B.S. Abdur Rahman Crescent Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

REGULATIONS 2017

CURRICULUM AND SYLLABI

B.Tech.

INFORMATION TECHNOLOGY

VISION AND MISSION OF THE INSTITUTION

VISION

B.S. Abdur Rahman Crescent 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

- To blossom into an internationally renowned Institution
- To empower the youth through quality education and to provide professional leadership
- To achieve excellence in all its endeavors to face global challenges
- To provide excellent teaching and research ambience
- To network with global institutions of Excellence, Business, Industry and Research Organizations
- 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.

REGULATIONS - 2017

B.TECH. DEGREE PROGRAMMES

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:

Assessment No.	Course Coverage in Weeks	Duration	Weightage of Marks
Assessment 1	1 to 6	1.5 hours	25%
Assessment 2	7 to 12	1.5 hours	25%
Semester End Exam	Full course	3 hours	50%

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 "I" grade in that course. The cases in which the student is awarded "I" 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 'I' 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 "I" or "W" grade is awarded. If the student is awarded, "I" or "W" 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 "U" 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 "U" 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 "U" 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 "U" 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:

Letter Grade	Grade Points
S	10
A	9
B	8
C	7
D	6
E	5
U	0
W	0
I	0
AB	0

"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 Ci, is the number of credits assigned for the i^{th} course and GPi is the Grade Point in the i^{th} course

$$GPA = \frac{\sum_{i=1}^{n}(C_i)(GPi)}{\sum_{i=1}^{n} C_i}$$

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 X 10

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

Classification	CGPA
First Class with Distinction	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
First Class	6.50 and above and completing the programme within a maximum of 10 semester for normal entry and 8 semesters for lateral entry
Second Class	Others

However, to be eligible for First Class with Distinction, a student should not have obtained ‘U’ or ‘I’ 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. Like wise 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.

B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY

B.TECH. INFORMATION & TECHNOLOGY

CURRICULUM & SYLLABUS, REGULATIONS 2017

SEMESTER I

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C	
1.	BS	MAC 1181	Differential Calculus and Geometry	3	1	0	4	
2.	HS	ENC 1181/ ISC 1181/ LNC 1181/ LNC 1182 / LNC 1183	English / Arabic / Mandarin / German / Japanese	3	0	0	3	
3.	BS	PHC 1181	Physics	3	0	2	4	
4.	BS	CHC 1181	Chemistry	3	0	2	4	
5.	ESF	GEC 1101	Engineering Graphics	2	0	2	3	
6.	ESF	GEC 1102	Engineering Design	2	0	0	2	
7.	ESF	GEC 1103	Basic Engineering Practices Laboratory	0	0	2	1	
8.	ESF	GEC 1104	Computer Programming I	1	0	2	2	**23**

SEMESTER II

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BS	MAC 1281	Advanced Calculus	3	1	0	4
2.	BS	-	Physics Elective	2	0	2	3
3.	BS	-	Chemistry Elective	2	0	2	3
4.	ESF	GEC 1211	Basic Engineering Mechanics	3	1	0	4
5.	BS	GEC 1212	Environmental Studies	2	0	0	2
6.	ESF	GEC 1213	Computer Programming II	1	0	2	2

7.	EC	ITC 1201	Digital Principles and Applications	2	0	2	3	
8.	EC	ITC1202	Programming in Python	2	0	2	3	**24**

SEMESTER III

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C	
1.	BS	MAC 2181	Partial Differential Equations and Transforms	3	1	0	4	
2.	HS	-	Humanities Elective I	2	0	0	2	
3.	HS	ENC 2181	Oral Communication	0	0	2	1	
4.	EC	ITC 2101	Data Structures	3	0	2	4	
5.	EC	ITC 2102	Computer Architecture	3	0	0	3	
6.	EC	ITC 2103	Computer Networks	3	0	0	3	
7.	EC	ITC 2104	Advanced Java & Internet Programming	3	0	0	3	
8.	EC	EEC2181	Fundamentals of Digital Signal Processing	1	0	0	1	
9.	EC	ITC 2106	Network Configuration Lab	0	0	3	1	
10.	EC	ITC 2107	Advanced Java & Internet Programming Lab	0	0	3	1	**23**

SEMESTER IV

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BS	-	Mathematics Elective I	3	1	0	4
2.	HS	-	Humanities Elective II	2	0	0	2
3.	HS	ENC2282	Written Communication	0	0	2	1
4.	EC	ITC2211	Unix and Shell Programming	2	0	2	3
5.	EC	ITC2212	Database Management System	3	0	0	3
6.	EC	ITC2213	Operating Systems	3	0	2	4
7.	EC	ITC2214	Software Engineering	3	0	0	3

8.	EC	ITC2215	DBMS Lab	0	0	3	1	
9.	PE		Programme Elective - I				3	**24**

SEMESTER V

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

SEMESTER VI

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	MS	MSC 3181 MSC 3182	Leadership and CEO Training/ Social Entrepreneurship	3	0	0	3
2.	BS	-	Mathematics Elective II	2	0	0	2
3.	HS	ENC3281	Communication and soft skill II Confidence Building	0	0	2	1
4.	EC	ITC3211	Software Testing	3	0	0	3
5.	EC	ITC3212	Cloud Computing Technologies	3	0	0	3
6.	EC	ITC3213	Distributed Computing	3	0	0	3
7.	EC	ITC3214	Open Source Technologies	1	0	2	2

8.	EC	ITC3215	Software Development Lab	0	0	3	1	
9.	PE	-	Programme Elective - III				6	**24**

SEMESTER VII

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

SEMESTER VIII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C	
1.	EC	ITC4211	Project Work	0	0	24	12	**12**

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 – I (3 CREDITS)

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

V SEMESTER ELECTIVES – II (6 CREDITS)

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	ITCX101	iOS Application Development	1	0	2	2
2.	PE	ITCX102	Oracle Database Programming	0	0	2	1
3.	PE	ITCX103	Natural Language Processing	3	0	0	3
4.	PE	ITCX104	Game Theory	3	0	0	3
5.	PE	ITCX105	Soft Computing	3	0	0	3
6.	PE	ITCX106	Machine Learning Algorithms	3	0	0	3
7.	PE	ITCX107	C# and .NET Framework	3	0	2	4
8.	PE	ITCX108	Artificial Intelligence	3	0	0	3
9.	PE	ITCX109	Grid Computing	3	0	0	3

10	PE	ITCX110	Information Coding Techniques	3	0	0	3
11	PE	ITCX111	Mobile AdHoc Networks	3	0	0	3

VI SEMESTER ELECTIVES – III (6 CREDITS)

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

VII SEMESTER ELECTIVES – IV (9 CREDITS)

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	ITCX117	Cloud Middleware Tools	1	0	2	2
2.	PE	ITCX118	Big Data Tools & Technologies	1	0	2	2
3.	PE	ITCX119	Forensic Tool Kits	0	0	2	1
4.	PE	ITCX120	MongoDB for Java developers	0	0	2	1

5.	PE	ITCX121	Green Computing	0	0	2	1
6.	PE	ITCX122	XML Technologies	0	0	2	1
7.	PE	ITCX123	Big Data Analytics	3	0	0	3
8.	PE	ITCX124	Programming in Scala	0	0	2	1
9.	PE	ITCX125	R Programming	1	0	2	2
10.	PE	ITCX126	Virtual Reality	2	0	2	3
11.	PE	ITCX127	Software Quality Management	3	0	0	3
12.	PE	ITCX128	Cloud Forensics	3	0	0	3
13.	PE	ITCX129	Networking Simulators	0	0	2	1
14.	PE	ITCX130	Enterprise Resource Planning	3	0	0	3
15.	PE	ITCX131	Embedded System	3	0	0	3

Physics Elective Courses

(To be offered in II Semester)

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

Chemistry Elective Courses

(To be offered in II Semester)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	CHCX01	Analytical Instrumentation	2	0	2	3
2.	CHCX02	Corrosion and its Control	2	0	2	3
3.	CHCX03	Electrical Materials and Batteries	2	0	2	3
4.	CHCX04	Engineering Materials	2	0	2	3
5.	CHCX05	Fuels and Combustion	2	0	2	3
6.	CHCX06	Fundamentals of Physical Chemistry	2	0	2	3
7.	CHCX07	Green Technology	2	0	2	3
8.	CHCX08	Organic Chemistry of Biomolecules	2	0	2	3
9.	CHCX09	Polymer Science and Technology	2	0	2	3

Maths Elective Courses

(To be offered in IV Semester)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	MACX 01	Discrete Mathematics And Graph Theory	3	1	0	4
2.	MACX 02	Probability And Statistics	3	1	0	4
3.	MACX 03	Random Processes	3	1	0	4
4.	MACX 04	Applied Numerical Methods	3	1	0	4

Maths Elective Courses

(To be offered in VI Semester)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	MACX 05	Mathematical Programming	2	0	0	2
2.	MACX 06	Statistical Methods for Data Analysis	2	0	0	2
3.	MACX 07	Numerical Methods for Integral and Differential Equations	2	0	0	2
4.	MACX 08	Mathematical Modelling	2	0	0	2
5.	MACX 09	Graph Theory	2	0	0	2

Humanities Elective I

(To be offered in III Semester)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	SSCX01	Fundamentals of Economics	2	0	0	2
2.	SSCX02	Principles of Sociology	2	0	0	2
3.	SSCX03	Sociology of Indian Society	2	0	0	2

Humanities Elective II

(To be offered in IV Semester)

Sl. No.	Course Code	Course Title	L	T	P	C
1.	SSCX04	Economics of Sustainable Development	2	0	0	2
2.	SSCX05	Industrial Sociology	2	0	0	2
3.	SSCX06	Law for Engineers	2	0	0	2

General Elective

Group I Courses

(To be offered in V semester)

Sl. No.	Course Code	Course Title	Offering Department
1.	GECX101	Disaster Management	Civil
2.	GECX102	Total Quality Management	Mechanical
3.	GECX103	Energy Studies	Mechanical
4.	GECX104	Robotics	Mechanical
5.	GECX105	Transport Management	Automobile
6.	GECX106	Control Systems	EEE
7.	GECX107	Introduction to VLSI Design	ECE
8.	GECX108	Plant Engineering	EIE
9.	GECX109	Network Security	CSE
10.	GECX110	Knowledge management	CSE
11.	GECX111	Cyber security	IT
12.	GECX112	Genetic Engineering	LS
13.	GECX113	Fundamentals of Project Management	CBS
14.	GECX114	Operations Research	Mathematics
15.	GECX115	Nano Technology	Physics / Chemistry
16.	GECX116	Vehicle Maintenance	Automobile
17.	GECX117	Fundamentals of Digital Image Processing	ECE

Group II Courses

(To be offered in VII semester)

Sl. No.	Course Code	Course Title	Offering Department
1.	GECX201	Green Design and Sustainability	Civil
2.	GECX202	Appropriate Technology	Civil / Mechanical
3.	GECX203	Engineering System Modelling and Simulation	Mechanical
4.	GECX204	Value Analysis and Engineering	Mechanical
5.	GECX205	Industrial Safety	Mechanical
6.	GECX206	Advanced Optimization Techniques	Mechanical
7.	GECX207	Mat Lab Simulation	EEE
8.	GECX208	Embedded Systemsand its Applications	ECE
9.	GECX209	Usability Engineering	CSE
10.	GECX210	Supply Chain Management	CBS
11.	GECX211	System Analysis and Design	CA
12.	GECX212	Advanced Materials	Physics & Chemistry
13.	GECX213	National Service Scheme	School of Humanities
14.	GECX214	Automotive Pollution and Control	Automobile
15.	GECX215	Motor Vehicle Act, Insurance and Policy	Automobile
16.	GECX216	Principles of Communication Systems	ECE
17.	GECX217	Lean Management	Civil
18.	GECX218	Spatial Data Modeling & Analysis	Civil

SEMESTER I

MAC 1181	DIFFERENTIAL CALCULUS AND GEOMETRY	L	T	P	C
		3	1	0	4

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** **8+2**

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** **7+3**

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** **7+3**

Curvature – Cartesian and polar coordinates – centre and radius of curvature – circle of curvature – involutes and evolutes – envelopes.

MODULE IV **DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES** **8+2**

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** **8+2**

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** **7+3**

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:

1. Ramana, B.V, "Higher Engineering Mathematics" Tata McGraw Hill Publishing Co. New Delhi, 2006.
2. Grewal B.S., "Higher Engineering Mathematics" (43rd edition), Khanna Publishers, New Delhi, 2012.
3. John W. Cell "Engineering Problems Illustrating Mathematics" Mc Graw Hill Publishing Co., New York 1943.

REFERENCES:

1. Veerarajan.T., "Engineering Mathematics" (5th edition) Tata Mc Graw Hill Publishing Co. New Delhi, 2012
2. Kreyszig, E., "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2011.
4. Dennis G. Zill, Warren S. Wright, "Advanced Engineering Mathematics", 4th edition, Jones and Bartlett publishers, Sudbury, 2011.
5. Alan Jeffrey, "Advanced Engineering Mathematics", Academic Press, USA, 2002.
6. Venkataraman, M.K., "Engineering Mathematics", Volume I, 2nd edition, National Publishing Co., Chennai, 2003.
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 eigen values 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	L	T	P	C
		3	0	0	3

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 **8**

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 **8**

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 "Wh" and question tags.

MODULE III **7**

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 **7**

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 **8**

L : Understanding Non- Verbal Communications while listening to narration of incidents.

S: Narrating an expereince

R: Inferential Reading

W: Process Description – Transcoding a Flow chart.

Language Focus: Interchange of Active & passive voice, Impersonal Passive voice.

MODULE VI **7**

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:

1. Carol Rosenblun perry(2011). The Fine Art of Technical Writing. Create Space Independent Publishing Platform, New Delhi.
2. Dutt, P.K. Rajeevan. G and Prakash , C.L.N. (2007) A course in Communication Skills. Cambridge Univesity Press, India.
3. Kala, Abdul & Arun Tiwari (2004). Wings of Fire: An Autobiography (Simplified and A bridged by Mukul Chowdhri). Hyderabad Univeristy Press.
4. Sen, Leena. (2004) Communication Skills. Prentice Hall, New Delhi.

5. Matt Firth, Chris Sowton et.al. (2012). Academic English: An Integrated Skills Course for EAP. Cambridge University Press, Cambridge.

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.

ISC1181	ARABIC	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

MODULE I PREPARATORY ARABIC **7**

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 **7**

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

MODULE III FUNCTIONAL ARABIC **8**

Implication of effective listening.
Audio aids.
Writing Simple sentences.
Communicating ordinal and cardinal numbers.
Situational communication:

Playground, library.
Forms of plural – Sample sentences.
Introduction to tenses.
Exercises.

MODULE IV FUNCTIONAL ARABIC 8

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

MODULE V TECHNICAL ARABIC 8

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 7

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:

- Write correct sentences in Arabic.
- 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:

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

MODULE I **8**

· General Introduction to Chinese • Pinyin and Tones • Introduction to the Writing System: basic strokes and stroke order · Numbers 1-100, song · Days of the Week · Months of the Year

MODULE II **8**

· Chinese names and related culture · Chinese family structures and values · Greetings · Introducing Yourself · Family members · Occupations

MODULE III **7**

· Languages and Nationalities · Daily Routine · Chinese breakfast · Negative Sentences and Interrogative Sentences · Asking for Personal Information · The Verb *shi* and Basic Sentence Structures

MODULE IV **7**

· Answering an Affirmative-negative Question · Food and drinks · Transportation · Likes and dislikes · Adverbs *bu*, *jiu* and *dou* · Verb-absent Sentences

MODULE V **8**

·*Jisui* and *duoda* Questions · S+V+O Construction · Routines and Daily Activities ·*Haishi* Questions · Modal Verbs · Hobbies and Habits

MODULE VI **7**

· Making Suggestions with *haoma* ·Colors · Clothing · Body parts · Talking about Likes and Dislikes · Measurement Words in Chinese

TOTAL HOURS :45

TEXT BOOKS:

1.Ma, Yanmin, and Li, Xinying. *Easy Steps to Chinese, Vol*. *1 Textbook*. Beijing: Beijing Language and Culture University Press, 2006. Print.

2. Ma, Yanmin, and Li, Xinying. *Easy Steps to Chinese, Vol. 1 Workbook*. Beijing: Beijing Language and Culture University Press, 2006. Print.

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 **8**

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 **8**

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

MODULE III **7**

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

MODULE IV **7**

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

MODULE V **8**

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

MODULE VI **7**

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

TEXT BOOKS:

1. Course book : Tangram aktuell 1 – Lektion 1–4 (Kursbuch + Arbeitsbuch mit Audio-CD zum Arbeitsbuch), Rosa-Maria Dallapiazza, Eduard von Jan, Til Schönherr, Hueber Publisher, ISBN 978-3-19-001801-7

2. Practice book: Tangram aktuell 1 – Lektion 1–4 (Kursbuch + Arbeitsbuch mit Audio-CD zum Arbeitsbuch), Rosa-Maria Dallapiazza, Eduard von Jan, Til Schönherr, Hueber Publisher, ISBN 978-3-19-001801-7.

REFERENCES:

1. NETZWERK A1 TEXTBOOK, Deutsch als Fremdsprache,Stefanie Dengler,Paul Rusch, Helen Schmitz, Tanja Sieber, Langenscheidt and Klett, ISBN : 9788183076968

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

3. Willkommen! Beginner's course. Paul Coggle, Heiner Schenke. 2nd edition. (chapter 1 - 6) ISBN: 9781444165159 –

4. Willkommen! Beginner's course. Paul Coggle, Heiner Schenke. ISBN: 978-1-444-16518-0

5. An Introduction to the German Language and Culture for Communication, Updated Edition Lovik, Thomas A., J. Douglas Guy & Monika Chavez. Vorsprung -. New York, Houghton Mifflin Company, 1997/2002. ISBN 0-618-14249-5.

