES:
The students will be conversant with the
- various thermodynamic terms and relate the laws of thermodynamics in chemical processes
- molecularity and order of reaction and derive the rate constant for different order of reactions
- basics of adsorption of different materials and propose mechanisms and surface area measurement
- conditions for equilibrium and learn different components at equilibrium

MODULE I  BASIC THERMODYNAMICS  8
Introduction - Thermodynamic terms - Thermodynamic equilibrium and processes - 1st law of thermodynamics: internal energy, enthalpy, heat capacity, isothermal and adiabatic expansion, Joule-Thomson effect - Zeroth law of thermodynamics: absolute temperature - 2nd law of thermodynamics: spontaneous and cyclic process, Entropy in isothermal, isobaric and isochoric processes, work and free energy function, Maxwell's relation - 3rd law of thermodynamics

MODULE II  CHEMICAL KINETICS  8
Rate of chemical reaction - order and molecularity of a reaction - Rate constant - kinetics of opposing, parallel and consecutive and chain reactions - isotope effects - effect of temperature on reaction rate - collision theory - absolute reaction rate theory - kinetics in enzyme catalysis

MODULE III  SURFACE SCIENCE AND CATALYSIS  8
Adsorption - adsorption isotherms - uni and bimolecular adsorption reactions - parahydrogen conversion - factors affecting adsorption ï Langmuir adsorption isotherm - Hinshelwood mechanism and Eley-Rideal mechanism with example - adsorption of gases on solids and surface area measurement by BET method - Terms in catalysis - homogeneous and heterogeneous and enzyme catalysis with example

MODULE IV  PHASE RULE  6
Terms involved - Conditions for equilibrium - application of phase rule to water, lead-silver system, freezing mixtures, thermal analysis: cooling curves.

PRACTICALS
1. Determination of the heat capacity of benzoic acid, internal energy of
combustion of camphor using Bomb calorimeter. Calculation of enthalpy of combustion and formation for camphor.

2. Determination of adsorption isotherm of (i) acetic acid on charcoal (ii) oxalic acid on charcoal.


4. Phase rule experiments with organic compounds: (i) naphthalene and p-dichloro benzene (ii) naphthalene and diphenyl (iii) m-dinitrobenzenzene and p-nitro toluene.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:


OUTCOMES:

The student will be able to

- calculate entropy, enthalpy and free energy change for different chemical processes
- calculate the rate constant for any chemical and biochemical processes
- differentiate the adsorption processes and calculate the surface area and predict the suitability of catalysts for different chemical processes
- predict the equilibrium conditions for water, alloys, freezing mixtures and draw the thermal curves for phase transition
OBJECTIVES:
To make students conversant with the
- basic principles of green chemistry and green technology.
- wastes that causes hazards to human health
- chemicals that harms our environment
- need for green processes in various industries

MODULE I  GREEN CHEMISTRY PROTOCOL 7
Need ï Significance ï 12 Principles with examples ï R4 model ï Life cycle analysis ï sustainable and cleaner production - Green Technology: definition, examples: CFC free refrigerants, green building, energy, 3D printers, nanotechnology ï Awards for Green chemistry ï organization promoting green chemistry.

MODULE II  WASTE & WASTE MINIMISATION 8

MODULE III  GREEN SYNTHESIS 7
Introduction - Solvent free reactions - green reagents, green solvents in synthesis - microwave and ultrasound assisted reactions ï supercritical fluid extraction ï green oxidation and photochemical reactions ï catalyst and biocatalysts.

MODULE IV  GREEN INDUSTRIAL PROCESSES 8

PRACTICALS
1. Synthesis of an ionic liquids (Ex: imidazolium) and testing the solubility of organic chemicals.
2. Green bromination of stilbene (using pyridine hydrobromide).
4. Microwave assisted chemical reaction. (synthesis of aspirin, pinacol-pinacolone reaction, etc).
5. Comparison of conventional reaction with microwave assisted reactions (atom economy, solvent, etc) [Ex: aldehyde and ketones with hydrazines to give hydrazones].
6. Diels-Alder reaction in eucalyptus oil (green process).