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.

LNC1183	JAPANESE	L	T	P	C
		3	0	0	3

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 **7**

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

MODULE II **8**

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 **7**

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 **8**

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

MODULE V **7**

Comprehension of passages in simple Japanese and writing of composition in Japanese applying lower intermediate grammatical patterns.

MODULE VI **8**

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 :45

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
4. Japani: Japanese Conversation for Improving Spoken Proficiency, By P.A. George, Inoue Yoriko and Itsuko Nandi, Books Plus.
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.

PHC 1181	PHYSICS	L	T	P	C
		3	0	2	4

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 – Unit Cell – Seven Crystal Systems – Bravais Lattice – Miller Indices – Interplanar Spacing – 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 –Defects in crystals-Point defects –Edge and screw dislocations and their significance - Surface Defects.

MODULE II ULTRASONICS AND THERMAL PHYSICS **8**

Introduction to Ultrasonics - Properties - Production methods - Magnetostriction Oscillator method- Piezoelectric Oscillator method – Detection of Ultrasonics – Thermal method – Piezoelectric method – Kundt's tube method – Applications of Ultrasonics – Acoustic Grating – SONAR – Depth of sea – Velocity of blood flow, Ultrasonic Flaw detector (qualitative).

Transmission of heat – Conduction, Convection and Radiation – Thermal Conductivity of good Conductor – Forbe's method- Thermal Conductivity of bad Conductor – Lee's Disc method.

MODULE III APPLIED OPTICS **8**

Interference – Air Wedge – Michelson's Interferometer – Determination of wavelength of light and thickness of thin transparent sheet.

Introduction to Laser – Characteristics of Laser – Spontaneous and Stimulated Emissions – Einstein's Coefficients - Population inversion – Pumping Mechanism – Laser Action – Types of Laser: He-Ne laser, CO2 laser and Nd:YAG laser - Applications : Laser Materials

Processing .

MODULE IV FIBRE OPTICS 7

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

MODULE V QUANTUM MECHANICS 7

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 7

Present Energy sources and sustainability - Solar energy - Solar photovoltaics - Solar cells – Bioenergy - Biomass – production of liquid fuels from biomass – Wind energy – Wind turbines – energy and power from wind turbines - Geothermal energy - Ocean energy: Wave energy – Wave energy conversion devices – Tidal energy – Tidal power basics – power generation –Tidal energy potential – Environmental benefits and impacts of 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.
6. Determination of particle size of lycopodium powder using semiconductor laser.
7. Determination of wavelength of laser light using semiconductor laser diffraction.
8. Determination of Acceptance angle and Numerical Aperture using fiber optic cable.
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 :

1. Gaur R.K. and Gupta S.L., “Engineering Physics’’, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2013.
2. Palanisamy P.K., Physics for Engineers, Vol1 & Vol2, 2nd Edition, Scitech Publications, 2003.
3. Serway R.A. and Jewett, J.W. “Physics for Scientists and Engineers with Modern Physics”. Brooks/cole Publishing Co., 2010.
4. Tipler P.A. and Mosca, G.P., “Physics for Scientists and Engineers with Modern Physics”, W.H. Freeman, 2007.
5. Markert J.T., Ohanian. H. and Ohanian, M. “Physics for Engineers and Scientists”. W.W. Norton & Co. 2007.
6. Godfrey Boyle, “Renewable Energy: Power for sustainable future”, 2nd edition, Oxford University Press, UK, 2009.

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.

CHC1181	CHEMISTRY	L	T	P	C
		3	0	2	4

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 9

Impurities present in water, hardness : types of hardness, demerits of hard water in boilers, estimation of hardness by EDTA method (problems) – alkalinity : estimation of alkalinity (problems) – dissolved oxygen: estimation of dissolved oxygen – conditioning methods : external treatment method: – lime soda and zeolite process (principle only), Ion exchange process – Internal treatment : colloidal, carbonate, phosphate and calgon methods – drinking water: standards (BIS), treatment of domestic water {screening, sedimentation, coagulation, filtration, disinfection }– desalination: electrodialysis, reverse osmosis.

MODULE II NANOCHEMISTRY 6

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 8

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 – geothermal energy: geothermal resources (hot dry rock and magma resources, natural and artificial), advantages and disadvantages – wind energy: wind resources, wind turbines, advantages and disadvantages – ocean energy: wave energy, wave energy conversion devices, ocean thermal energy, advantages and disadvantages.

MODULE IV PHOTOCHEMISTRY 7

Introduction: absorption and emission, chromophores, auxochromes – laws of photochemistry : Grotthus-Draper law, Stark Einstein law – quantum yield (problems) –photo physical processes : fluorescence and phosphorescence - Jablonski diagram (electronic states and transitions) – quenching, annihilation – photosensitization: principle and applications – chemiluminescence, bioluminescence.

MODULE V ANALYTICAL TECHNIQUES 7

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

MODULE VI ELECTROCHEMISTRY 8

Electrochemistry - types of electrodes (principle and working) : gas (SHE), metal/metal ion electrode, metal-metal insoluble salt (calomel electrode), ion-selective (glass electrode and fluoride ion selective electrode) – 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 – 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.
8. Synthesis of thermosetting polymer.

L – 45; P – 30; TOTAL HOURS – 75

REFERENCES:

1. S. Vairam, P. Kalyani and Suba Ramesh, “Engineering Chemistry”, Wiley India Ltd., New Delhi, 2011.
2. G.A. Ozin and A.C. Arsenault, “Nanochemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, Thomas Graham House, Cambridge, 2005.
3. P.C Jain & Monica Jain, Engineering Chemistry Dhanpatrai Publishing Company (P) Ltd., New Delhi (2013).
4. S S Umare & S S Dara, A text Book of Engineering Chemistry, S. Chand& Company Ltd, New Delhi, 2014.
5. G.D.Rai, “Non conventional energy sources,” Khanna Publishers, New Delhi, 2011.
6. John Twidell and Tony Weir, “Renewable Energy Resources, Taylor & Francis Ltd, London, United Kingdom, 2005
7. Principles of molecular photochemistry: An introduction, Nicholas J. Turro, V.Ramamurthy and Juan C. Scaiano, University Science Books, Sausalito, CA, 2009.

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.

GEC 1101	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To introduce the students of all engineering programs, the basic concepts of engineering drawing, which is the basic communication medium for all engineers
- 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.
- 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 – first angle, second angle, third angle and fourth angle projections –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 – true length and true inclinations – Rotating line and trapezoidal methods –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 – 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 – sectional view – 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 – frustum of cone, pyramid and simple sheet metal parts.

MODULE VI PICTORIAL PROJECTIONS 10

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

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

L – 30; P – 30; TOTAL HOURS – 60

TEXT BOOKS:

1. N.D. Bhatt, 'Engineering Drawing' Charotar Publishing house, 53rd Edtion, (2014)

REFERENCES:

1. K.V. Natarajan, 'A text book of Engineering Graphics', Dhanalakshmi publishers, Chennai. (2009)
2. Venugopal. K, and V. Prabhu Raja, Engineering Graphics, New Age International (P) Ltd., Publication, Chennai. (2011)

OUTCOMES:

- Students should be able to read the specifications and standards of technical drawing and able to draw conic sections and special curves.
- 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.
- Students should be able to draw the orthographic views of straight lines and plane figures.
- Students should be able to draw the orthographic views of simple solids.
- Students should be able to draw the sections of solids and development of solid surfaces.
- 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 Reasoning”, 2nd Edition, Cambridge University Press, New Delhi, 2011.
2. Daniel G. Dorner, G. E. Gorman and Philip J. Calvert, “Information Needs Analysis: Principles and practice in information organizations”, Published by Faced Publishing, London. 2015.
3. Cliff Matthews, “Case Studies in Engineering Design”, John Wiley & Sons Pvt. Ltd, New York, 1998.
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.

GEC1103	BASIC ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	2	1

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:

1. Ashok N Kamthane, “Computer Programming”, Pearson Education, 2nd Edition, ISBN 13: 9788131704370, 2012
2. Paul J. Deitel, Deitel & Associates, “C How to Program”, Pearson Education, 7th Edition, ISBN-13: 978-0132990448, 2012

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.

SEMESTER II

MAC 1281	ADVANCED CALCULUS	L	T	P	C
		3	1	0	4

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

Operations on vectors – Scalar Product, Vector Product, Projection of Vectors - 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 **7+3**

Statement and application of Cauchy's integral theorem – Cauchy's integral formula – Taylor's series and Laurent's series expansion – singularities - classification – 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:

1. Veerarajan.T., "Engineering Mathematics "(5th edition) Tata Mc Graw Hill Publishing Co. New Delhi, 2012
2. Grewal B.S., "Higher Engineering Mathematics" (43rd edition), Khanna Publishers, New Delhi, 2012.
3. John W. Cell "Engineering Problems Illustrating Mathematics" Mc Graw Hill Publishing Co., New York 1943

REFERENCES:

1. Kreyszig, E., "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
2. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2011.
3. Dennis G. Zill, Warren S. Wright, "Advanced Engineering Mathematics", 4th edition, Jones and Bartlett publishers, Sudbury, 2011.
4. Alan Jeffrey, "Advanced Engineering Mathematics", Academic Press, USA, 2002.
5. Ramana, B.V., "Higher Engineering Mathematics" Tata Mc Graw Hill Publishing Co. New Delhi, 2006.
6. Venkataraman, M.K., "Engineering Mathematics", Volume 2, 2nd edition, National Publishing Co., Chennai, 2003.
7. James Stewart ".Calculus" (7th edition),Brooks/Cole cengage learning,UK.

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.

GEC 1211 BASIC ENGINEERING MECHANICS

L	T	P	C
3	1	0	4

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 **07**

Introduction - Units and Dimensions- Vectors – Vectorial representation of forces and moments –Vector Algebra and its Physical relevance in Mechanics - Laws of Mechanics – Parallelogram and triangular Law of forces -Lame's theorem, Coplanar Forces – Resolution and Composition of forces- Equilibrium of a particle.

MODULE II EQUILIBRIUM OF PARTICLE **06**

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 **06**

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 **08**

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 FRICTION **08**

Introduction to friction- types of friction- Laws of Coloumb friction- Frictional force – simple

contact friction – Rolling resistance –ladder friction

MODULE VI LAWS OF MOTION 10

Review of laws of motion – Newton's law – Work Energy Equation of particles– Impulse and Momentum – Impact of elastic bodies.

L – 45; T – 15; TOTAL HOURS – 60

REFERENCES:

1. Beer, F.P and Johnston Jr. E.R, "Vector Mechanics for Engineers, Dynamics & Statics", Third SI Metric Edition, Tata McGraw-Hill International Edition, 2001.
2. Hibbeller, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
3. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition Pearson Education Asia Pvt. Ltd., 2003.

OUTCOMES:

On completion of this course students should be able

- Analyse and resolve forces, moments and solve problems using various principles and laws of Mechanics
- Apply the concept of equilibrium to particles and solve problems
- Apply the concept of equilibrium to rigid bodies and solve problems
- Analyse and determine the properties of surfaces
- Analyse and evaluate the fractional forces between the bodies
- Apply the laws of motion in solving dynamics problems

GEC 1212	ENVIRONMENTAL STUDIES	L	T	P	C
		2	0	0	2

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 8

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 8

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.

Biodiversity - genetic, species and ecosystem diversity – hot-spots of biodiversity – biogeographic classification of India - endangered, endemic, extinct and invasive species of India - red data book - values of biodiversity: consumptive, productive, social, ethical, aesthetic and option values - threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - conservation of biodiversity: in-situ and ex-situ conservation of biodiversity

MODULE III ENVIRONMENTAL POLLUTION AND NATURAL DISASTER **8**

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 **6**

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.

Sustainable development - environmental legislation and laws: water act, air act, wildlife protection act, forest conservation act, environment protection act - environmental impact assessment, steps in EIA - human rights - women and child welfare.

Case studies related to current situation

TOTAL HOURS – 30

TEXT BOOKS:

1. Erach Bharucha, Textbook for Environmental Studies For Undergraduate Courses of all Branches of Higher Education for University Grants Commission, Orient Blackswan Pvt Ltd, Hyderabad, India, 2013.
2. Benny Joseph, Environmental Studies, Tata McGraw-Hill Education, India, 2009.
3. Ravikrishnan A, Environmental Science and Engineering, Sri Krishna Publications, Tamil Nadu, India, 2015.
4. Raman Sivakumar, Introduction to Environmental Science and Engineering, McGraw Hill Education, India, 2009.
5. Venugopala Rao P, Principles of Environmental Science and Engineering, Prentice Hall India Learning Private Limited; India, 2006.
6. Anubha Kaushik and Kaushik C.P., Environmental Science and Engineering,

New Age International Pvt Ltd., New Delhi, India, 2009.

REFERENCES:

1. Masters G.M., Introduction to Environmental Engineering and Science, Prentice Hall, New Delhi, 1997.
2. Henry J.G. and Heike G.W., Environmental Science and Engineering, Prentice Hall International Inc., New Jersy, 1996.
3. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. Boston, USA, 2016.

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.

GEC 1213	COMPUTER PROGRAMMING II	L	T	P	C
		1	0	2	2

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 7

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

MODULE II PROGRAMMING IN C++ 8

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.
9. Method overloading.
10. Inheritance

L – 15; P – 30; TOTAL HOURS – 45

REFERENCES:

1. Bjarne Stroustrup," The C++ Programming Language", Addison Wesley, 4th edition, ISBN-13: 978-0321563842, 2013.
2. Brian W. Kernighan and Dennis M. Ritchie, " The C Programming Language", Prentice Hall, ISBN 0-13-110362-8, 2015.
3. Bjarne Stroustrup, " Programming: Principles and Practice Using C++ ", Addison Wesley, 2nd edition, ISBN-13: 978-0321992789, 2014.
4. Brian W. Kernighan and Dennis M. Ritchie, " The C Programming Language (Ansi C Version)", Prentice Hall India Learning Private Limited, 2nd edition, ISBN-13: 978-8120305960, 1990.

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.
- Write simple programs using concepts of object oriented programming.
- Implement algorithms in C++ Language.
- Demonstrate the Object Oriented Programming concepts applied in networking, web development and Database applications.

ITC 1201	DIGITAL PRINCIPLES AND APPLICATIONS	L	T	P	C
		2	0	2	3

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

Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion – Octal Numbers – Hexadecimal Numbers – The ASCII Code – The Excess-3-Code – The Gray Code – Digital Logic – The Basic Gates – NOT,OR,AND – Universal Logic Gates – NOR, NAND, AND-OR-Invert Gates – Boolean Laws and Theorems

MODULE II MAPPING AND TABULATION METHODS 7

Sum-of-Products Method –Truth Table to Karnaugh Map – Pairs, Quads, and Octets – Karnaugh Simplifications – Don't-care Conditions – Product-of-sums Method – Products-of-sums Simplifications – Simplification by Quine-McClusky Method.

MODULE III COMBINATIONAL LOGIC CIRCUITS 8

Multiplexers – De-multiplexers – Decoders –Encoders – Code converters - Parity Generators and Checkers – Magnitude Comparator –- Read-only-Memory – Programmable Array Logic – Programmable Logic Arrays – Binary Adder and Subtractor.

MODULE IV SEQUENTIAL LOGIC CIRCUITS 8

Flip-flops: RS Flip-flops, D Flip-flops, JK Flip-flops, T Flip-flops – Registers: Serial-In-Serial-Out, Serial-In-Parallel-Out, Parallel-In-Parallel-Out, Universal Shift Registers– Counters: Asynchronous counters, Synchronous counters –

Design of sequential circuits: State Transition diagram, State Synthesis Table, Design Equations and Circuit Diagrams, State Reduction Technique.

LIST OF EXPERIMENTS

1. Study of logic gates – 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
12. Design and implementation of Registers with flip-flops.

L – 30; P – 30; TOTAL HOURS – 60

TEXT BOOKS:

1. Donald P.Leach, Albert Paul Malvino and Goutam Saha, 'Digital Principles an Applications', Tata McGraw Hill Education Private Limited, Seventh Edition, 2011.

REFERENCES:

1. M. Morris R. Mano and Michael D. Ciletti, 'Digital Design' , Pearson, Fourth Edition, 2011
2. John F.Wakerly , 'Digital Design – Principles and practices', Pearson Fourth Edition, 2014.

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.

ITC1202	PROGRAMMING IN PYTHON	L	T	P	C
		2	0	2	3

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 **7**

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

MODULE II FILES INPUT AND OUTPUT **7**

Mapping and set types – conditionals and loops – files input and output

MODULE III PYTHON IN OTHER PARADIGMS **8**

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

MODULE IV ADVANCED TOPICS **8**

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 Digital Clock 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:

1. Wesley J Chun, “Core Python Programming”, Second Edition, Prentice hall, 2006.

REFERENCES:

1. Richard L.Halterman, “Learning to program with python”, 2011.

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.

SEMESTER III

		L	T	P	C
MAC 2181	**PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS**	**3**	**1**	**0**	**4**

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

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients..

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

Introduction to Laplace transform - Existence of Laplace Transform - Properties of Laplace Transforms - Initial & Final Value Theorems - Inverse Laplace Transform - Convolution Theorem – Circuits to signal square wave: Integral equations with unrepeated complex factors – Damped forced vibrations: repeated complex factors – Resonance - Solution of differential equations

MODULE VI Z – TRANSFORM 7 + 3

Introduction and Definition of Z-transform - Properties of Z- Transform - Convolution Theorem of Z-Transform - Inverse Z–transform - Convolution Theorem of Inverse Z-Transform - Formation of difference equations - Solving Difference Equations using Z-Transform.

L – 45; T – 15; Total – 60

TEXT BOOKS

1. Kreyszig .E., “Advanced Engineering Mathematics“, 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
2. Grewal B.S., “Higher Engineering Mathematics”, 42nd edition, Khanna Publishers, New Delhi, 2012.
3. Ramana, B.V, “Higher Engineering Mathematics” Tata Mc Graw Hill Publishing Co. New Delhi, 2006.

REFERENCES

1. Veerarajan.T., “Engineering Mathematics“, 5th edition, Tata Mc Graw Hill Publishing Co. New Delhi, 2012.
2. Peter V. O'Neil, “Advanced Engineering Mathematics**”**, 7th edition, Cengage Learning, 2011.
3. Dennis G. Zill, Warren S. Wright, “Advanced Engineering Mathematics”, 4th edition, Jones and Bartlett publishers, Sudbury, 2011.
4. Alan Jeffrey, “Advanced Engineering Mathematics”, Academic Press, USA, 2002.

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	L	T	P	C
		0	0	2	1

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 **4**

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 **4**

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 **4**

Making Poster presentations on current issues

Understanding nuances of making effective presentations (TED Videos)

MODULE IV **6**

Deliberation on social and scientific issues – Debates (focus on rebuttal skills and deconstructing arguments)

Viewing videos on debates (NDTV Discussions)

MODULE V **6**

Discussing social issues or current affairs in groups

Viewing group discussions and listening for specific information

MODULE VI **6**

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:

1. Hancock, Mark (2012). *English Pronunciation in Use*. Cambridge University Press, UK.
2. Anderson, Kenneth & et.al (2007). *Study Speaking: A Course in Spoken English for Academic Purposes* (Second Edition). Cambridge University Press, UK.
3. Hurlock, B.Elizabeth (2011). *Personality Development*. Tata McGraw Hill, New York.
4. Dhanavel,S.P (2015). *English and Soft Skills*. Orient Blackswan, Chennai.
5. Whitby, Norman (2014). *Business Benchmark: Pre-Intermediate to Intermediate.* Cambridge University Press, UK.

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.

ITC2101	DATA STRUCTURES	L	T	P	C
		3	0	2	4

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

Preliminaries - Binary Trees - The Search Tree ADT - Binary Search Trees - AVL Trees - Tree Traversals – Binary Heap - Hashing - General Idea - Hash Function - Separate Chaining - Open Addressing - Linear Probing.

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

Definitions - Topological Sort - Shortest-Path Algorithms - Unweighted Shortest Paths – Dijkstra’s Algorithm - Minimum Spanning Tree – Prim’s Algorithm -

Applications of Depth-First Search - Undirected Graphs.

MODULE VI APPLICATIONS 7

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.
6. Implementation of binary search tree.
7. Program for tree traversal (inorder, postorder, preorder)
8. Implementation of Quick sort, Merge sort, Shell sort.
9. Implementation of Dijkstra”s algorithms.
10. Implementation of Depth First search.
11. Implementation of Linked List, Stack and Queue in real world.

Practical: 20 Hours

L – 45; P – 20; TOTAL HOURS – 65

TEXT BOOK:

1. R. G. Dromey, "How to Solve it by Computer", Prentice-Hall of India, 2009.

2. M. A. Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Pearson Education, 2007.

REFERENCES:

1. Ashok Kamthane, "Introduction to Data Structures in C", 2nd edition, Wiley Publishers, 2011.

2. Narasimha Karumanchi, “Data Structures and Algorithms Made Easy”, 2nd Edition, CareerMonk Publications, 2011.

3. S.K. Srivastava & Deepali Srivastava," Data Structures Through C in Depth" 2nd Edition, 2011, BPB Publications.

4. A.K.Sharma, “Data Structures using C”, Pearson Education, 2013.

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.

ITC2102 COMPUTER ARCHITECTURE L T P C
3 0 0 3

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 – Computer Registers – Computer Instructions – Timing and Control – Instruction Cycle – Memory Reference Instructions – Input – output and Interrupt – Complete Computer Description – Design of Basic Computer – Design of accumulator Logic – Micro programmed Control – Control Memory – Address sequencing.

MODULE II CENTRAL PROCESSING UNIT 8

General Register Organization – Stack Organization –Instruction Formats – Addressing Modes – Data Transfer and Manipulation – Program Control – Reduced Instruction Set Computers.

MODULE III PIPELINE AND VECTOR PROCESSING 8

Parallel Processing – Pipelining – Arithmetic Pipeline – Instruction Pipeline – RISC Pipeline – Vector Processing – Array Processors.

MODULE IV COMPUTER ARITHMETIC 8

Addition and Subtraction Algorithms – Multiplication Algorithms – Division Algorithms – Floating Point Arithmetic Operations – Decimal Arithmetic Unit – Decimal Arithmetic Operations.

MODULE V I/O ORGANIZATION **7**

Peripheral Devices – Input-Output Interface –Asynchronous Data Transfer – Modes of Transfer – Priority Interrupt- Direct Memory Access – Input/ Output Processor – Serial Communication.

MODULE VI MEMORY ORGANIZATION **7**

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

Total : 45 Hours

TEXT BOOK:

1. M. Morris Mano, “Computer System Architecture” Revised Third Edition, Pearson

Education, 2017.

REFERENCES:

1. Smruthi Ranjan Sarangi, “Computer Organization and Architecture”, McGraw Hill Education (India) Pvt.Ltd., 2015.

2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, 9th edition, Pearson, 2013.

3. Hohl, William, “ARM Assembly Language: fundamentals and techniques “ , 2nd edition, CRC Press, 2014.

4. David A. Patterson and John L.Hennesey, “Computer Organization and Design- The Hardware / Software Interface”, 5th edition, Morgan Kauffman / Elsevier , 2014.

5. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", 5th Edition, McGraw-Hill, 2011

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.

ITC2103 COMPUTER NETWORKS L T P C

3 0 0 3

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 7

Data communication: components, data representation, data flow – Networks: Network criteria, Physical Topology, Categories of Networks - Protocols and standards – Network Models: OSI and TCP/IP Model – Data Transmission: Transmission Impairments, line coding – Transmission Media: Guided and Unguided media.

MODULE II DATA LINK LAYER 8

Error detection and correction: CRC, Hamming code - Flow and Error control Protocols: Stop and Wait, Go back-N ARQ, Selective Repeat ARQ - HDLC – LAN: Ethernet, IEEE 802.3, IEEE 802.11 - Switches - Virtual LAN.

MODULE III INTERNET AND ROUTING PROTOCOLS 8

Logical Addressing – IPv4: Classfull Addressing, Classless Addressing , CIDR, NAT, Sub netting , Super netting, VLSM – IPv6: Structure, Address space, Advantages -- Routers – Routing Protocols - Distance Vector Routing - Link State Routing.

MODULE IV TRANSMISSION AND CONGESTION CONTROL MECHANISMS 8

Transmission control: Process to Process Delivery, Transmission Control Protocols: UDP, TCP and SCTP - Congestion control: Open loop and closed loop congestion control methods, Congestion control examples in TCP and Frame Relay - Quality of Service.

MODULE V NETWORK SERVICES AND SECURITY 7

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

MODULE VI SOFTWARE DEFINED NETWORKS 7

Need for SDN : Evolution of switches and control panel, SDN Implications for Research and Innovation, Data Center Innovation, Data Center Needs – Genesis of SDN: The Evolution of Networking Technology, Forerunners of SDN, Open Source Contributions to SDN – Working Principles of SDN: Fundamental Characteristics of SDN, SDN operation, SDN Devices, SDN Controller and SDN applications.

Total : 45 Hours

TEXT BOOK:

1. Behrouz A. Forouzan, "Data Communication and Networking", 4th Edition, Tata McGraw- Hill, 2017.

REFERENCES:

1. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2017.

2. Andrew S. Tanenbaum, David.J.Wetherall "Computer Networks", Fifth Edition, Pearson Education, 2013.

3. William Stallings, "Data and Computer Communication", Tenth Edition, Pearson Education, 2017.

4. Paul Goransson, Chuck Black, and Timothy Culver **"**Software Defined Networks:

A Comprehensive Approach", Second Edition, Pearson Education, 2016.

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 **8**

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 **7**

Multithread programming, thread creation, inter process communication, synchronization-i/o basics- generic programming – string handling-collections.

MODULE III INTRODUCTION TO GUI PROGRAMMING **8**

AWT – using AWT Controls - Event Handling -SWING - Applets and Applications- JavaFX Programming.

MODULE IV JAVA OPEN DB AND RICH INTERNET APPLICATIONS **7**

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 **7**

Introduction to HTML5 - cascading Style Sheets -Java Script- functions-arrays – objects-DOM- event handling.

MODULE VI INTERNET PROGRAMMING FRAMEWORKS **8**

Java Beans- Servlets – JSP– Session Management – Cookies – Java Web Start – Java Plug-Ins – Deployment, Plug-In And Web Start Tools –– Installing And Configuring Apache Tomcat Server- Jboss Server.

Total Hours : 45

TEXT BOOKS:

1. Herbert Schildt, “Java 2 – The Complete Reference”, Nineth Edition, Tata McGraw Hill, 2014.

2. Deitel and Deitel and Nieto “Internet and World Wide Web-How to Program”, Prentice Hall, 6th Edition, 2012.

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

ECC2105	FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING	L	T	P	C
		1	0	0	1

OBJECTIVES:

- To introduce signals, systems, time and frequency domain concepts and the associated fundamental mathematical tools to all DSP techniques.
- To impart knowledge about the digital filters
- To excel in fields such as speech processing, image processing and audio signal processing

MODULE I SIGNALS AND SYSTEMS 06

Basic elements of DSP, Sampling theorem, Discrete time signals, Discrete time systems , Analysis of discrete time LTI systems , Z transform, convolution (linear and circular) , Discrete Fourier Transform, Fast Fourier Transform.

MODULE II INTRODUCTION TO FILTERS & DSP APPLICATIONS 09

IIR filter design, FIR filter design, DSP applications- audio processing, speech processing, digital image processing.

TOTAL HOURS: 15

TEXT BOOKS

1. John G. Proakis& Dimitris G.Manolakis, “Digital Signal Processing – Principles, Algorithms and Applications”, Pearson education / Prentice Hall, Fourth edition, 2007.
2. Mitra, Sanjit K, Digital Signal Processing : A Computer Based Approach, 4th Edition, McGraw-Hill, 2011.

REFERENCES

1. Kuo Sen M, Lee Bob H andTianWenshun, Real-Time Digital Signal Processing: Implementations and Applications, 2nd Edition, John Wiley, c2006.
2. Alan V. Oppenheim, Ronald W. Jchafer&Hohn. R.Back, “Discrete Time Signal Processing”, Pearson Education, Second Edition, 2001
3. Emmanuel C.Ifeachor, &Barrie.W.Jervis, “Digital Signal Processing”, Pearson Education / Prentice Hall, Second edition, 2002.

OUTCOMES:

On completion of the course, students will be able to

1. To understand the key theoretical principles of DSP.
2. Differentiate between continuous & discrete time signals.
3. Understand the implications of the sampling theorem and the consequences of aliasing and quantization distortion.
4. Represent real world signals in digital format and understand transform-domain (Fourier and z-transforms) representation of the signals.
5. Describe about digital filters.
6. To apply signal processing concepts in speech processing, image processing and audio signal processing.

ITC2106	NETWORK CONFIGURATION LAB	L	T	P	C
		0	0	3	1

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.

ITC2107 ADVANCED JAVA AND INTERNET PROGRAMMING LAB

L	T	P	C
0	0	3	1

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.
6. Java programs for database connectivity using JDBC-ODBC connectivity.
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.

Total Hours : 30

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.

SEMESTER IV

ENC 2282	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 – Fundamentals of academic and professional writing – 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**

Viewing letter of application and Résumé, letter calling for an interview, letter of inquiry and Promotional letter

Writing Functional résumé and letter of application using Edmodo,

MODULE V **6**

Viewing a Video and reading a case study (industry specific) – collaborative writing using Edmodo –reading and information transfer

Writing reports- Survey, feasibility and progress – 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:

1. Riordan,D (2013). *Technical Report Writing Today*. Cengage Learning, 10th edition. USA.
2. Oliu, W. E., Brusaw, C.T., & Alred, G.J.(2012). *Writing that Works: Communicating Effectively on the Job* . Bedford/St. Martin's. Eleventh Edition.
3. Garner, B.A. (2013). *HBR Guide to Better Business Writing (HBR Guide Series)*. Harvard Business Review Press. USA.
4. Sharma, R.C. & Krishna M. (2002). *Business Correspondence and Report Writing*. Tata MacGraw – Hill Publishing Company Limited, New Delhi.
5. Macknish, C. (2010). *Academic and Professional Writing for Teachers*. McGraw-Hill Education. USA.
6. Whitby, Norman (2014). *Business Benchmark: Pre-Intermediate to Intermediate.* Cambridge University Press, UK.

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.

ITC2211 UNIX AND SHELL PROGRAMMING

L	T	P	C
2	0	2	3

OBJECTIVES:

To enable the students to

- learn the structure of unix and file system
- use unix shells and commands
- write shell and C programming in unix

Prerequisite: Fundamentals of Computer and operating systems

MODULE I INTRODUCTION **7**

Introduction to Unix:- Architecture- Features -Commands-Unix Utilities:- file system-file handling utilities- security by file permissions.

MODULE II UNIX UTILITIES **7**

Utilities-process utilities- disk utilities- networking commands-Text processing utilities and backup utilities- Introduction to Shells- Unix Session- Standard Streams- Pipes-filters.

MODULE III GREP , SED AND AWK PROGRAMMING **8**

Grep -Operation- grep Family- Searching for File Content-Sed -Scripts- Operation-Addresses- commands- Applications- Awk-Execution- Fields and Records- Scripts-Operations- String Functions- Mathematical Functions.

MODULE IV SHELL PROGRAMMING **8**

Interactive Korn Shell-Korn Shell Features- Interactive C Shell-C shell features -Special Files- Variables- Output/ Input-Environmental Variables- Startup Scripts-Debugging Scripts- Script Examples

Total : 30 Hours

LIST OF EXERCISES:

1. Basic unix commands and vi editor.
2. Unix utilities-file system, permissions, process, networking, grep and sed.
3. Programming with shell scripts- basic shell program, streams, control statements, test condions and Loop setup.
4. Korn shell and awk programming.

5. Process management – Fork, Exec and job control.

6. Inter-process communication between related processes using pipes and filters.

7. Interactive C shell programming on unix – pointer arithmetic, statements for program control, functions, manipulating files.

L – 30; P – 30; TOTAL HOURS – 60

TEXT BOOKS :

1. Behrouz A. Forouzan, Richard F. Gilberg.Thomson," Unix and shell Programming ", Brooks/Cole-Thomson Learning, 2003.

2. Sumitabha Das,"Your Unix the ultimate guide", 2nd Edition, Tata McGraw-Hill, 2006.

REFERENCES :

1. Kernighan and Pike,"Unix programming environment", PHI. / Pearson Education.

2. Graham Glass, King Ables,"Unix for programmers and users", 3rd edition, Pearson Education.

3. Rosen, Host, Klee, Farber, Rosinski,"The Complete Reference Unix", Second Edition, TMH.

OUTCOMES:

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

- Describe the structure of unix system
- Use unix commands to manage file systems
- Discuss file structure and system calls
- Write shell and awk programming
- Write C program for inter process communication, memory allocation and file handling.

ITC2212 DATABASE MANAGEMENT SYSTEM

L	T	P	C
3	0	0	3

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 – UML – 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

Importance of good schema design - Problems due to bad design schema- Functional dependencies: Definition-Inference rules for FD-minimal sets of FD- Normal forms up to BCNF- Dependency preserving and Lossless decomposition. Storage File organization: Memory Hierarchies - Secondary Storage devices - Magnetic tape storage device. Files - Fixed length and Variable length records. Operations on files: Sorted Files - Heap Files-Hashing and overflow handling techniques.

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. – 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 6

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:

1. Silberschatz, A., Korth, H. F., & Sudarshan, “Database system concepts” McGraw-Hill. ,(International Edition) (6th ed.). New York, 2011.
2. Elmasri, R., & Navathe, S. B. “Fundamentals of database systems” (6th ed.) Pearson Education, 2011.

REFERENCE BOOKS:

1. Raghu Ramakrishnan, “Database Management System”,3rd Edition, Tata McGraw-Hill Publishing Company, 2003.
2. Peter Rob and Corlos Coronel- “Database System, Design, Implementation and Management”, 5th edition, 2003.
3. C J Date, “An Introduction to Database System”, 8th Edition, 2004.
4. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- “Database System Implementation”, Pearson Education, 2000.

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.

ITC2213 OPERATING SYSTEMS L T P C

3 0 2 4

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

Introduction to system software-Editor, Assembler, Loader, Linker, Compiler & Interpreter, Macro-processors and Emulator, Operating System: Goals – Operating System Types: Multiprogramming, Timesharing, Distributed, Real-Time System, Multimedia, Open Source, Android – Computing Environments – System Components – Operating System Design & Implementation – Operating System Structure

MODULE II PROCESS SCHEDULING 7

Overview of Process, Memory, File and Disk Management-Process Management-Process Concepts – Schedulers – Process Scheduling: Algorithms, Multiple-Processor & Real-Time Scheduling – Threads: Overview, Threading Issues, Thread Scheduling.