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
The students will be able to
- outline the principles and implications of green chemistry.
- comprehend the potential risks of waste generated and analyse the threats to human and environment.
- integrate information into design of molecules to avoid/eliminate toxic solvents & reagents or reduce toxic products.
- identify various alternate greener technologies for various industries.
OBJECTIVES:
To make students conversant with the
- basic concepts in organic chemistry
- types and structure of carbohydrates and lipids
- formation of different structures of proteins from amino acid
- structure of nucleic acids

MODULE I  BASIC CONCEPTS IN ORGANIC CHEMISTRY  8
Classification and IUPAC nomenclature of organic compounds, stereochemistry, optical, stereo and geometrical isomerism, types of reagents: electrophiles and nucleophiles, types of reactions: addition, substitution, elimination and rearrangement reactions.

MODULE II  CARBOHYDRATES, LIPIDS AND VITAMINS  7

MODULE III  AMINO ACIDS, PEPTIDES AND PROTEINS  7

MODULE IV  NUCLEIC ACIDS  8

PRACTICALS
1. Qualitative tests to identify carbohydrates.
2. Quantitative estimation of carbohydrates.
3. Separation of sugars - TLC and/or paper chromatography.
5. Separation of amino acids - TLC and/or paper chromatography.
REFERENCES:

OUTCOMES:
The students will be able to
- classify organic compounds and explain the mechanism of various organic reactions.
- draw the structures and enumerate the functions of carbohydrate, lipids and vitamins.
- correlate the relationship among amino acids, peptides and proteins.
- recognize the role of nucleic acid in the formation of RNA & DNA and differentiate DNA & RNA using their structure and function.
OBJECTIVES:
To make the student conversant with the
➢ basic concepts of polymers, classification, types of polymerization and molecular weight & its distribution
➢ preparation, properties and applications of thermoplastics and introduction to biodegradable polymers
➢ properties and applications of thermosets, elastomers and FRP
➢ different types of moulding techniques

MODULE I   BASIC CONCEPTS OF POLYMERS   8
Definitions: monomer, polymer, functionality, degree of polymerization ✓ classification of polymers: source, structure, application, thermal processing behavior (thermoplastics and thermosets), composition and structure (addition and condensation), mechanism (chain growth and step-wise growth) ✓ copolymer: types ✓ Definition ✓ nomenclature of polymers ✓ tacticity ✓ types of polymerization: free radical, cationic and anionic polymerization (concepts only) ✓ average molecular weight of polymer: number, weight ✓ molecular weight distribution (problems)

MODULE II   THERMOPLASTICS AND BIODEGRADABLE POLYMERS   8
Preparation, properties and applications: LDPE, HDPE, polypropylene, PVC, PTFE, PET, polyamides (Nylon-6 and Nylon 6,6) and polycarbonates ✓ polymer blends and alloys ✓ basics of biodegradable polymers.

MODULE III   THERMOSET RESINS, ELASTOMERS AND FRP   7
Thermoset resins: phenolic resins, amino resins (urea and melamine formaldehyde), epoxy resins, unsaturated polyesters ✓ polyurethanes ✓ elastomers: vulcanization of natural rubber, diene based elastomers ✓ fibre reinforced plastics: glass, aramid and carbon.

MODULE IV   MOULDING TECHNIQUES   7
Moulding constituents: functions ✓ moulding techniques: compression, injection, extrusion (single screw), blow moulding, thermoforming, (mechanical and vacuum forming), lamination.

PRACTICALS
1. Determination of molecular weight and degree of polymerization using Oswald’s viscometer.
2. Free radical polymerization of styrene.
3. Free radical polymerization of PMMA.
4. Preparation of phenol-formaldehyde.
5. Preparation of urea-formaldehyde.
7. Synthesis of unsaturated polyester.
8. Preparation of FRP laminates.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
The student will be able to
- classify various polymers, name the polymers and types of polymerization reactions, calculate molecular weight of polymers,
- summarise preparation, properties and applications of thermoplastics and give examples of biodegradable polymers
- elaborate the properties and applications of thermosets, elastomers and FRP
- select the appropriate moulding technique for a given polymer, based on the application
Mathematics Electives – I
(to be offered in IV semester)

MACX 01 DISCRETE MATHEMATICS AND GRAPH THEORY

OBJECTIVES

The aims of this course are to

- introduce Logical and Mathematical ability to deal with abstraction.
- familiarize the basic mathematical ideas and terminologies used in computer science.
- translate real life situations into diagrammatic representations.

MODULE I PROPOSITIONAL CALCULUS 8+2

Propositions i Logical connectives i Compound propositions i Conditional and biconditional propositions i Truth tables i Tautologies and contradictions i Contrapositive i Logical equivalences and implications i DeMorgan’s Laws i Normal forms i Principal conjunctive and disjunctive normal forms i Rules of inference i Arguments i Validity of arguments.

MODULE II PREDICATE CALCULUS 7+3

Predicates i Statement function i Variables i Free and bound variables i Quantifiers i Universe of discourse i Logical equivalences and implications for quantified statements i Theory of inference i The rules of universal specification and generalization i Validity of arguments.

MODULE III FUNCTIONS 7+3

Functions i Classification of functions i Composition of functions i Inverse functions i Binary and n-ary operations i Characteristic function of a set i Hashing functions i Recursive functions i Permutation functions.

MODULE IV ALGEBRAIC SYSTEMS 8+2

Groups, Cyclic Groups, Subgroups, Cosets, Lagrange’s theorem, Normal subgroups i Codes and group codes i Basic notions of error correlation i Error recovery in group codes.
MODULE V  GRAPH THEORY  

Graphs — incidence and degree — subgraphs — isomorphism — complement of a graph — operations on graphs

MODULE VI  PATH AND CIRCUIT  

Walks, trails and paths — Eulerian graphs — Konigsburg bridge problem — Hamiltonian graphs

L – 45; T – 15; Total – 60

TEXT BOOKS


REFERENCES


OUTCOMES

At the end of the course, student will be able to

- use the concepts of propositional calculus.
- use the concepts of predicate calculus.
- identify types of functions and their importance.
- decode and encode the messages using group theory concepts.
- apply the basic concepts of graph theory.
- represent some real life situations into diagrammatic representation.
OBJECTIVES

The aims of this course are to impart:

- knowledge of the theory of probability and random variables
- techniques to carry out probability calculations and identifying probability distributions
- application of statistical inference in practical data analysis

MODULE I  BASICS OF PROBABILITY AND STATISTICS  8+2

Sample space, events- axioms of probability and interpretation ï Addition, multiplication rules ï conditional probability, Independent events - Total probability ï Bayeï’s theorem - Descriptive Statistics.

MODULE II  ONE DIMENSIONAL RANDOM VARIABLE AND PROBABILITY DISTRIBUTION FUNCTIONS  7+3

Discrete random variable ï continuous random variable ï Expectation - probability distribution - Moment generating function ï Binomial, Poisson, Geometric, Uniform (continuous), Exponential and Normal distributions.

MODULE III  TWO DIMENSIONAL RANDOM VARIABLES  8+2

Joint, marginal, conditional probability distributions ï covariance, correlation - transformation of random variables.

MODULE IV  SAMPLING AND ESTIMATION  7+3

Sampling distributions ï basic knowledge on Random, simple random, stratified and cluster samplings ï Test of Hypotheses - concepts- Point estimation and Interval estimation.

MODULE V  THEORY OF INFERENCES  8+2

Large sample tests ï test for single and difference on proportions, single mean, difference of means, difference of variances ï confidence intervals. Small sample tests ï Studentï’s t test, F test and Chi square test on theory of goodness of fit and analyses of independence of attributes.
MODULE VI DESIGN OF EXPERIMENTS
7+3

Analysis of variance (one way classification) and two way classification. Completely Randomised Block Designs, Randomised Block Design, Latin square designs - interpretations - case studies.