MODULE III PROCESS SYNCHRONIZATION 7

Operations on Processes – Inter-Process Communication – Process Synchronization: Critical-Section Problem, Semaphores, Classic Problems of Synchronization, Critical Region-Monitors.

MODULE IV DEADLOCKS AND SYSTEM PROTECTION 7

Deadlocks: System Model– Deadlock Prevention-Deadlock Avoidance: Banker's Algorithm - Deadlock Detection -Deadlock Recovery- System Protection: Goals, Principles- System and Network Threats: Firewall-Port Scanner.

MODULE V MEMORY MANAGEMENT 8

Main Memory Address Space–Swapping – Contiguous Memory Allocation: Fragmentation, Paging, Segmentation – Virtual Memory: Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing, Virtualization: Memory Virtualization, Virtual Machine.

MODULE VI FILE AND DISK MANAGEMENT 8

File Concepts – Access Methods – Directory Structure– File System Structure – File System Implementation– Virtual File System: Network File System – Distributed File System – File System Mounting – File Sharing & Protection: File Locking- Disk Structure – Disk Scheduling– Disk Management, Case study- UNIX Operating System.

Lecture : 45 Hours

LIST OF EXPERIMENTS

1. Study of UNIX commands
2. Study of Shell Programming
3. Creation of process using system call.
4. Implementation of Producer-Consumer problem using shared-memory API.
5. Development of multi-threaded program.
6. Implementation of Semaphore.
7. Implementation of Scheduling algorithms (FIFO, SJF, Priority & Round-robin)
8. Implementation of Banker's algorithm for Deadlock avoidance.
9. Implementation of Port Scanner.
10. Implementation of First-fit, Best-fit and Worst-fit memory allocation strategies.
11. Implementation of page replacement algorithms.
12. Creation of Virtual Machines
13. Implementation of File-locking concept.
14. Implementation of disk scheduling algorithms (SCAN, C-SCAN & LOOK)

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

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, 'Operating System Concepts', Ninth Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2013.

REFERENCES:

1. Leland L. Beck, "System Software - An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2000.
2. Harvey M. Deitel, 'Operating Systems', Second Edition, Pearson Education Pvt. Ltd, 2002.
3. Andrew S. Tanenbaum, 'Modern Operating Systems', Prentice Hall of India Pvt. Ltd, 2003.
4. William Stallings, 'Operating System', Prentice Hall of India, 4th Edition, 2003.
5. Pramod Chandra P. Bhatt – 'An Introduction to Operating Systems, Concepts and Practice', PHI, 2003.

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

The Software Process - Software Engineering Practice - Software Development Myths - Software Process Structure - Process Models - Agile Process Models - Agile Teams.

MODULE II SOFTWARE REQUIREMENTS 8

Requirements Engineering - Establishing The Groundwork - Eliciting Requirements - Developing Use Cases - Building The Analysis Model - Scenario-Based Modeling: Requirements Analysis - Scenario-Based Modeling - Class-Based Methods: - Requirements Modeling for Web And Mobile Apps.

MODULE III SOFTWARE DESIGN FUNDAMENTALS 7

The Design Process - Design Concepts - The Design Model - Software Architecture - Architectural Styles - Component-Level Design: - Designing Class-Based Components - Component-Level Design for Webapps - Component-Level Design for Mobile Apps.

MODULE IV SOFTWARE DESIGN 7

User Interface Design: The Golden Rules - Interface Design Steps - Webapp And Mobile Interface Design - Design Evaluation - Pattern-Based Software Design.

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 Techniques - Black-Box Testing Techniques - Testing Object-Oriented Applications - Testing Concepts For Webapps - Testing Web Applications - Testing Mobileapps.

MODULE VI MANAGING SOFTWARE PROJECTS 7

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

Total : 45 Hours

TEXT BOOK:

1. Roger S. Pressman, "Software Engineering - A Practitioners Approach", 8th Edition, McGraw Hill Publication, 2015.

REFERENCES:

1. Sommerville, "Software Engineering", 10th Edition, Addison-Wesley, 2015.
2. Jordan Hudgens, “Skill Up: A Software Developer's Guide to Life and Career”, Packt Publishing, 2017.
3. John Sonmez , “The Complete Software Developer's Career Guide: How to Learn Programming Languages Quickly, Ace Your Programming Interview, and Land Your Software Developer Dream Job”, Simple Programmer, 2017.

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.

ITC2215	DBMS LAB	L	T	P	C
		0	0	3	1

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.
4. Working with Views.
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.
9. Triggers.
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.

SEMESTER V

MSB 3181	**LEADERSHIP & CEO TRAINING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

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 09

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 08

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's. 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.

L – 45; Total Hours – 45

REFERENCES:

1. Andrew J DuBrin. "Leadership: Research Findings, Practice, and Skills", 8th Edition, South-Western College Pub, 2015.
2. Yukl G , "Leadership in Organisations", 8th Edition, Pearson Education, 2013.
3. Richard L Daft , "Leadership", 5th Edition, South Western Cengage Learning 2012.

4. Stephen P. Robbins and Timothy A. Judge. “Organizational Behaviour”, 15th Edition, New Delhi: Pearson, 2013.
5. Fred Luthans, “Organizational Behavior, An Evidence Based Approach”, 12th Edition, New Delhi: McGraw Hill Education, 2013.
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)
7. Primal Leadership: Unleashing the Power of Emotional Intelligence by Prof Daniel Goleman , Richard Boyatzis and McKee ,Harvard Business Review Press

Recommended Readings:

1. Jim Collins, (2001). “Good To Great: Why Some Companies Make the Leap...And Others Don't”, Random House Publishers India Pvt.Ltd, New Delhi
2. George, B. with Sims, P. True North: Discover Your Authentic Leadership, The Times Group Books; First edition (1 October 2015)
3. Kim, W. C., & Mauborgne, R. A. (2014). Blue ocean strategy, expanded edition: How to create uncontested market space and make the competition irrelevant. Harvard business review Press.
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

MSB 3182 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

Introduction - Emergence and Development of Social Entrepreneurship. Social Problems in India: An Overview. Social Development: The Indian Scenario. Emergence of Social Entrepreneurs and Sustainable Solutions to Social Problem. Characteristics and Context of Social Entrepreneurship .The Role of Social Entrepreneurship in Societies & Economies.

MODULE II SOCIAL ENTREPRENEURSHIP: DRIVERS AND CHALLENGES 07

The Drivers of Social Entrepreneurship. Elements of the Social Entrepreneurial Personality. Challenges of financial constraints. Challenge to attract and cultivate talented workers. Challenge of evaluation of social entrepreneur impact. Challenge of scaling and its impact. Cases

MODULE III SOCIAL ENTREPRENEURSHIP: OPPORTUNITY RECOGNITION 07

Opportunity Recognition and Planning Process. Opportunities for Social Entrepreneurs. The Nature of Social Entrepreneurial Opportunities. Social Problems into Opportunities. Idea development and conceptualization of social problem. Cases

MODULE IV RESOURCE MOBILIZATION FOR SOCIAL VENTURE 08

Resources at Initial Stage. Social Network as a role of Social Capital. Team and Collective Efforts. Need and Determination of Important Resources. Resource of Knowledge, Skills and Abilities. overview of venture capital and angel investment. Cases

MODULE V **BUSINESS MODELS AND BUSINESS PLAN FOR SOCIAL ENTERPRISES** **08**

Design Principles of Social Entrepreneurship Business Models , Evaluation of the Root Cause of a Societal Problem. Developing business plan for social ventures. Developing an investor presentation. Feasibility study and report. How to start a business - Procedures for registration of small scale industry

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

Static Impact of Social Entrepreneurship. Impact of Charitable NGOs vs. Social Entrepreneurship, Impact of For-Profit Companies vs. Social Entrepreneurship. Social entrepreneurship report preparation by students.

Case Study of Social Entrepreneurs

L – 45; 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
3. “Social Entrepreneurship and social business” Christine K Volkmann, Springer Gabler 2012
4. “Social Entrepreneurship” Manuel London ,Routlege, 2010

OUTCOMES:

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 CAREER CHOICE	L	T	P	C
		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:

1. Brown,D.(2002). Career Choice and Development. Wiley,J. & Sons.USA
2. Lore,N.(1998). The Pathfinder: How to Choose or Change Your Career for a Lifetime of Satisfaction and Success. Simon & Schuster.USA.
3. Shell, G.R.(2013). Springboard Launching your Personal Search for Success.Portfolio.USA.

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.

ITC3101 OBJECT ORIENTED ANALYSIS AND DESIGN

L	T	P	C
3	0	0	3

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**

An Overview of Object Oriented Systems Development - Object Basics - Object Oriented Systems Development Life Cycle.

MODULE II OBJECT ORIENTED METHODOLOGIES **8**

Unified Approach - Development Process - Unified Modeling Language – Use case - Class diagram: The Essential - Advanced Concepts – Interactive Diagram - Package Diagram - Collaboration Diagram - State Diagram – Activity Diagram - Communication Diagrams - Composite Structure - Timing Diagrams.

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**

Access Layer: Object Storage and Object Interoperability, View Layer: Designing Interface Objects.

MODULE VI SOFTWARE QUALITY AND USABILITY **7**

Designing Interface Objects - Software Quality Assurance - System Usability - Measuring User Satisfaction

Total Hours : 45

TEXT BOOKS:

1. Ali Bahrami, "Object Oriented Systems Development", Tata McGraw-Hill, 1999.
2. Martin Fowler, "UML Distilled", 3rd edition, Pearson Education, 2007.

REFERENCES:

1. John Deacon, "Object Oriented Analysis and Design", Pearson Education, 2009.
2. Bennett, Farmer, Steve McRobb, "Object-oriented Systems Analysis and Design: Using UML", McGraw-Hill Higher Education, 2010.
3. Grady Booch, "Object Oriented Analysis and Design with Applications", 3rd edition, Pearson, 2010.

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's 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's 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 – 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:

1.The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press – 2012.

2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.) – Springer – 2011.

3. Designing internet of things –Adrian McEwen & Hakim Cassimally – Jhon Wiley and

sons – 2014.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

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.

ITC3103 MICROPROCESSORS AND MICROCONTROLLER

L	T	P	C
3	0	2	4

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 **8**

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 **8**

Instruction formats, addressing modes, Instruction Set of 8086, String Manipulations, assembler directives, Procedures and Macros, Assembly Language Programming.

MODULE III I/O INTERFACING **7**

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 **7**

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 **7**

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

MODULE VI 8051 REAL TIME CONTROL **8**

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 Peripherals- TMH", 2nd edition, 2006.

2. Subrata Ghoshal, "8051 Microcontroller Internals, Instructions, Programming and Interfacing", Pearson Education, 2010.

REFERENCES:

1. K.Uma Rao, Andhe Pallavi, "The 8051 Microcontrollers, Architecture and programming and Applications", Pearson Education, Sixth Edition, 2013.

2. D. V. Hall, "Micro processors and Interfacing",1st edition, 2006.

3. Kenneth. J. Ayala , "The 8051 microcontroller", 3rd edition, Cengage learning, 2010.

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.

ITC3104	CASE TOOLS LAB	L	T	P	C
		0	0	3	1

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.
7. Health Insurance Management 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.

SEMESTER VI

MSB 3181	**LEADERSHIP & CEO TRAINING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

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 09

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 08

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's. 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.

L – 45; Total Hours – 45

REFERENCES:

8. Andrew J DuBrin. "Leadership: Research Findings, Practice, and Skills", 8th Edition, South-Western College Pub, 2015.
9. Yukl G , "Leadership in Organisations", 8th Edition, Pearson Education, 2013.
10. Richard L Daft , "Leadership", 5th Edition, South Western Cengage Learning 2012.

11. Stephen P. Robbins and Timothy A. Judge. “Organizational Behaviour”, 15th Edition, New Delhi: Pearson, 2013.
12. Fred Luthans, “Organizational Behavior, An Evidence Based Approach”, 12th Edition, New Delhi: McGraw Hill Education, 2013.
13. 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)
14. Primal Leadership: Unleashing the Power of Emotional Intelligence by Prof Daniel Goleman , Richard Boyatzis and McKee ,Harvard Business Review Press

Recommended Readings:

5. Jim Collins, (2001). “Good To Great: Why Some Companies Make the Leap...And Others Don't”, Random House Publishers India Pvt.Ltd, New Delhi
6. George, B. with Sims, P. True North: Discover Your Authentic Leadership, The Times Group Books; First edition (1 October 2015)
7. Kim, W. C., & Mauborgne, R. A. (2014). Blue ocean strategy, expanded edition: How to create uncontested market space and make the competition irrelevant. Harvard business review Press.
8. 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

MSB 3182 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

Introduction - Emergence and Development of Social Entrepreneurship. Social Problems in India: An Overview. Social Development: The Indian Scenario. Emergence of Social Entrepreneurs and Sustainable Solutions to Social Problem. Characteristics and Context of Social Entrepreneurship .The Role of Social Entrepreneurship in Societies & Economies.

MODULE II SOCIAL ENTREPRENEURSHIP: DRIVERS AND CHALLENGES 07

The Drivers of Social Entrepreneurship. Elements of the Social Entrepreneurial Personality. Challenges of financial constraints. Challenge to attract and cultivate talented workers. Challenge of evaluation of social entrepreneur impact. Challenge of scaling and its impact. Cases

MODULE III SOCIAL ENTREPRENEURSHIP: OPPORTUNITY RECOGNITION 07

Opportunity Recognition and Planning Process. Opportunities for Social Entrepreneurs. The Nature of Social Entrepreneurial Opportunities. Social Problems into Opportunities. Idea development and conceptualization of social problem. Cases

MODULE IV RESOURCE MOBILIZATION FOR SOCIAL VENTURE 08

Resources at Initial Stage. Social Network as a role of Social Capital. Team and Collective Efforts. Need and Determination of Important Resources. Resource of Knowledge, Skills and Abilities. overview of venture capital and angel investment. Cases

MODULE V BUSINESS MODELS AND BUSINESS PLAN FOR SOCIAL ENTERPRISES **08**

Design Principles of Social Entrepreneurship Business Models , Evaluation of the Root Cause of a Societal Problem. Developing business plan for social ventures. Developing an investor presentation. Feasibility study and report. How to start a business - Procedures for registration of small scale industry

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

Static Impact of Social Entrepreneurship. Impact of Charitable NGOs vs. Social Entrepreneurship, Impact of For-Profit Companies vs. Social Entrepreneurship. Social entrepreneurship report preparation by students.

Case Study of Social Entrepreneurs

L – 45; 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
7. “Social Entrepreneurship and social business” Christine K Volkmann, Springer Gabler 2012
8. “Social Entrepreneurship” Manuel London ,Routlege, 2010

OUTCOMES:

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
	CONFIDENCE BUILDING	0	0	2	1

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 **6**

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

MODULE II **6**

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

MODULE III **4**

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 **6**

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

MODULE V **8**

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

Total Hours – 30

REFERENCES:

1. Covey,S.R. (2004). The 7Habits of Highly Effective People: Powerful Lessons in Personal Change. Free Press.UK
2. Fine, P.M.& Alice Olins. (2016).Step up: Confidence, Success and Your Stellar Career in 10 Minutes a Day. Vermilion.UK
3. Pai, A. (1993).How to Develop Self-Confidence. Amazon.com
4. Wentz,F.H.(2012). Soft skills training: A Workbook to Develop Skills for Employment. Amazon.com

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.

ITC3211 SOFTWARE TESTING

L	T	P	C
3	0	0	3

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 8

Testing as an Engineering Activity - Role of Process in Software Quality - Testing as a Process - Basic Definitions, Testing Concepts and Definitions – TMM levels- Software Testing Principles - The Tester"s Role in a Software Development Organization - Origins of Defects - Defect Classes - The Defect Repository and Test Design- Defect Examples - Developer/Tester Support for developing a defect Repository.

MODULE II STRATEGIES AND METHODS FOR TEST CASE DESIGN 8

Introduction to Testing Design Strategies - The Smarter Tester -Test Case Design Strategies - Using Black Box Approach to Test Case Design – Random Testing - Equivalence Class Partitioning - Boundary Value Analysis –Using White-Box Approach to Test design - Test Adequacy Criteria - Coverage and Control Flow Graphs - Covering Code Logic - Paths - White-box Based Test Design - Additional White Box Test design approaches - Evaluating Test Adequacy Criteria.

MODULE III LEVELS OF TESTING AND TESTING GOALS, PLANS AND POLICIE 8

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 7

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 7

Reviews as a testing activity-Types of Reviews-Developing a Review Program-Measurement program to support product and process Quality-Review of Quality concepts-Quality costs-An approach to usability Testing.

MODULE VI TESTERS WORKBENCH 7

Defect analysis and prevention-Defect casual Analysis-Evaluating Testing Tools for the workbench-Tool categories-process reuse-Approach to model development-TMM structure-TMM Assessment model components.

Total Hours : 45

TEXT BOOKS:

1. Abu Sayed Mahfuz, “Software Quality Assurance: Integrating Testing, Security, and Audit, CRC Press, 2016.
2. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing - Principles and Practices", Pearson education, 2006.
3. Ilene Burnstein, "Practical Software Testing", Springer, 2003.

REFERENCES:

1. Limaye L G, "Software Testing - Principles, Techniques and Tools", Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2009.
2. Aditya P.Mathur, "Foundations of Software Testing", Pearson Education, 2008.
3. Boris Beizer, "Software Testing Techniques", 2nd Edition, Dreamtech, 2003.

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

ITC3212 CLOUD COMPUTING TECHNOLOGIES

L	T	P	C
3	0	0	3

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**

Introduction to Cloud Computing - Essential Characteristics - Architectural Overview – Cloud Delivery Models - Service Models – Deployment models – Cloud computing vendors – Benefits of cloud computing – Limitations.

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**

Virtualization Technology - Overview - Virtual Machines Provisioning and Manageability - Virtual Machine Migration Services - VM Provisioning and Migration in Action - VM Life Cycle and VM Monitoring - Amazon Elastic Compute Cloud.

MODULE V DATA CENTER TECHNOLOGY **7**

Virtualization – Automation – Remote Operation and Management – Computing Hardware – Storage Hardware – Network Hardware – Carrier and External Network Interconnection – Web Tier Load Balancing and Acceleration.

MODULE VI CLOUD SECURITY **8**

Cloud Security Fundamentals- Terms and Concepts- Threat Agents – Anonymous Attacker - Malicious Service Agent - Trusted Attacker - Malicious Insider -Cloud

Security Threats - Traffic Eavesdropping- Malicious Intermediary -Denial of Service - Insufficient Authorization - Virtualization Attack - Overlapping Trust Boundaries – Case Study example for IaaS, PaaS, SaaS.

Total Hours : 45

TEXT BOOKS:

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, McGraw-Hill, 2010.
2. Thomas Erl , Ricardo Puttini , Zaigham Mahmood, “Cloud Computing: Concepts, Technology & Architecture”, Prentice –Hall, 2013
3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, “Cloud Computing Principles and Paradigms”, John Wiley & Sons, Inc Publications, 2011

REFERENCES:

1. Kai Hwang, Fox and Dongarra, Morgan Kaufmann, “Distributed and Cloud Computing”, 1st Edition, Elseiver, 2012.
2. Scott Granneman, “Google Apps Deciphered: Compute in the cloud to streamline your desktop”, Pearson Education, 2009.
3. Tim Malhar, S.Kumaraswammy, S.Latif, “Cloud Security & Privacy”, SPD, O”REILLY 2009.

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.

ITC3213 DISTRIBUTED COMPUTING

L	T	P	C
3	0	0	3

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 8

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 7

Communication-Layered Protocols-Issues in communications-Client server model - remote procedure call - group communication.

MODULE III SYNCHRONIZATION 8

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

MODULE IV SCHEDULING 7

Deadlock - System models - Processor Allocation – Scheduling.

MODULE V DISTRIBUTED FILE SYSTEMS 8

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

MODULE VI DISTRIBUTED SHARED MEMORY 7

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

Total Hours : 45

TEXT BOOK:

1. Andrew S.Tanenbaum, “Distributed Operating Systems”, Pearson Education Asia, 2001.

REFERENCES:

1. Mukesh singhal and Niranjan G.Shivaratri, “Advanced concepts in Operating System”, Tata McGraw Hill, 2001.
2. Pradeep.K and Sinha, “Distributed operating systems”, PHI, 2001.

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

ITC3214 OPEN SOURCE TECHNOLOGIES

L	T	P	C
1	0	2	2

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 Web server –Working with Web server –Configuring and using Apache Web services – Execution Environment
5. Open Source Software tools and processors –Eclipse IDE platform –Compilers.
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.

SEMESTER VII

ITC4101	**INTERNET OF THINGS**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

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 –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT – The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT.

MODULE II IOT PROTOCOLS **8**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus – KNX – ZigBee Architecture – Network layer – APS layer.

MODULE III WEB OF THINGS **8**

Web of Things – Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.

MODULE IV DESIGN PRINCIPLES OF CONNECTED DEVICES **7**

Technology for design – Privacy in storing data – Internet principles for connected devices-Prototypes and production – Changing embedded platform – Open source versus closed source.

MODULE V PROTOTYPING EMBEDDED DEVICES **7**

Prototyping embedded devices – Electronics- Sensors – Actuators – Arduino – Raspberry PI – Beagle Bone Black – Electric Imp.

MODULE VI PROTOTYPING ONLINE COMPONENTS AND EMBEDDED CODING 8

Sketch – Iterate and Explore – Preparation of physical prototype – Getting started with API – Writing New API – Writing New API – Real Time Reactions – 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:

1. Honbo Zhou , “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012.
2. Dieter Uckelmann; Mark Harrison; Florian Michahelles , Architecting the Internet of Things, Springer, 2011.
3. Adrian McEwen & Hakim Cassimally , “Designing internet of things”, Jhon Wiley and sons, 2014.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

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

ITC4102 INFORMATION SECURITY

L	T	P	C
3	0	0	3

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 CRYPTOGRAPHY 9

Introduction - Computer Security – Threats - Harm – Vulnerabilities – Controls - Authentication - Access Control – Cryptography – Symmetric key & Asymmetric key encryption – Digital signatures.

MODULE II PROGRAM & WEB SECURITY 7

Unintentional (Nonmalicious) Programming errors – Malicious code – Malware - Viruses, Trojan Horses, and Worms – Countermeasures - The Web - Browser Attacks - Web Attacks Targeting Users - Email Attacks.

MODULE III OPERATING SYSTEM SECURITY 7

Memory and Address Protection - File Protection Mechanisms - User Authentication - Trusted Operating Systems - Designing Trusted Operating Systems- Assurance in Trusted Operating Systems

MODULE IV NETWORK SECURITY 8

Network Security Attacks - Threats to Network Communications - Wireless Network Security - Denial of Service - Security Countermeasures - Cryptography in Network Security – Firewalls - Intrusion Detection and Prevention Systems

MODULE V DATABASE SECURITY 7

Introduction - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data

MODULE VI ADMINSTERING SECURITY AND ETHICAL ISSUES 7

Security Planning - Risk Analysis - Organizational Security Policies - Physical Security - Protecting Programs and Data - Information and the Law - Computer Crime

- Ethical Issues.

Total Hours : 45

TEXT BOOK:

1. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", 5th Edition, Pearson Education, 2015.

REFERENCES:

1. William Stallings, "Cryptography and Network Security - Principles and Practices", 3rd Edition, Pearson Education, 2003.
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill, 2003.

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.

ITC4103 WIRELESS NETWORKS

L	T	P	C
3	0	0	3

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 8

Applied Wireless Transmission Techniques. Short Distance Baseband Transmission. Pulse Transmission. Carrier Modulated Transmission. Traditional Digital Cellular Transmission. Broadband Modems for Higher Speeds. Spread Spectrum Transmissions. High-Speed Modems for Spread Spectrum Technology. Diversity and Smart Receiving Techniques. Comparison of Modulation Schemes. Coding Techniques for Wireless Communications

MODULE II PRINCIPLES OF WIRELESS NETWORK OPERATION 8

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 8

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 7

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 7

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 7

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:

1. Kaveh Pahlavan, Prashant Krishnamoorthy, "Principles of Wireless Networks- A united approach", Pearson Education, 2008.

REFERENCES:

1. Jochen Schiller, "Mobile Communications", 2nd Edition, Pearson Education, 2003.
2. X.Wang and H.V.Poor, "Wireless Communication Systems", Pearson education, 2004.
3. M.Mallick, "Mobile and Wireless design essentials", Wiley Publishing Inc. 2003.
4. P.Nicopolitidis, M.S.Obaidat, G.I. papadimitria, A.S. Pomportsis, "Wireless Networks", John Wiley & Sons, 2003.
5.

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.

III Semester Electives

Programme Elective - I

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

OBJECTIVES:

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

THEORETICAL STUDY

ANDROID APPLICATION DEVELOPMENT **15**

Android Basics - Android Architecture - Application Framework - The Manifest file - Libraries – Developing - Managing Virtual Devices - Building and Running – Debugging – Testing - Building Blocks - Application Components - Content Providers - Broadcast Receiver - Processes and Threads - Data storage - SQLite Databases - Localization - User Interface.

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
  - Scientific calculator
  - Online shopping
  - Student attendance and marks maintenance
  - Bus route management
  - Games

Total Hours : 45

REFERENCES:

1. Dawn Griffiths, David Griffiths, “Head First Android Development: A Brain-Friendly Guide”, O'Reilly Media, 2015.

2. John Horton, “Android Programming for Beginners”, Packt Publishing, 2015.
3. Herbert Shieldt , “Java: A Beginner's Guide”, 7th Edition, Oracle Press, 2017.

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 – Next-Generation Sequencing Technology – Computing Technology - Cloud Computing, Data Science Technology - Big Data, Internet of Things (IoT), Social Media and Mobility, Machine Learning-Artificial Intelligence (AI) – 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

Digital Social Media – Microblogging – Customer Personas - Social Networks – Social Bookmarking – Social Media Marketing – Social Media Profiling - Video Sharing and Podcasts – Live Streaming – REALLY Framework – Strategy

Development – Gamification.

MODULE IV MOBILE APP DEVELOPMENT 7

Introduction – Mobile Platforms - Andriod 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 Survial and basic apps – Impact on business cases.

MODULE V INTERNET OF THINGS (IOT) 8

Introduction to IoT and Web of Things (WoT) – Business aspects of IoT – Industry domains - Making Things Smart – M2M to IoT - Cloud Computing for IoT - IoT Communication Protocols – IoT services or attributes - Electronics- Sensors – Actuators – Arduino – Raspberry PI – Beagle Bone Black – Electric Imp.

MODULE VI ARTIFICIAL INTELLIGENCE & MACHINE LEARNING 8

Foundations of AI & Machine Learning – Knowledge representation – Advanced search – Types of learning – Supervised – Unsupervised – Dimensionality Reduction – Machine Learning System Design – Linear model – Distance based model – Tree and Rule models – Support Vector Machines – Neural networks – Robotic Process Automation – Machine learning tools – Octave/Matlab tutorial – A case study – Photo OCR – Game playing – Speech recognition

Total Hours : 45

TEXT BOOKS:

1. Ian Foster, Dennis B.Gannon, “Cloud Computing for Science and Engineering”, MIT Press, September 2017.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, “Cloud Computing Principles and Paradigms”, John Wiley & Sons, Inc., Publications, 2011.
3. Michael Minelli, Michele Chambers, Ambiga Dhiraj., “Big Data, Big Analytics, Emerging Business Intelligence and Analytic Trends for Today's Businesses”, First Edition, Wiley Publications, 2013.
4. Luttrell, Regina, “Social Media: How to Engage, Share, and Connect”, Rowman & Littlefield Publishers, 2016.
5. Jeff McWherter, Scott Gowell, “Professional Mobile Application Development”, 2012.
6. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012.

7. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012.

REFERENCE BOOKS:

1. Reto Meier, “Professional Android 4 Development”, John Wiley and Sons, 2012.
2. Matt Neuburg, “Programming iOS 5”, O'Reilly Media, Inc., 2012.
3. Adrian McEwen & Hakim Cassimally, “Designing internet of things”, John Wiley and Sons, 2014.
4. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012.

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 **30**

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.

ITCX204 **SYSTEM SOFTWARE** **L T P C**

3 0 0 3

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 **8**

Simplified Instructional Computer (SIC)- -Modes of addressing - instruction sets,instruction formats - I/O instructions-Device Driver, Role of Device Drivers, Classes of Devices, Security issues, Design issues.

MODULE II ASSEMBLERS **8**

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 **8**

Absolute Loader - Features of Loader- Machine dependent and machine independent - Program relocation ,linking- Tables used during Linking – Standard Library Search - Design of Loader - Linkage Editors – Dynamic program Linking – Types of Loaders - MSDOS linker.

MODULE IV MACRO PROCESSORS AND EMULATORS **8**

Functions of a macro processor - Macro Definition and Expansion – Tables generated- machine-independent features - Example - MASM Macro Processor - Introduction of virtual machine (VM)-Emulation –Basic interpretation-Threaded interpretation.-Binary Transalation.

MODULE V COMPILER AND INTERPRETERS **8**

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 **5**

Features of a Text editors - Editing tasks - Editor Structure- Debugging systems- Debugging tasks - User-Interface Criteria. Android operating system: Android Architecture, Linux Kernel, Android Architecture Libraries, Android Architecture Application Framework, Applications, Security features and Permission.

Total : 45 Hours

TEXT BOOK:

1. Leland L. Beck, "System Software - An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2000.

REFERENCES:

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", 2nd Edition, Tata McGraw-Hill, 1999.
2. John J. Donovan, "Systems Programming", Tata McGraw-Hill, 1972.
3. Neil Smith , ”Android studio development essentials”, Second edition .

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.

ITCX205 PRINCIPLES OF COMMUNICATION

L	T	P	C
3	0	0	3

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

The Significance of Human Communication - Communication Systems - Types of communication – Modulation and Multiplexing - EM spectrum - Optical spectrum – Bandwidth **and** Gain – Attenuation and Decibels - Tuned Circuits- Filters - Application.

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

Basic Principles - Frequency Modulation - Phase Modulation - Modulation Index - Sidebands – Noise Suppression – FM Versus AM - Frequency Modulators - Phase Modulators - Frequency Demodulators - Signal reproduction – Receivers - Transceivers.

MODULE IV DIGITAL MODULATION TECHNIQUES 7

Introduction – Types of modulation - ASK – FSK – PSK - QAM - Bandwidth Efficiency - Carrier Recovery - Clock Recovery - DPSK - Trellis Code Modulation - Error -Probability -Bit Error Rate - Performance.

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 7

Satellite systems - Satellite Orbits – Spectrum usage – Satellite sub systems -

Communication sub system – Power–Antenna – Receiver– Transmitter – Ground station - Satellite application – Global navigation.

Total Hours : 45

TEXT BOOKS:

1. Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th edition Pearson Education, 2014.
2. Louis E. Frenzel Jr., “Principles of Electronic Communication Systems”, 4th Edition McGraw-Hill Education, 2016.

REFERENCES:

1. Simon Haykin and Michael Moher “Communication Systems”, 5th Edition, John Wiley & Sons, 2010.
2. George Kennedy and Bernard Davis, “Electronic Communication Systems”, 4th Edition, McGraw-Hill Education, 2009.

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.

ITCX206 PRINICPLES OF COMPILER DESIGN

L	T	P	C
3	0	0	3

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 tress
- concise and design optimization of codes.
- design a compiler for a simple programming language.

Prerequisite: Programming concepts and Data structures

MODULE I INTRODUCTION **7**

Language processor - Structure of a Compiler - Applications of Compiler Technology - Programming language basics - Syntax Definition - Syntax-Directed translation - parsing - Lexical Analysis - symbol tables - intermediate code generation.

MODULE II LEXICAL ANALYSIS **9**

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 **8**

Introduction - Context Free Grammars -Top Down parsing - Bottom-up Parsing - Introduction to LR parsing - Construction of SLR Parsing table - Introduction to LALR Parser- Parser Generators.

MODULE IV SYNTAX - DIRECTED TRANSLATION **7**

Syntax-Directed Definitions - Construction of Syntax Trees - Syntax-Directed Translation schemes - Implementing L-Attributed SDD's.

MODULE V INTERMEDIATE CODE GENERATION **7**

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 7

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:

1. Alfred V.Aho, Monica S.Lam, Ravi Sethi and Jeffrey D.Ullman, "Compilers – Principles, Techniques and Tools", Second edition, Pearson Education, New Delhi, 2013.

REFERENCES:

1. Raghavan V, “Principles of Compiler Design”, Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2009.
2. Dick Grone, Henri E Bal, Ceriel J H Jacobs and Koen G Langendoen, “Modern Compiler Design”, John Wiley, New Delhi, 2016.
3. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2015.
4. Dhamdhere D M, "Compiler Construction Principles and Practice", second edition, Macmillan India Ltd., New Delhi, 2002.
5. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", McGraw Hill, New Delhi, 2005.

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.

ITCX207	USER INTERFACE DESIGN	L	T	P	C
		3	0	0	3

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 hoe to use messages and controls.
- acquire the knowledge about icons and images.
- learn about android.

Prerequisite: Computer Fundamentals

MODULE I DESIGN PROCESS 8

The Importance of Good Design, The Benefits of Good Design, Characteristics of the Graphical User Interface, Characteristics of a Web Interface, Principles of User Interface Design, The User Interface Design Process

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:

1. Wilbert O. Galitz, “The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques”, 3rd Revised edition, John Wiley & Sons, 2007
2. Ian G. Clifton, “Android User Interface Design: Implementing Material Design for Developers “, Second Edition, Addison Wesley, 2017

REFERENCES:

1. Alon Cooper, “About Face: The Essentials of Interface Design, Fourth Edition, WILEY, 2016
2. Laura Klein, “UX for Lean Startups”, Shroff, 2013
3. Jeff Gothelf, “Lean UX: Designing Great Products with Agile Teams”, Second Edition, Shroff/O'Reilly, 2016.
4. Patricia Harris, “What Is User Interface Design?”, Powerkids Press, 2017

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.

ITCX208	SEMANTIC WEB	L	T	P	C
		2	0	0	2

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 9

Overview of semantic web – source of semantic web– examining semantic web and examples-semantic wikis-twine-FOAF project-sources of semantic data-RDF-architecture of semantic web-role of ontology in sematic web-semantic web data-Compare and Contrast semantic technologies with traditional technologies-Semantic framework-web based issues and solutions.

MODULE II ONTOLOGY & WEB RESOURCES 12

Ontologies – Taxonomies –Topic Maps – Classifying Ontologies - Kind of Ontology resources -construction of ontology instances – Classifications and methods for building ontology -Ontology Development Life Cycle & process – Ontology-Evolution – Versioning-Structured Web Documents - XML ,JSON– Building page structures – Namespaces – Labeling – Query parsers for ontology–RDF – RDF based models– Formats - RDF grammar– fundamentals.