L – 45; T – 15; Total – 60

TEXT BOOKS


REFERENCES

3. Arora and Arora, "Comprehensive Statistical Methods" S. Chand, 2007

OUTCOMES

On completion of the course, students will be able to

- do basic problems on probability and descriptive statistics.
- derive the probability mass / density function of a random variable.
- calculate probabilities and derive the marginal and conditional distributions of bivariate random variables.
- calculate point and interval estimates.
- apply some large sample tests and small sample tests.
- carry out the data collection representation analysis and implications and the importance of inferences.
OBJECTIVES

The aims of the course are to

- acquire the knowledge of the theory of probability and random variables
- study discrete and continuous probability distributions.
- demonstrate the techniques of two dimensional random variables and its distributions.
- introduce the random process, stationarity, Markov process and the study of correlation function and spectral analysis.

MODULE I     BASICS OF PROBABILITY
7+3
Sample space, events - axioms of probability and interpretation \( \Omega \) Addition, multiplication rules \( \Omega \) conditional probability, Independent events - Total probability \( \Omega \) Bayes theorem - Tchebychev inequality.

MODULE II    ONE DIMENSIONAL RANDOM VARIABLE AND PROBABILITY DISTRIBUTION FUNCTIONS
7+3
Discrete random variable \( \Omega \) continuous random variable \( \Omega \) Expectation - probability distribution - Moment generating function \( \Omega \) Binomial, Poisson, Geometric, Uniform (continuous), Exponential and Normal distributions.

MODULE III TWO DIMENSIONAL RANDOM VARIABLES
7+3
Joint, marginal, conditional probability distributions - covariance, correlation and regression lines - transformation of random variables.

MODULE IV  RANDOM PROCESSES  8+2
Classification of Random process - Stationary process - WSS and SSS processes - Poisson process \( \Omega \) Markov Chain and transition probabilities.

MODULE V   CORRELATION FUNCTIONS  8+2
Autocorrelation function and its properties - Cross Correlation function and its properties - Linear system with random inputs \( \Omega \) Ergodicity.
MODULE VI  SPECTRAL DENSITY  8+2

L – 45; T – 15; Total – 60

TEXT BOOKS


REFERENCES


OUTCOMES

On completion of the course, students will be able to

- do basic problems on probability.
- derive the probability mass / density function of a random variable.
- calculate probabilities and derive the marginal and conditional distributions of bivariate random variables.
- identify and study the different random processes.
- compute correlation functions and related identities.
- compute power spectral density functions and apply Weiner-Khinchine formula.
OBJECTIVES

The aims of the course are to

- introduce basic computational methods for analyzing problems that arise in engineering and physical sciences.
- acquire knowledge about approximation theory and convergence analysis associated with numerical computation.

MODULE I  NUMERICAL SOLUTIONS OF EQUATIONS  7+3


MODULE II  INTERPOLATION  8+2

Finite difference operators - Gregory Newton’s forward and backward interpolations - Cubic spline interpolation - Lagrange interpolation - Newton’s divided difference formula.

MODULE III  NUMERICAL DIFFERENTIATION AND INTEGRATION  8+2

Numerical differentiation using Newton’s forward and backward formulae - Numerical integration: Trapezoidal and Simpson’s 1/3 and 3/8 rules - Romberg’s method - Gaussian Two Point and Three Point Quadrature formulae - Double integrals using Trapezoidal and Simpson’s 1/3 rule.

MODULE IV  INITIAL VALUE PROBLEMS FOR FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS  7+3

Numerical solutions by Taylor’s Series method, Euler’s method, Modified Euler’s Method - Runge Kutta Method of fourth order - Milne’s and Adam’s Bashforth Predictor and Corrector methods.

MODULE V  INITIAL AND BOUNDARY VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  8+2

Numerical solutions by Taylor’s Series method - Runge Kutta Method of fourth order of second order ODE. Finite difference methods.
MODULE VI  BOUNDARY VALUE PROBLEMS FOR PARTIAL DIFFERENTIAL EQUATIONS  

Finite difference solution of one dimensional heat equation by explicit and implicit methods i One dimensional wave equation and two dimensional Laplace equation.