MODULE III SEMANTIC WEB TOOLS AND APPLICATIONS 9

Tools for construction and designing ontology and reasoning logics for semantic web– Apache Jena Framework, Protégé – SPARQL – Alchemy API – Word Net based Applications -Case studies and Applications using Python and NLTK based Libraries.

Total : 30 Hours

TEXT BOOK:

1. Liyang Yu, A Developer's Guide to the Semantic Web, Springer; 3rd Edition, 2015.

REFERENCES:

1. John Hebeler, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez, Semantic Web
2. Programming, Wiley; 1 edition, 2009.
3. Grigoris Antoniou, Frank van Harmelen, A Semantic Web Primer, Second Edition
   (Cooperative Information Systems) (Hardcover), MIT Press, 2008
4. Dean Allemang and James Hendler, Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, Morgan Kaufmann; 2 edition, 2011.

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)

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

OBJECTIVES:

- To know the importance of mobile applications.
- To learn the fundamentals of iOS application development.
- To develop simple mobile applications using iOS.

THEORETICAL STUDY

iOS APPLICATION DEVELOPMENT **15**

iOS Basics - iOS Architecture - Integrated development Tools - Objective C - Frame work and Libraries - Project templates - Resource & Application Settings - Views & Controls - Debugging & Running - Building Block Approach - Application Life cycle - MVC – Pattern - View - Data Management - Core Data - Application Storage - External Storage - Memory Management - UI Design - Design Tools - Interface Builders - Story board - View Controllers - Drawing model – Windows - Event Handling - View data Source and delegates.

LABORATORY PRACTICE **30**

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

  Sample applications
  - Scientific calculator
  - Home Automation
  - Live Chat
  - Currency converter
  - To do list
  - Games

Total Hours : 45

REFERENCES:

1. Rob Napier, Mugunth kumar, “iOS 7 Programming”, Wiley, 2014.
2. Erica Sadun, “The iOS 5 Developer’s Cookbook”, Pearson, Third Edition, 2012.

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 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.
3. Implementation of Constraints, Views, Sequences, Privileges and Regular Expressions.
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.
10. Creating and Presenting Database Projects.

Total Hours : 30

OUTCOMES:

1. Understand the use and application of the relational database model.
2. Enhance skills in Oracle database programming.
3. Implement database applications using Java programming.
4. Design database and websheet application creation using Application Builder.
5. Expertise in relational database data management.

ITCX103 NATURAL LANGUAGE PROCESSING

L	T	P	C
3	0	0	3

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

Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model.

MODULE II WORD LEVEL AND SYNTACTIC ANALYSIS 7

Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging.

MODULE III SYNTACTIC ANALYSIS AND SEMANTIC ANALYSIS 8

Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing. Semantic Analysis: Meaning Representation-Lexical Semantics-Ambiguity-Word Sense Disambiguation.

MODULE IV DISCOURSE PROCESSING AND NATURAL LANGUAGE GENERATION 8

Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure. Natural Language Generation: Architecture of NLG Systems-Generation Tasks and Representations- Application of NLG.

MODULE V MACHINE TRANSLATION AND INFORMATION RETRIEVAL 8

Machine Translation: Problems in Machine Translation- Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.

MODULE VI LEXICAL RESOURCES AND APPLICATIONS 7

Information Retrieval: Design features of Information Retrieval Systems-Classical,

Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora - Applications.

Total Hours : 45

REFERENCES:

1. Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, 2 nd Edition, Prentice Hall, 2008.
3. James Allen, “Natural Language Understanding”, 2nd edition, Benjamin /Cummings publishing company, 1995.

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.

ITCX104 GAME THEORY L T P C

3 0 0 3

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 INTRODUCTION 7

Introduction - Making rational choices: basics of Games - strategy - preferences - payoffs -

Mathematical basics - Game theory - Rational Choice - Basic solution concepts-non-cooperative versus cooperative games - Basic computational issues - finding equilibrium and learning in games - Typical application areas for game theory (e.g. Google's sponsored search, eBay auctions, electricity trading markets).

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

Non-cooperative Game Theory - Self-interested agents- Games in normal form -

Analyzing games: from optimality to equilibrium - Computing Solution Concepts of Normal - Form Games - Computing Nash equilibrium of two-player, zero-sum games - Computing Nash equilibrium of two-player, general-sum games - Identifying dominated strategies.

MODULE V MECHANISM DESIGN 8

Aggregating Preferences-Social Choice - Formal Model- Voting - Existence of social functions - Ranking systems - Protocols for Strategic Agents: Mechanism Design - Mechanism design with unrestricted preferences- Efficient mechanisms - Vickrey and VCG mechanisms (shortest paths) - profit maximization Computational applications of mechanism design - applications in Computer Science - Google's sponsored search - eBay auctions.

MODULE VI GAME PRODUCTION AND BUSINESS OF GAMES 7

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

Total Hours : 45

REFERENCES:

1. M. J. Osborne, “An Introduction to Game Theory”. Oxford University Press, 2004.
2. N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani, “Algorithmic Game Theory”, Cambridge University Press, 2007.
3. M. J. Osborne and A. Rubinstein, “A Course in Game Theory”, MIT Press, 1994.
4. A.Dixit and S. Skeath, “Games of Strategy”, Second Edition. W W Norton & Co Inc, 2004.
5. Yoav Shoham, Kevin Leyton-Brown, “Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations”, Cambridge University Press 2008
6. Jeannie Novak, "Game Development Essentials - An Introduction", 3rd Edition, Delmar Cengage Learning, 2011.

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.

ITCX105 SOFT COMPUTING L T P C

3 0 0 3

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**

Membership functions: features, fuzzification, methods of membership value assignments- Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic – extension principle -fuzzy integrals – fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

MODULE V 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, Differences & similarities between GA & other traditional methods.

MODULE VI HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS **7**

Neuro-fuzzy hybrid systems – genetic neuro hybrid systems – genetic fuzzy hybrid and fuzzy genetic hybrid systems – Applications: A fusion approach of multispectral images with SAR and soft computing based hybrid fuzzy controllers.

Total Hours : 45

TEXT BOOKS:

1. S.Rajasekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications”, PHI Publication, 2002.
2. S.N.Sivanandam and S.N.Deepa, “Principles of Soft Computing”, Wiley India Pvt Ltd, 2011.
3. J.S.R.Jang, C.T. Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI / Pearson Education 2004.

REFERENCES:

1. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.
2. N.K.Bose, “Neural Network Fundamentals with Graphs, Algorithms, and Applications” TMH, 1996.
3. Kosko: “Neural Network & Fuzzy System”, PHI Publication, 1992.
4. Rich E and Knight K, “Artificial Intelligence”, TMH, 1991.

OUTCOMES:

- 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.

ITCX106 MACHINE LEARNING ALGORITHMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- 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 7

Introduction - Component of learning - examples of machine learning applications - Types of machine learning - Mathematical foundations of machine learning - Learning models - Probabilistic models - Logic models - Parametric Models - Non-Parametric Models - Theory of learning - Theory of generalization.

MODULE II SUPERVISED LEARNING 8

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 8

Nearest neighbor models – Clustering - K-means - hierarchical clustering - k-d trees - EM Algorithm- Mixtures of Gaussians - Dimensionality Reduction - Factor analysis - Principal Component Analysis (PCA) - Probabilistic PCA - Independent components analysis (ICA) - Singular Value Decomposition - meta learning.

MODULE IV TREE AND GRAPHICAL MODELS 8

Decision trees - learning decision trees - regression trees - clustering trees - descriptive rule learning - association rule mining - Graphical Models - Undirected graphical models - Markov Random Fields - Directed Graphical Models - Bayesian Networks - Inference - Learning - Generalization - Hidden Markov 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

Ranking: Priority Inbox - Ordering Email Messages by Priority - Writing a Priority Inbox - Spam Filtering - Analyzing Social Graphs - Social Network Analysis - Hacking Twitter Social Graph Data - Analyzing Twitter Networks - Case Study - Octave/Matlab.

Total Hours : 45

TEXT BOOKS:

1. Ethem Alpaydin, “Introduction to Machine Learning”, Third Edition, MIT Press, 2014.
2. Alex Smola and S.V.N Vishwanathan, “Introduction to Machine Learning”, Second Edition Cambridge University Press, 2010.

REFERENCES:

1. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012.
2. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012.
3. Ian H. Witten, Eibe Frank, Mark A. Hall, “Data Mining: Practical Machine Learning Tools and Techniques”, Third Edition, Morgan Kaufmann, 2011.
4. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.

OUTCOMES:

- 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.

ITCX107 C# AND .NET FRAMEWORK L T P C
3 0 2 4

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

Review of OOP Concepts - Overview of .NET Framework - Basic Elements of C# -
Program Structure and simple Input and Output Operations – Operators and Expressions – Statements – Arrays and Structures.

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

C# Concepts for creating Data Structures - File Operation – File Management systems–
Stream Oriented Operations- Multitasking – Multithreading – Thread Operation – Synchronization.

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

Application Domains – Remoting – Leasing and Sponsorship - .NET Coding Design

Guidelines –Assemblies – Security – Application Development

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.

Total Hours : 45

REFERENCES:

1. S. Thamarai Selvi and R. Murugesan “A Textbook on C# “, Pearson Education,2003.
2. Stephen C. Perry “Core C# and .NET”, Pearson Education,2006.
3. Jesse Liberty, “Programming C#”, Second Edition, O’Reilly Press, 2002.
4. Robinson et al, “Professional C#”, Fifth Edition, Wrox Press, 2002.
5. Herbert Schildt, “The Complete Reference: C#”, Tata McGraw Hill, 2004.
6. Andrew Troelsen, “C# and the .NET Platform”, A! Press, 2003.
7. Thuan Thai and Hoang Q. Lam, “. NET Framework Essentials”, Second Edition, O’Reilly, 2002.

OUTCOMES:

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

- List the major elements of the .NET frame work 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

ITCX108 ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

OBJECTIVES:

- To become familiar with AI and neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To provide the mathematical background for carrying out the optimization associated with neural network learning.
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

MODULE I INTRODUCTION 5

Computerized reasoning - Artificial Intelligence (AI) - characteristics of an AI problem - Problem representation in AI - State space representation - problem reduction.

MODULE II SEARCH PROCESS 10

AI and search process - Brute force search techniques, Depth first, Breadth first search techniques, Hill climbing, Best first search, AND/OR graphs, A* algorithm - Constraint satisfaction.

MODULE III AI AND GAME PLAYING 6

Major components of a game playing program - plausible move generator - static evaluation - function generator - Minimal strategy - Alpha - Beta techniques - problems in computer game playing programs.

MODULE IV KNOWLEDGE REPRESENTATION 9

Logic, Propositional logic - Tautology - Contradiction - Normal forms - Predicate logic - Rules of inference - Resolution - Unification algorithm - Production rules - Semantic networks - Frames – Scripts - Conceptual dependency.

MODULE V KNOWLEDGE ENGINEERING 7

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 5

Frame work for learning – Inductive learning –Supervised, Unsupervised learning – Parallel distributed processing – Genetic Algorithms .

Total Hours : 45

REFERENCES:

1. Stuart Russel and Peter Norvig, " Artificial Intelligence – a modern approach", Prentice Hall, 2003.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 2003.
3. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley, 2000.
4. Luger George F and Stubblefield William A, "Artificial Intelligence : Structures and Strategies for Complex Problem Solving", Pearson Education, 2002.

OUTCOMES:

Upon successful completion of this course, the student shall be able to:

- Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- 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.
- Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.
- Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems.
- Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms).

ITCX109 **GRID COMPUTING** **L T P C**

3 0 0 3

OBJECTIVES:

- To provide an overview of the basic concepts of Grid Computing.
- To highlight the advantages of deploying Grid Computing.
- To illustrate the practical adoption of a Grid deployment through real life case studies.

MODULE I CONCEPTS AND ARCHITECTURE **8**

Introduction-Parallel and Distributed Computing- Cluster Computing-Grid Computing- Virtual Organization and the Grid Standards -Anatomy and Physiology of Grid- Web and Grid Services.

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**

Grid Security-A Brief Security Primer-PKI-X 509 Certificates-Grid Security Requirement -WS security.

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- Metadata, 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:

1. Ian Foster, Carl Kesselman, "The Grid 2: Blueprint for a New Computing Infrastructure", Elsevier Series, 2004.
2. Parvin Asadzadeh, Rajkumar Buyya, Chun Ling Kei, Deepa Nayar, and Srikumar Venugopal, "Global Grids and Software Toolkits: A Study of Four Grid Middleware Technologies, High Performance Computing: Paradigm and Infrastructure", Laurence Yang and Minyi Guo (editors), Wiley Press, New Jersey, 2005.

REFERENCES:

1. Jarek Nabrzyski, Jennifer M. Schopf, Jan Weglarz, "Grid Resource Management: State of the Art and Future Trends", (International Series in Operations Research & Management Science), 1st Edition, Springer, 2003.
2. "Designing a Resource Broker for Heterogeneous Grids, Software: Practice and Experience", Wiley Press, New York, USA, 2008.
3. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, "Grid Computing: Making The Global Infrastructure a Reality", Wiley, 2003.

OUTCOMES:

- Outline the basic concepts of Grid Computing.
- Discuss the components of OGSA frame work.
- 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.

ITCX110 INFORMATION CODING TECHNIQUES

L	T	P	C
3	0	0	3

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 8

Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding – Shannon-fano coding – Discrete Memory less channels – channel capacity – channel coding theorem – Channel capacity theorem.

MODULE II DATA AND VOICE CODING 8

Differential Pulse Code Modulation – Adaptive Differential Pulse code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC).

MODULE III BLOCK CODES 7

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 – CRC.

MODULE IV ERROR CONTROL CODING 7

Generator polynomial – Parity check polynomial – Convolutional codes – code tree trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding.

MODULE V COMPRESSION TECHNIQUES 8

Principles of text compression – static Huffman coding – dynamic huffman coding – arithmetic coding – image compression – graphics interchange format – tagged image file format – digitized documents – introduction to JPEG standards.

MODULE VI AUDIO AND VIDEO CODING 7

Linear predictive coding – code excited LPC – perceptual coding - MPEG audio coders – Dolby audio coders – video compression – H.261 and MPEG video standards.

Total Hours : 45

TEXT BOOKS:

1. Simon Haykin, 'Communication Systems', John Wiley and Sons, 4th Edition 2001.

2. Fred Halsall, "Multidedia Communications: Applications, Networks, Protocols and Standards", Perason Education Asia, 2002

REFERENCES:

1. Mark Nelson, "Data Compression Book", BPB, 1992.

2. Watkinson J, "Compression in Video and Audio", Focal Press, London, 1995.

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 **8**

Model of Operation. symmetric Links. Layer-2 Ad Hoc Solutions. Proactive versus Reactive Protocols. Multicast. Commercial Applications of Ad Hoc Networking. Conferencing. Home Networking. Emergency Services. Personal Area Networks and Bluetooth. Embedded Computing Applications. Technical and Market Factors Affecting Ad Hoc Networks. Scalability. Power Budget versus Latency. Protocol Deployment and Incompatible Standards.

MODULE II CHANNEL ALLOCATION **8**

Channel allocation methods –802.11 WLAN – MACA – MACAW – MACABI – CSMA – TSMA.

MODULE III DESTINATION SEQUENCED DISTANCE VECTOR PROTOCOL **7**

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 **7**

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 **7**

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 **8**

ZRP: A Hybrid Framework for Routing in Ad Hoc Networks. The Zone Routing Protocol. ZRP – Formal Description. Hiearchical based Routing – Hierarchical State Routing Protocol, Fisheye Routing Protocol.

Total Hours : 45

TEXT BOOKS:

1. Charles E. Perkins, “Ad Hoc Networking”, Addison Wesley, December 2000.
2. C. Siva Ram Murthy, B.S. Manoj, “Adhoc Wireless Networks”, Prentice Hall, 2004.

REFERENCES:

1. C.K. Toh, “Adhoc Mobile Wireless Networks: Protocols and Systems”, Pearson Education, 2009.
2. Elizabeth M.Royer and C.K.Toh, “A Review of Current Routing Protocols for Mobile Adhoc Networks”, IEEE Personal Communications, April 1999.

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

		L	T	P	C
ITCX212	**HYBRID APPLICATION DEVELOPMENT**	**1**	**0**	**2**	**2**

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 **15**

Introduction - Computing eras & current mobile wave - Platforms, Frameworks & Tools - Hybrid frameworks, web tech, web APIs (backend) - The stack – HTML5/CSS3/AngularJS - Ionic – AngularJS and native-like – Phonegap.

JS Basics - JS Frameworks - AngularJS Intro - Ionic Framework, Why Ionic? - Ionic 1 / 2 - NodeJS / NPM - Data Binding & Filters - Module, Controller & Views – Directives – Services – Routing - Angular JS 2 changes – Components – Typescript - Working with Angular code.

Project Structure - Application Logic - Screen Templates - Ionic components - Navigation Stack - Application structure and screens - Integrating the screens - Component customization - Working with Web APIs - Integrating Device Features.

LABORATORY PRACTICE **30**

- 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:

1. Asep Edi Kurniawan, "Mobile App Development with Angularjs and Ionic", Leanpub 2015.

2. Jeremy Wilken, "Ionic in Action: Hybrid Mobile Apps with Ionic and AngularJS", Manning Publication 2015.

3. Vinci Rufus, "AngularJS Web Application Development Blueprints", Packt Publishing 2014.

ITCX213 DATA WAREHOUSING AND DATA MINING TOOLS

L	T	P	C
3	0	2	4

OBJECTIVES:

- To introduce the concept of data mining with a detail coverage of basic tasks, metrics, issues and implication.
- To explain core topics like classification, clustering and association rules are exhaustively dealt with.
- To introduce the concept of data warehousing with special emphasis on architecture and design.

MODULE I INTRODUCTION TO DATA WAREHOUSING **7**

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 MINING **6**

Motivation and Importance of Data mining – Evolution of Database systems – Data mining functionalities – Steps in KDD process- Architecture of a typical data mining system - Classification of data mining systems – Data mining task primitives - Major issues in data mining.

MODULE III DATA PREPARATION AND CONCEPT DESCRIPTION **7**

Different forms of Preprocessing - Data Cleaning - Data Integration and Transformation - Concept hierarchy - Data generalization - Attribute oriented induction for data generalization and data characterization.

MODULE IV ASSOCIATION ANALYSIS **6**

Market Basket Analysis – Frequent Itemsets- Closed Itemsets - Frequent Pattern mining - The Apriori algorithm – Generating association rules- Improving the efficiency of Apriori - Correlation analysis.

MODULE V CLASSIFICATION AND PREDICTION **8**

Issues – Decision tree induction – Attribute selection measures – Overfitting and pruning- Bayesian Classification – Bayesian Belief Networks - Prediction.

MODULE VI CLUSTER ANALYSIS & APPLICATIONS **11**

Types of data in Cluster Analysis – Categorization of clustering methods – Partitioning methods - Classical partitioning methods- Hierarchical methods -

Agglomerative and Divisive - BIRCH- Outlier analysis. Trends and social impacts of data mining – privacy concerns– Web mining - Social network analysis - Biological data analysis. Introduction to WEKA tool.

Total Hours : 45 + 30

TEXT BOOKS:

1. Alex Berson, Stephen J. Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw- Hill, New Delhi, 2008.
2. Jiawei Han and Micheline Kamber,” Data Mining Concepts and Techniques”, Elsevier Science India Pvt Ltd., New Delhi,2007

REFERENCES:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, Pearson Education,New Delhi, 2007.
2. Margaret Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education, New Delhi, 2007.
3. Gupta K, “Introduction to Data Mining with Case Studies”, PHI Learning Private Ltd, New Delhi, 2011.
4. Jamie MacLenna, Zhaohui Tang, Bogdan Crivat, “Data Mining with Microsoft SQL Server 2008”, Wiley publications, USA, 2008.
5. Daniel T.Larose, “Data Mining Methods and Models”, Wile-Interscience, 2006.
6. Sam Anahory, Dennis Murry, “Data Warehousing in the real world”, Pearson Education, 2003.
7. David Hand, Heikki Manila, Padhraic Symth, “Principles of Data mining”, PHI, 2004.
8. Sam Anahory, Dennis Murry, “Data Warehousing in the real world”, Pearson Education, 2003.
9. W.H.Inmon, “Building the Data Warehouse”, 3rd Edition, Wiley, 2003.
10. Alex Bezon, Stephen J.Smith, “Data Warehousing, Data Mining & OLAP”, McGraw Hill Edition, 2001.
11. Paulraj Ponniah, “Data Warehousing Fundamentals”, Wiley-Interscience Publication, 2003.

ITCX214 **CYBER SECURITY** **L T P C**

3 0 0 3

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 7

Security problem in computing – Cryptography Basics – History of Encryption – Modern Methods – Legitimate versus Fraudulent Encryption methods – Encryption used in Internet.

MODULE II CYBERCRIME AND CYBER OFFENSES 8

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

MODULE III CYBERCRIME: MOBILE AND WIRELESS DEVICES 8

Proliferation of Mobile and Wireless Devices – Trends in Mobility – Credit card frauds in Mobile and Wireless Computing – Security Challenges – Authentication Service Security – Attacks on Mobile Phones.

MODULE IV TOOLS AND METHODS USED IN CYBERCRIME 8

Proxy Servers and Anonymizers – Phishing – Password Cracking – Keyloggers and Spywares – Virus and Worms – Trojan Horses and Backdoors – Steganography – DoS and DDoS Attacks.

MODULE V SECURITY POLICIES 7

Introduction - Defining User Policies – Passwords – Internet Use – Email Usage – Installing/ Uninstalling Software – Instant Messaging – Defining System Administrative Policies – Defining Access Control – Developmental Policies – Standards, Guidelines and Procedures – Basics of Assessing a System.

MODULE VI COMPUTER FORENSICS **7**

General Guidelines – Finding Evidence on the PC - Finding Evidence in System Logs – Windows Logs – Linux Logs – Getting Back Deleted Files – Operating System Utilities – The Windows Registry.

Total Hours : 45

TEXT BOOK:

1. Nina Godbole, Sunit Belapure, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley, 2011.
2. Chuck Easttom, “Computer Security Fundamentals”, 2nd Edition, Pearson Education, 2012.

REFERENCES:

1. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, 3rd Edition, Pearson Education, 2003.
2. William Stallings, “Cryptography and Network Security – Principles andPractices”, 3rd Edition, Pearson Education, 2003.
3. Atul Kahate, “Cryptography and Network Security”, Tata McGraw Hill, 2000.

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.

ITCX215 SOFTWARE REQUIREMENTS AND SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

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 INDTRODUCTION 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

Total Hours : 45

REFERENCES:

1. McConnell, S. “Software Requirements”, 3rd edition, Microsoft Press, 2013.
2. Bob Hughes and Mike Cotterell, “Software Project management”, 5th edition, Mc Graw Hill, 2009.

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.

ITCX216 BUSINESS AND DATA ANALYTICS L T P C

3 0 2 4

OBJECTIVES:

- To gain an understanding 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 7

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

MODULE II BUSINESS ANALYTICS LIFE CYCLE 8

Business Analytics Process, CRISP-DM, predictive power and over fitting, using JMP, automated data mining solutions.

MODULE III DATA EXPLORATION AND DIMENSION REDUCTION 8

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 7

Evaluating Predictive performance, judging classifier performance, judging ranking performance, and oversampling.

MODULE V ADVANCED ANALYTICS 8

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

MODULE VI MODEL EVALUATION TECHNIQUES 7

Model Evaluation Techniques for the Description Task **,**Model Evaluation Techniques for the Estimation and Prediction Tasks **,**Model Evaluation Techniques for the Classification Task, Error Rate, False Positives, and False Negatives, Misclassification Cost Adjustment to Reflect Real-World Concerns ,Decision Cost/Benefit Analysis **,** Lift

Charts and Gains Charts, Interweaving Model Evaluation with Model Building , Confluence of Results: Applying a Suite of Models.

Total Hours : 45
Practical Hours:15

TEXT BOOKS:

1. Galit Shmueli ,Peter C. Bruce,Mia L. Stepiiens, Nitin R. Patel, “Data Mining For Business Analytics Concepts, Techniques, and Applications with JMP Pro”, John Wiley & sons, 2017.
2. Daniel T. Larose & Chantal D. Larose, “Discovering Knowledge in Data: An Introduction to Data Mining”, Wiley, Second Edition.

REFERENCES:

1. Ron Klimberg and B. D. McCullough, “Fundamentals of Predictive Analytics with JMP”, SAS Institute.
2. Marc J. Schniederjans, Dara G. Schniederjans , Christopher M. Starkey, “Business analytics principles, concepts and applications what, why and how”, Pearson.
3. Saxena, Rahul, Srinivasan, Anand, “Business Analytics A Practitioner’s Guide”, Springer.
4. Hastie, Trevor, et al. The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
5. Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010.

OUTCOMES:

- 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

ITCX217 WEB SERVICES L T P C

3 0 0 3

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

Business motivations for web services – B2B – B2C – Technical motivations- limitations of CORBA and DCOM – Service-oriented Architecture (SOA).

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 V HTTP VERBS AND HEADERS 8

HTTP – Clients and Servers – Making HTTP requests - HTTP Verbs - Serving GET request- Making GET request – Handling POST request – Making

POST request- Headers –request response headers – identify clients with user agents – Headers for content negotiation – Securing headers with authorization headers – caching headers – custom headers.

MODULE VI BUILDING API 8

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:

1. Ron Schmelzer et al., “XML and Web Services”, Pearson Education, 2008.
2. Sandeep Chatterjee and James Webber, “Developing Enterprise Web Services:An Architect’s Guide”, Pearson Education, 2004.
3. Lorna Jane Mitchell,“PHP Web Services – APIs for the Modern Web” 2nd edition, O’reilly , 2016.

REFERENCES:

1. Keith Ballinger, “.NET Web Services Architecture and Implementation”, Pearson Education, 2003.
2. David Chappell, “Understanding .NET ATutorial and Analysis”, Addison Wesley,2002.
3. Kennard Scibner and Mark C.Stiver, “Understanding SOAP”, SAMS publishing.
4. Alexander Nakhimovsky and Tom Myers, “XML Programming: Web Applications and Web Services with JSP and ASP”, Apress, 2002.

OUTCOMES:

- 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.
- Learn to work with JSON and XML technologies.
- Use the best service for a given application and make it robust.

ITCX218 IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:

The course aims to provide understanding of

- The basic principles and concepts in digital image processing
- The application of digital image analysis moving towards image interpretation.
- 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 7

Digital image fundamentals - Digital Image through scanner, digital camera. Concept of gray levels. Imaging Geometry – Image sampling and quantization Basic relationship between pixels.

MODULE II DIGITAL IMAGE TRANSFORMS 8

Basic geometric transformations-Introduction to Fourier Transform and DFT , Properties of 2D Fourier Transform , FFT , Separable Image Transforms, Walsh, Hadamard, Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.

MODULE III IMAGE ENHANCEMENT TECHNIQUES 7

Spatial Domain methods: Basic grey level transformation, Histogram equalization, Image subtraction, Image averaging, Spatial filtering: Smoothing, sharpening filters, Laplacian filters , Frequency domain filters : Smoothing, Sharpening filters.

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

Need for data compression, Lossless compression: Variable length coding, LZW coding, Bit plane coding, predictive coding-DPCM. Lossy Compression: Transform coding, Wavelet coding, Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization.

MODULE VI IMAGE SEGMENTATION AND REPRESENTATION 8

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

Total Hours: 45

REFERENCES:

1. Rafael C Gonzalez, Richard E Woods, “Digital Image Processing”, 2nd Edition, Pearson Education, 2003.
2. William K Pratt, “Digital Image Processing”, John Willey, 2001.
3. Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, “Image Processing Analysis and Machine Vision”, 1999.
4. A.K. Jain, PHI, “Fundamentals of Digital Image Processing”, New Delhi ,1995.
5. Chanda Dutta Magundar , “Digital Image Processing and Applications”, PrenticeHall of India, 2000.

OUTCOMES:

- 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.

ITCX219 EXPERT SYSTEMS

L	T	P	C
3	0	0	3

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 study 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 – 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 7

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:

1. Peter Jackson, “Introduction to Expert Systems”, Third Edition, Pearson Education, 2003.
2. Donald A. Waterman, “A Guide to Expert Systems”, Addison Wesley, 1999.

REFERENCES:

1. W. Patterson, ‘Introduction to Artificial Intelligence and Expert Systems’, Prentice Hall of India, 2003.
2. Elain Rich and Kevin Knight, ‘Artificial Intelligence’, Second Edition, Tata McGraw Hill, 1995.

OUTCOMES:

- 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 8

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation.

MODULE II WEB SERVICES & SERVICE ABSTRACTION 8

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration –Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer.

MODULE III SERVICE-ORIENTED ANALYSIS & DESIGN 8

Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design– Application service design – Task centric business service design.

MODULE IV XML BASED WEB SERVICES 9

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

MODULE V SERVICE COORDINATION AND WEB SERVICES SECURITY 6

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS- Policy, WSSecurity.

MODULE VI SOA TRANSACTION & PROTOCOL COORDINATION 6

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

Total Hours : 45

REFERENCES:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.
2. Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
3. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services- An Architect"s Guide", Pearson Education, 2005.
4. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation", 1st Edition, O'Reilly, 2006.
5. Shankar Kambhampaly, "Service–Oriented Architecture for Enterprise Applications", Wiley India Pvt Ltd, 2008.
6. Mark O'Neill, et al. , "Web Services Security", Tata McGraw-Hill , 2003.

OUTCOMES:

- 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.

ITCX221 PERVASIVE COMPUTING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To know about the applications of pervasive computing.
- To understand the use of pervasive computing on web applications.
- To gain knowledge about PDA"s using pervasive computing.
- To learn the user interface issues in pervasive computing.

MODULE I INTRODUCTION **7**

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

MODULE II WEB APPLICATION CONCEPTS **8**

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) – Introduction.

MODULE III VOICE TECHNOLOGY **7**

Voice Enabling Pervasive Computing - Voice Standards - Speech Applications in Pervasive Computing and security –java for pervasive devices, Biometrics.

MODULE IV PERSONAL DIGITAL ASSISTANTS **8**

PDA in Pervasive Computing – Introduction - PDA software Components, Standards, emerging trends - PDA Device characteristics - PDA Based Access Architecture.PDA browsers

MODULE V USER INTERFACE ISSUES **7**

User Interface Issues in Pervasive Computing, Architecture - Smart Card- based Authentication Mechanisms - Wearable computing Architecture.Case study- Wearable computing / Cyber physical system

MODULE VI PERVASIVE WEB APPLICATION ARCHITECTURE **8**

Introduction - scalability and availability - Development of Pervasive computing Web Applications - Pervasive application architecture. Example application – User interface overview – Architecture – Implementation.

Total Hours : 45

TEXT BOOKS:

1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaec & Klaus Rindtorff. "Pervasive Computing Technology and Architecture of Mobile Internet Applications", Addision Wesley, Reading, 2002.
2. Uwe Hansman, Lothat Merk, Martin S Nicklous & Thomas Stober, "Principles of Mobile Computing", 2nd Edition, Springer- Verlag, New Delhi, 2003.

REFERENCES:

1. Rahul Banerjee, "Internetworking Technologies: An Engineering Perspective", Prentice –Hall of India, New Delhi, 2003. (ISBN 81-203-2185-5).
2. Rahul Banerjee, "Lecture Notes in Pervasive Computing", Outline Notes, BITS-Pilani, 2003.

OUTCOMES:

On completion of the programme 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:

- To become familiar with the theoretical perspectives of knowledge creation, knowledge transfer, knowledge sharing, and knowledge leadership roles and skills.
- To understand how the study of communication relates to knowledge development and knowledge sharing in organizations.
- 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 **7**

Decision making, Systems, Modeling, and support - Introduction and Definition - Systems - Models - Modeling process - Decision making: The intelligence phase - The design phase - The choice phase - Evaluation: The implementation phase -Alternative Decision - Making models - Decision support systems - Decision makers - Case applications.

MODULE II DECISION SUPPORT SYSTEM DEVELOPMENT **8**

Decision Support System Development: Introduction - Life cycle - Methodologies - prototype - Technology Levels and Tools - Development platforms - Tool selection - Developing DSS. Enterprise systems: Concepts and Definition - Evolution of information systems - Information needs - Characteristics and capabilities – Comparing and Integrating EIS and DSS - EIS data access, Data Warehouse, OLAP, Multidimensional analysis, Presentation and the web - Including soft information enterprise on systems- Organizational DSS - supply and value chains and decision support - supply chain problems and solutions - computerized systems MRP, ERP, SCM - frontline decision support systems.

MODULE III KNOWLEDGE MANAGEMENT **8**

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 TECHNIQUES 8

Knowledge representation: Introduction - Representation in logic and other schemas - Semantic networks - Production rules - Frames - Multiple knowledge representation - Experimental knowledge representations - Representing uncertainty.Inference Techniques: Reasoning in artificial intelligence - Inference with rules: The Inference tree - Inference with frames- Model-based and case-based reasoning - Explanation and Meta knowledge- Inference with uncertainty - Representing uncertainty - Probabilities and related approaches - Theory of certainty - Approximate reasoning using fuzzy logic.

MODULE V INTELLIGENT SYSTEM DEVELOPMENT 7

Intelligent Systems Development: Prototyping: Project Initialization – System analysis and design - Software classification: Building expert systems with tools - Shells and environments - Software selection - Hardware -Rapid prototyping and a demonstration prototype - System development - Implementation - Post implementation.

MODULE VI MANAGEMENT SUPPORT SYSTEMS 7

Implementing and integrating management support systems - Implementation: The major issues - Strategies - System integration – Generic models MSS, DSS, ES - Integrating EIS, DSS and ES, and global integration Intelligent DSS - Intelligent modeling and model management – Examples of integrated systems - Problems and issues in integration. Impacts of Management Support Systems - Introduction - overview - Organizational structure and related areas - MSS support to business process reengineering

Personnel management issues - Impact on individuals - Productivity, quality, and competitiveness - decision making and the manager manager"s job - Issues of legality, privacy, and ethics - Intelligent systems and employment levels - Internet communication - other societal impacts - managerial implications and social responsibilities.

Total Hours : 45

TEXT BOOK:

1. Efrain Turban, Jay Aaronson, "Decision Support Systems and Intelligent Systems", 6th Edition, Pearson Education, 2001.

REFERENCES:

1. Ganesh Natarajan, Sandhya Shekhar, "Knowledge management – Enabling Business Growth", Tata McGraw Hill, 2002.
2. George M.Marakas, "Decision Support System", Prentice Hall, India, 2003.
3. Efrem A.Mallach, "Decision Support and Data Warehouse Systems", Tata McGraw-Hill, 2002.

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.

ITCX223 ELECTRONICS COMMERCE L T P C
3 0 0 3

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 8

Introduction – Electronic 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 8

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

MODULE III ADVERTISING AND MARKETING 8

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 8

The Corporate Digital Library – Dimensions of Internal Electronics Commerce Systems - Making a Business case for a document Library - Types of Digital documents - Issues behind document Infrastructure- Corporate data warehouses- Documents Active / Compound document architecture.