L – 45; T – 15; Total – 60

TEXT BOOKS

REFERENCES

OUTCOMES
At the end of this course, students will be able to

- solve algebraic, transcendental and system of equations.
- apply interpolation techniques.
- carry out numerical differentiation and integration using different methods.
- solve first order ODE using single and multi step methods.
- solve second order ODE, initial and boundary value problems.
- solve the boundary value problems in PDE.
Mathematics Electives – I
(to be offered in IV semester)

MACX 05 MATHEMATICAL PROGRAMMING

OBJECTIVES
The aims of the course are to

- acquire knowledge and training in optimization techniques.
- obtain knowledge about optimization in utilization of resources.
- understand and apply operations research techniques to industrial operations.

MODULE I  LINEAR PROGRAMMING PROBLEM 10

MODULE II  ADVANCED LINEAR PROGRAMMING PROBLEMS 8

MODULE III  TRANSPORTATION PROBLEM 7
Transportation problems – Initial basic feasible solutions, MODI method, Unbalanced transportation problem, Degeneracy in transportation models.

MODULE IV  ASSIGNMENT PROBLEM 5
Assignment problem – Minimization and Maximization type of problems by Hungarian method.

Total-30

TEXT BOOKS
REFERENCE

OUTCOMES
At the end of the course, students will be able to

- formulate industrial problems as mathematical programming problems.
- solve linear programming problems by different methods.
- solve transportation problems by different methods.
- solve assignment problems by Hungarian method.
OBJECTIVE

The aim of the course is to

- introduce statistical quality control tools.

MODULE I   TESTS OF HYPOTHESES AND STATISTICAL INFERENCES     8

Small sample tests i Student’s t test for single mean, difference of means, paired t test F test for difference of variances Chi square test on theory of goodness of fit and analyses of independence of attributes.

MODULE II   DESIGN OF EXPERIMENTS   7

Analysis of variance one way classification two way classification Completely Randomised Block Designs Randomised Block Design Latin square designs - Statistical analysis - Interpretations - case studies.

MODULE III   STATISTICAL QUALITY CONTROL-I   8

Quality improvement and statistics Statistical quality control- statistical process control control charts design of control charts analysis of patterns on control charts - X bar chart, R chart and S chart.

MODULE IV   STATISTICAL QUALITY CONTROL-II   7


Total-30

TEXT BOOKS


REFERENCE


OUTCOMES

On completion of the course, students will be able to

- develop and test hypothesis for different statistical tests
- design an experiment and case study the experiment with different data.
- analyze the industrial data using quality control design tools statistically.
- analyze the industrial data using process and product control tools statistically.
MACX 07 NUMERICAL METHODS FOR INTEGRATION AND DIFFERENTIAL EQUATIONS

OBJECTIVE

- This course aims to solve numerically integral and differential equations.

MODULE I NUMERICAL INTEGRATION

Numerical integration by trapezoidal and Simpson’s 1/3 and 3/8 rules - Romberg’s method - Two Point and Three point Gaussian quadrature formulae.

MODULE II NUMERICAL DOUBLE INTEGRATION

Double integrals using trapezoidal and Simpson’s 1/3 rules.

MODULE III NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Milne’s Predictor and Corrector Method - Adam’s Predictor-Corrector Method - Finite difference methods for two point Boundary Value problems for Ordinary Differential Equations.

MODULE IV BOUNDARY VALUE PROBLEMS FOR PARTIAL DIFFERENTIAL EQUATIONS

Finite difference solution of one dimensional heat equation by explicit and implicit methods - One dimensional wave equation and two dimensional Laplace and Poisson equations.

Total: 30

TEXT BOOKS


REFERENCES


OUTCOMES

At the end of the course students will be able to

- solve the integration by numerical methods.
- solve the double integration by numerical methods
- find numerical solution of ordinary differential equations in engineering problems.
- find numerical solution of partial differential equations in engineering problems.
OBJECTIVES

The aims of the course are to

- provide basic idea of formation and use of Mathematical models for different purposes.
- determine the extent to which models are able to replicate real-world phenomena under different conditions

MODULE I  PRINCIPLES OF MATHEMATICAL MODELING  7

Mathematics as a modelling language - Classification of models - Building, studying, testing and using models - Black and white box models - Difference equations

MODULE II  PHENOMENOLOGICAL MODELS  7

Linear, Multiple linear and nonlinear regression - Neural networks - Fuzzy model - Stability and higher dimensional systems

MODULE III  MECHANISTIC MODELS –I  8

Setting up ODE models - Initial and Boundary value problems - Numerical solutions - Fitting ODE to data - Applications

MODULE IV  MECHANISTIC MODELS –II  8

Linear and nonlinear equations - Elliptic, parabolic and hyperbolic equations - Closed form solutions - Finite difference and finite element methods

Total-30

TEXT BOOKS

1. G. Ledder, "Calculus, modelling, probability and dynamic systems" Springer 2013
REFRENCES

2. Alfio Quarteroni, "Mathematical models in science and engineering" Notices of AMS

OUTCOMES

On completion of the course, the students will be able to

- identify the relationship between real world and mathematical models
- Classify the data and choose the appropriate model
- Distinguish between linear and nonlinear models
- identify the relationship between empirical and mechanistic models
OBJECTIVES

The aims of this course are to

- represent the real life situations diagrammatically.
- appraise different methods to find solutions to graph theory problems.

MODULE I  INTRODUCTION TO GRAPH THEORY  8
Graphs - finite and infinite graphs - Incident and degree-isolated vertex, pendent vertex and null vertex.

MODULE II  PATH AND CIRCUIT  8
Isomorphism ċ sub graphs-walks, paths and circuits ċ connected and disconnected graphs ċ Euler graphs ċ operation on a graph.

MODULE III  TREES AND FUNDAMENTAL CIRCUITS  7
Trees- some properties of trees- pendent vertices in a tree ċ rooted binary tree- spanning trees-fundamental circuits.

MODULE IV  CUT SETS AND CUT VERTICES  7
Cut sets ċ some properties of cut sets- fundamental circuits and cut sets-network flows.

Total-30

TEXT BOOKS

1. NARSINGH DEO, Graph theory with applications to Engineering and Computer Science, Prentice Hall INC, New Delhi,
2. J.A. Pondy and U.S.R. Murthy, North Holland, Oxford, New York Graph theory with applications

REFERENCES

OUTCOMES

At the end of the course, students will be able to

- demonstrate the basic concepts of Graph theory.
- explore connected and disconnected graphs.
- identify the real life problems with trees and circuits.
- bring out the cut set properties and network flows properties.
Humanities Elective I

SSCX01 – FUNDAMENTALS OF ECONOMICS

Course objectives:

- To identify and present the basic concepts of demand, supply and equilibrium.
- To explain and discuss the types and concepts of national income and inflation.
- To illustrate the fundamental concepts of money, banking and public finance.
- To apprise the students about Indian economy and the role of engineers in economic development.

MODULE I    DEMAND AND SUPPLY ANALYSIS  8

MODULE II   NATIONAL INCOME AND INFLATION  7
Concepts of National income and measurement - Importance and difficulties of estimating National Income in India - Aggregate demand and aggregate supply, Macroeconomic equilibrium - meaning of inflation- types - causes and preventive measures.

MODULE III  MONEY, BANKING AND PUBLIC FINANCE  9

MODULE IV  INDIAN ECONOMY AND THE ROLE OF ENGINEERS  6
Economic reforms – Liberalization, Privatization and Globalization - challenges and opportunities, Engineers – Engineers' contributions to the economic growth.

Periods: 30
Outcomes:

On successful completion of this course,

- Students will have had exposure to the basic concepts of demand, supply and various pricing strategies.
- Students will have understood the macroeconomic concepts of national income and inflation.
- Students will be able to apply the knowledge of money, banking and public finance in their real life situations.
- Students will have an overview of the economic reforms introduced in Indian economy.

Reference Books:


*****
SSCXO2 – PRINCIPLES OF SOCIOLOGY.

Course Objectives:  

- To acquaint the students with Concepts and perspectives of Sociology

- To explain the reflection of society in Individuals and vice versa

- To describe the hierarchical arrangement of individuals and groups in society

- To explicate the dimensions, forms and factors of Social change.

- To examine the context, impact and agencies of Globalization

MODULE I  THE FOUNDATIONAL CANON

Sociology-Definition, scope and importance; Major theoretical perspectives-Functionalism, Conflict Theorising and Interactionism; Elements of social formation-Society, Community, Groups and Association; Associative Social Process- Co-operation, Accommodation and Assimilation; Dissociative Social Process- Competition and Conflict.

MODULE II INDIVIDUAL AND SOCIETY

Culture-definition, characteristics, functions, types, cultural lag and civilization, Socialization- definition, process, stages, agencies and anticipatory socialization; Social Control- definition, characteristics, importance, types & agencies.

MODULE III SOCIAL INEQUALITY AND STRATIFICATION


MODULE IV SOCIAL CHANGE AND GLOBALIZATION

Social Change-definition, nature, direction; Forms- evolution, development, progress and transformation; Factors of social change- demography, economy, technology, polity and culture. Globalization- definition, characteristics, historical
and social context and Impact, agencies of globalization- IGOs, INGOs, Nation-State, MNEs and Media

Total: 30 Hours

OUTCOMES:

On successful completion of this course,

- Students will have exposure to the fundamentals tenets of Sociology.
- Students will be trained to understand social reality with sociological perspective.
- Students will be oriented to constructively analyze human interactions, social relationship and social issues
- Students will gain exposure to the dynamics of human society with special reference to the contemporary trends of globalization.

Textbooks


References

- Das Gupta, Samir and Paulomi Saha (2012), An Introduction to Sociology Pearson, Delhi
SOCIETY OF INDIAN SOCIETY.

Course Objectives:
- To present a portrayal of the components of the Indian Social structure
- To describe the nature and contemporary structure of Indian social Institutions.
- To examine the causality and magnitude of social problem facing the contemporary India.
- To elucidate the processes forms and impact of change and development in Indian society

MODULE I INDIAN SOCIAL STRUCTURE
Unity and Diversity; Concepts of unity and diversity- racial, religious, ethnic and linguistic composition of India. Types of communities-rural, urban and tribal; Social backwardness- OBC, SC and ST; Indian minorities- religious, ethnic, linguistic and LGBT

MODULE II INDIAN SOCIAL INSTITUTIONS
Family- definition, types, characteristics, functions of family; Joint Family- definition features, utility, changes; Marriage- definition, characteristics, marriage as sacrament or contract. Caste- definition, principles, contemporary changes, dominant caste, caste -class interface.

MODULE III SOCIAL PROBLEMS IN INDIA
Social Problem-definition, nature, social disorganization; Population explosion-causes, effects, relationship with development; Child Labour- causes, magnitude and consequences; Unemployment-nature , types, causes and effects; Gender issues- social status of women, violence against women and women in work place; Contemporary issues- communalism, terrorism and corruption.

MODULE IV SOCIAL CHANGE AND DEVELOPMENT IN INDIA
Socio-cultural Change- Sanskritization, Westernization, Secularization, Modernization; Processes of Social change- Industrialization, Urbanization, Globalization; Development- definition, elements, role of government, industry and corporate sector. Technology and change- invention and innovation, impact of technology on social institutions, technology and development.

Total: 30 Hours
OUTCOMES:

On successful completion of this course,

- Students will gain an in-depth understanding of the social structure and social institutions that constitute society in India.
- Students will be sensitized to the various categories, inequalities and their challenges.
- Students will be exposed to the social problems encountered in contemporary India.
- Students will gain knowledge about the various forms and trends of the social change.
- Students will become aware about the challenges in the path of progress of Indian society and realize relevance of their role in bringing about development.

Textbooks


Reference Books:

IV Semester Electives (3 Credits)

Humanities Elective – II

SSCXO4– ECONOMICS OF SUSTAINABLE DEVELOPMENT

L T P C
2 0 0 2

Objectives:
1. To have an increased awareness on the concept and components of sustainable development.
2. To develop the ability to demonstrate the need of sustainable development and international responses to environmental challenges.
3. To have an insight into global environmental issues and sustainable globalization.
4. To establish a clear understanding of the policy instruments of sustainable development.

MODULE I CONCEPT OF SUSTAINABLE DEVELOPMENT

Evolution of the Concept ï Rio Summit and sustainable development - various definitions of sustainable development - Components of sustainable development: Social, environmental and economic components.

MODULE II NEED FOR SUSTAINABLE DEVELOPMENT

Need for sustainability ï Global environmental challenges: population growth, resource depletion, pollution, energy use, climate change, pollution, growing water scarcity, other urban problems, loss of biodiversity, hazardous wastes disposal.

International responses to environmental challenges - Global policy such as Kyoto Protocol, Montreal Protocol, Basel Convention.

MODULE III GLOBALIZATION AND ENVIRONMENT SUSTAINABILITY


MODULE IV POLICIES FOR ACHIEVING SUSTAINABLE DEVELOPMENT

regulation \text{ and} \text{ market based pollution control instruments such as pollution tax, subsidy, pollution permits.}

\textbf{Periods: 30}

\textbf{Course Outcomes}

At the end of the course, the students will

1. The students will have understood the concepts and components of sustainable development.
2. The students will have a holistic overview on the challenges of sustainable development and International responses to environmental challenges.
3. The students will have gained knowledge on the global environment issues and demonstrate responsible globalization through global governance.
4. The students will have developed awareness of the ethical, economic, social and political dimensions that influence sustainable development.

\textbf{References:}


******
SSCX05 – INDUSTRIAL SOCIOLOGY

Course Objectives:
- To introduce sociological approaches and perspectives to understand the social relationship in manufacturing industries and corporate sector.
- To explain the structure and functions of industrial organizations.
- To elucidate the dynamics of organizational behavior, leadership and communication.
- To inculcate professional ethics and values to equip students to work in organizational settings.

MODULE I INTRODUCTION

Industrial Sociology- definition, scope and importance; Theoretical approaches- scientific management, human relations approach, theory of bureaucracy, Fordism and post-fordism; Production system- concept and characteristics of factory system, automation and rationalization; Industrial conflict- strike, lockout and trade unions

MODULE II INDUSTRIAL ORGANIZATION

Formal organization- definition, features, utility; Informal organization- definition, characteristics, types and relevance; Structure of industrial organization- features and functions of line organization, characteristics and roles of staff organization, distinction; Industrial hierarchy-white collar, blue collar, supervisors and managers

MODULE III DYNAMICS OF INDUSTRIAL RELATIONS

Group dynamics- Definition, Group behaviour model, Group decision making process, group cohesiveness; Leadership- definitions, style and effective supervision; Communication- concepts, types, model barriers; Job satisfaction- nature, employee compensation and job satisfaction

MODULE IV PROFESSIONAL ETHICS AND VALUES


Total: 30 Hours
Textbook


Reference

- Robbins, Stephen, Organizational Behaviour, Prentice Hall of India PVT Ltd, New Delhi, 1985

OUTCOMES:

On successful completion of this course,

- Students will have acclimatized with sociological perspectives for dealing with social relationships in production and service organizations.
- Students will be familiar with structure of authority, roles and responsibility in organizational settings.
- Students will imbibe leadership, communication and behavioral acumen to govern organization.
- Students will be sensitized to standards of desirable behavior to engage in industrial and corporate sector.
Course objectives
- To understand the Constitution and Governance of our country.
- To apprise the students of human rights - local and international and redressal mechanism.
- To have an insight into the industrial, corporate and labour laws of our country.
- To establish a clear understanding about the importance of intellectual property related laws.

MODULE I - INDIAN CONSTITUTION AND GOVERNANCE 10

MODULE II - HUMAN RIGHTS 6

MODULE III – INDUSTRIAL, CORPORATE AND LABOUR LAWS 8

MODULE IV - LAWS RELATED TO IPR 6
IPR ï meaning and scope, International organization ï WIPO ï TRIPS, Major Indian IPR Acts ï Copyright laws, Patent and Design Act, Trademarks Act, Trade Secret Act, Geographical Indicator.

Periods: 30
Text Books:

References:

Outcomes:

On successful completion of the course

- Students will be able to apply the basic concepts of Indian Constitution, Governance and power in their real life situation.
- Students will have gained knowledge in human rights, cultural, social and political rights.
- Students will have synthesized knowledge about industrial, corporate and labour laws of our country.
- Students will have an overview of IPRs and laws related to Intellectual Property Rights.