MODULE V DOCUMENT TYPES 8

Structured Documents-Structured Document Fundamentals-Document Interchange Representations-Separating Logical Structure from Physical Structure - Document Markup- Document Markup Languages.

MODULE VI MULTIMEDIA AND ECOMMERCE 5

Multimedia and Digital Video – Broad band Telecommunications – Mobile and Wireless Computing Fundamentals-Social networks and online communities- Online auctions including ebay-Ecommerce portals-mobile commerce.

Total Hours : 45

TEXT BOOK:

1. Kalakota & Whinston, “Frontiers of Electronic Commerce”, Pearson Education, 2002.

REFERENCES:

1. Kamalesh K. Bajaj, “E-Commerce: The Cutting Edge & Business”, Tata McGraw-Hill, 2003.
2. Brenda Kennan, “Managing your E-Commerce Business”, Prentice Hall of India, 2001.
3. Elias M. Awad, “Electronic Commerce from Vision to Fulfillment”, Prentice Hall of India, 2003.
4. Bharat Bhaskar, “Electronic Commerce – Framework, Technology andApplication”, TMH, 2003.
5. Effy Oz, “Foundations of E-Commerce”, Prentice Hall of India, 2001.
6. Jim A Carter, “Developing E-Commerce Systems”, Prentice Hall of India, 2001.

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 7

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

MODULE II PRIVATE, PUBLIC AND HYBRID CLOUD 8

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
4. Creating Windows and Ubuntu virtual data centers using Eucalpytus and OpenNebula-Open Source Middleware technology.
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 TECHNOLGIES

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
12. Working with AWS nodes. Creation of Virtual machines in AWS and Amazon S3.

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.

MODULE I **7**

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.
6. Storage media forensics.
7. Image Analysis & Steganography using tools like Merge Streams, Image Hide, Stealth Files, Blindside, Stools.
8. Network Forensics Analysis – Capture and analyze network traffic using network traffic/data capturing/monitoring tools like NetWitness, Windump, Network Flight Recorder.
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.

ITCX120	MONGODB FOR JAVA DEVELOPERS	L	T	P	C
		0	0	3	1

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.

ITCX121 GREEN COMPUTING L T P C
2 0 0 1

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 7

Green IT Fundamentals: Business, IT, Environment - Green IT Strategies: Drivers, Dimensions, Goals - Green Assets: Buildings, Data Centers, Networks, and Devices - Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture - Green Information Systems: Design and Development Models.

MODULE II GREEN IT FRAMEWORK & GREEN COMPLIANCE 8

Virtualizing of IT systems – Role of electric utilities, Telecommuting, Teleconferencing and

Teleporting – Going paperless - Materials recycling – Green Data center – Green Grid framework – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

Total Hours : 15

TEXT BOOKS:

1. Bud E. Smith,"Green Computing Tools and Techniques for Saving Energy, Money, and Resources", Taylor & Francis Group, CRC Press, ISBN-13: 978-1-4665-0340-3, 2014.
2. Jason Harris, "Green Computing and Green IT Best Practices, On Regulations and Industry Initiatives, Virtualization and power management, materials recycling and Tele commuting , Emereo Publishing .ISBN-13: 978-1-9215-2344-1,2014.

REFERENCES:

1. Ishfaq Ahmed & Sanjay Ranka, "Handbook of Energy Aware and Green Computing", CRC Press, ISBN: 978-1-4665-0116-4, 2013.
2. Greg Schulz, "The Green and Virtual Data Center", CRC Press, ISBN-13:978-

1-4200-8666-9, 2009.

3. Marty Poniatowski, “Foundation of Green IT: Consolidation, Virtualization, Efficiency, and ROI in the Data Center”, Printice Hall, ISBN: 9780-1-3704-375-0, 2009.

OUTCOMES:

- Discuss Green Computing concepts, assets and business process management.
- Outline Green IT data center framework, Green compliance in IT systems.

ITCX122 **XML TECHNOLOGIES** **L T P C**
0 0 2 1

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.
3. Render XML document with HTML in JavaScript.
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
9. Parsing XML Document using SAX/DOM Parser.
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.

ITCX123 BIG DATA ANALYTICS L T P C

3 0 2 4

OBJECTIVES:

- Understand big data analytics
- Discuss data analytic methods
- To learn technology and tools for analytics

MODULE I INTRODUCTION TO BIG DATA ANALYTICS 7

Data structures –state of practice in data analytics-key roles-examples-data analytics life cycle-discovery-data preparation-model planning-model building-communicate result-operationalize.

MODULE II DATA ANALYTIC METHOD 8

Introduction to R-exploratory data analysis-statistical methods for evaluation-clustering-k means-association rules.

MODULE III ADVANCED ANALYTICS 8

Regression-linear regression-logistic regression-classification-decision trees-naives bayes-diagnostics of classifiers-text analytics.

MODULE IV TECHNOLOGY AND TOOLS 7

Analytics of unstructured data-use cases-map reduce-hadoop- echo system-pig-hive-hbase-mahout-NoSql.

MODULE V IN-DATABASE ANALYTICS 8

Sql essentials-joins-set operation-grouping extensions-text analysis-advanced sql-window function-ordered aggregates-MADlib.

MODULE VI ANALYTIC PROJECTS 7

Communicating and operationalize analytic projects-final deliverables-data visualization.

Theory : 45

Practical session:

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux.
2. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).
3. Map Reduce application for word counting on Hadoop cluster

4. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
5. K-means clustering using map reduce.

Practical : 15

Total Hours : 60

TEXT BOOKS:

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", John Wiley & Sons, Inc., Indianapolis, Indiana, 2015.

REFERENCES:

1. Big data analytics with R and Hadoop, Vignesh Prajapati, packet publishing, 2013.
2. Big data, big analytics, Michael Minelli, Michele Chambers and Ambiga Dhiraj, John Wiley & Sons, Inc,2013.
3. Real-time big data analytics-emerging architecture by mike barlow, O'Reilly Media, First Edition,2013.
4. Big data governance: Modern Data Management Principles for Hadoop, NoSQL & Big Data Analytics by Peter K. Ghavami, PhD, 2016.

OUTCOMES:

- Discuss the basics of big data analytics
- To understand the methods of analytics
- To discuss the advanced analytics methods
- To setup environment using technology and tools for analytics
- To understand in-database analytics
- To carry out the analytic projects

ITCX124 **PROGRAMMING IN SCALA** **L T P C**

0 0 3 1

OBJECTIVES:

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

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. Case study of different web frameworks with Scala.

Total Hours : 45

OUTCOMES:

Upon Completion of this course the student will be able to

- Install and set 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	1	2

OBJECTIVES:

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

MODULE I INTRODUCTION TO R PROGRAMMING 7

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

MODULE II DATA ANALYSIS AND GRAPHICS 8

Input/ Output – Graphics - Interface R to Other Languages

LIST OF EXERCISE:

1. Store data in textual and binary format.
2. Subsetting R objects
3. Vectorized Matrix Operation
4. Apply select, filter and arrange, group_by function.
5. Control structures

Total Hours : 45

Text Book:

Norman Matloff, “The Art of R Programming: A Tour of Statistical Software Design, “, No Starch Press, 2011.

OUTCOMES:

On completion of the programme students will be able to:

- Develop a simulation model in R programming.
- Analyze the data and draw various graphs.

ITCX126 **VIRTUAL REALITY** **L T P C**
3 0 0 3

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 interface design, human factors, developer recommendations, and technological issues of virtual reality.
- To provide the technology for managing large scale VR environment in real time.
- To discuss VR system framework and development tools.
- To design a virtual environment and compelling virtual reality experience.
-

MODULE I INTRODUCTION TO VIRTUAL REALITY 7

Introduction – Goals and VR definitions – Transforming models – Matrix algebra and 2D rotations – 3D rotations – Axis-angle representations – Converting and multiplying rotations – Homogeneous transforms – Eye transforms – Canonical view transform – Viewport transform.

MODULE II VISUAL PHYSIOLOGY AND VISUAL PERCEPTION 8

Photoreceptors – Sufficient resolution for VR – Light intensity – Eye movements - Eye movements issues for VR – Neuroscience of vision – Depth perception – Motion perception – Frame rates and displays.

MODULE III VI: TRACKING SYSTEMS 8

Orientation tracking – Tilt drift correction – Yaw drift correction – Tracking with a camera – Perspective n-point problem – Filtering – Lighthouse approach.

MODULE IV VISUAL RENDERING & AUDIO 8

Visual rendering – Shading models – Rasterization – Pixel shading – VR-specific problems – Distortion shading – Post-rendering image warp – Audio – Auditory localization – Rendering – Spatialization and display – Combining other senses.

MODULE V VR INTERFACES & ANIMATING VIRTUAL ENVIRONMENT 7

Interfaces – Overview – Locomotion – Manipulation – System control – Social

interaction – Evaluation of VR Systems – Interactive techniques in VR – Body track – Hand gesture – Animation of objects – Shape and object inbetweening – Free-from deformation – Particle systems.

MODULE VI VR DEVELOPMENT TOOLS AND FRAMEWORKS 7

Frameworks of Software Development Tools in VR – X3D standard – Vega – MultigEN – VR toolkits – VRML Programming – Augmented reality system - VR technology in Film & TV production – VR technology in physical exercises and games – Demonstration of Digital Entertainment by VR – Emerging Virtual Reality Applications.

Total Hours : 45

REFERENCES:

1. John Vince, “Virtual Reality Systems”, Pearson Education, First edition, 2007.
2. Burdea, G.C. and P. Coiffet, “Virtual Reality Technology”, Second edition, Wiley-IEEE Press, 2003.
3. Sherman, W.R. & A. Craig, “Understanding Virtual Reality: Interface, Application, and Design”, Morgan Kaufmann, San Francisco, CA, 2003.
4. George Mather, “Foundations of Sensation and Perception”, Psychology Press; Second edition, 2009.
5. Peter Shirley, Michael Ashikhmin, and Steve Marschner, “Fundamentals of Computer Graphics”, A K Peters/CRC Press; Third edition, 2009.

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 knowledge of computing and mathematics to solve complex computing problems in computer science discipline.
- Describe current techniques, skills, and tools necessary for computing practice
- 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.

ITCX127 SOFTWARE QUALITY MANAGEMENT L T P C

3 0 0 3

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 SOFTWARE QUALITY ASSURANCE 7

Quality Concepts and Perspectives - Assuring Software Quality Assurance – Software Quality Assurance Planning.

MODULE II SOFTWARE QUALITY MEASUREMENTS 7

Fundamentals Of Measurement Theory – Software Quality Metrics Overview – Applying The Seven Basic Quality Tools In Software Development – Selecting Quality Goals And Measures – Principles Of Measurement – Measures And Metrics – Quality Function Deployment – Measuring And Analyzing Customer Satisfaction.

MODULE III SOFTWARE QUALITY MANAGEMENT MODELS 8

Quality Management Systems – A Historical Perspective, A QMS For Software – Quality Management Systems – The ISO 9000 Series Of Quality Management Standards – Models And Standards For Process Improvement – Dos And Don”ts Of Software Process Improvement.

MODULE IV SOFTWARE QUALITY METRICS 8

Product Quality Metrics: Defect Density-Customer Problems Metric-CustomerSatisfaction Metrics-Function Points- In-Process Quality Metrics: Defect Arrival Pattern-Phase-Based Defect Removal Pattern- Defect Removal Effectiveness-Metrics for Software Maintenance: Backlog Management Index- Fix Response Time- Fix Quality-Software Quality Indicators.

MODULE V SOFTWARE MANAGEMENT PROCESS FRAMEWORK & DISCIPLINE 8

Life Cycle Process – Model Based Software Architectures – Workflow of The Process – Checkpoint of The Process – Iterative Process Planning – Project Organizations And Responsibilities – Process Automation.

MODULE VI SOFTWARE RELIABILITY AND PROCESS IMPROVEMENT 7

Definition and Measurement – Measurement based Assurance – Software Process Improvement and Capability Determination.

Total Hours : 45

TEXT BOOK:

1. Abu Sayed Mahfuz, “Software Quality Assurance: Integrating Testing, Security, and Audit, CRC Press, 2016.

REFERENCES:

1. Gordon G Schulmeyer, “Handbook of Software Quality Assurance”, 4th Edition, Artech House Publishers, 2008.

2. Stephen H. Kan, “Metrics and Models in Software Quality Engineering”, 2nd Edition, Pearson Edition, India, 2004.

3. Alan C. Gillies, “Software Quality Theory and Management”, 2nd Edition, Thomson Press, 2003.

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 L T P C

3 0 0 3

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 9

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 8

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 9

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 6

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

MODULE V SYSTEMS INVESTIGATION AND ETHICAL ISSUES 6

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

MODULE VI INCIDENT AND INCIDENT RESPONSE **7**

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

Total Hours : 45

REFERENCES:

1. Anthony Reyes, Jack Wiles, “Cybercrime and Digital Forenscis”, Elseiver Publications, 2007.
2.John Sammons, “The Basics of Digital Forensics”, Elesvier 2012
3. Linda Volonins, Reynalds Anzaldua, “Computer Forensics for dummies”, Wiley Publishing 2008.
4.Norbert Zaenglein, “Disk Detective: Secret You Must Know to Recover Information From a Computer”, Paladin Press, 2000.
5.Bill Nelson,Amelia Philips and Christopher Steuart, “Guide to computer forensics and investigations”, course technology, Cengage Learning; 4thedition, ISBN: 1- 435-49883-6, 2009.
6.Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”,Tata McGrawHill, 2006.

OUTCOMES:

1. Have a fundamental understanding of Cloud Forensics and how resultant evidence can be applied within legal cases.
2. Distinguish various types of Cloud crime, and use cloud forensic techniques to identify the digital fingerprints associated with criminal activities.
3. Understand why Digital forensics is important for any modern organization. Gained theoretical knowledge in digital forensic investigations.
4. Know how to apply forensic analysis tools to recover important evidence for identifying cloud crime
5. Identify and apply current practices for data discovery recovery and acquisition.
6. Understand financial and accounting forensics, and explain their role in preventing various forms of fraud.

ITCX129 NETWORK SIMULATOR LAB

L	T	P	C
0	0	3	1

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/matlab/Qualnet/Routers/Switches, etc.,)

1. Wireless Access Point - configuring and enabling security
2. Wi-Fi based Data Acquisition
3. Routing protocols for IP network using routers
4. Configuration of VLAN using switches
5. PDA mobility analysis using layer 3 switches
6. Hidden and exposed terminal problem
7. Signaling in wireless networks (RTS, CTS, DATA andACK)
8. AODV/DSR
9. RTP protocol of VoIP
10. Implementation of network security algorithms
11. Network performance analysis using packet sniffer

Total Hours : 45

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 a suitable network security algorithms for a given scenario.
- Assess the performance of wireless network using packet sniffer.

ITCX130 ENTERPRISE RESOURCE PLANNING L T P C
3 0 0 3

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 9

ERP: An Overview, Enterprise – An Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering (BPR), Data Warehousing, Data Mining, OLAP, SCM, CRM and Product life Cycle management.

MODULE II ERP IMPLEMENTATION 9

ERP Implementation Challenges - Lifecycle, Implementation Methodology, Package selection , Requirements Definition – Methodologies -Vendors, Consultants and Users, Contracts with Vendors, Consultants and Employees, Data Migration, Project Management and Monitoring.

MODULE III ERP IN ACTION 6

Operation and Maintenance of the ERP System, Measuring the Performance of the ERP System, Maximizing the ERP System.

MODULE IV THE BUSINESS MODULES 7

Business modules in an ERP Package, Finance, Manufacturing, Human Resources, Materials Management, Marketing, Total Quality Management, Sales, Distribution and Service.

MODULE V THE ERP MARKET **8**

Marketplace – Dynamics – SAP AG – Oracle – PeopleSoft – JD Edwards – QAD Inc –SSA Global – Lawson Software.

MODULE VI ERP – PRESENT AND FUTURE **6**

Turbo Charge the ERP System, EIA, ERP and e-Commerce, ERP II , ERP and Internet, Future Directions and Trends in ERP.

Total Hours : 45

TEXT BOOKS:

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, New Delhi, 2000.
2. Mary Sumner, “Enterprise Resource Planning”, Pearson Education, 2007.

REFERENCES:

1. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI, New Delhi, 2003.
2. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”,Thompson Course Technology, USA, 2001.

OUTCOMES:

- 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.

ITCX131 EMBEDDED SYSTEMS L T P C

3 0 0 3

OBJECTIVES:

- This course will introduce students to embedded systems by providing a detailed overview of the important topics in the field.
- This course will equip students with the software development skills necessary for practitioners in the embedded systems field.
- Entire software development lifecycle and examine the various issues involved in developing software for embedded systems.

MODULE I EMBEDDED COMPUTING PLATFORM 7

Embedded computing - characteristics and challenges - embedded system design process-- Overview of Processors and hardware units in an embedded system.

MODULE II COMPUTING PLATFORM AND DESIGN ANALYSIS 9

CPU buses - Memory devices - I/O devices - Component interfacing - Design with microprocessors - Development and Debugging - Program design - Model of programs - Assembly and Linking - Basic compilation techniques - Analysis and optimization of execution time, power, energy, program size - Program validation and testing.

MODULE III REAL TIME OPERATING SYSTEMS (RTOS) 7

Overview of Operating Systems (OS) concepts - Real time systems - Types- Need for RTOS in Embedded Systems -Compare OS and RTOS - RTOS Tasks - Task States - Multitasking -Context Switching - Scheduling Algorithms- IPC mechanisms .

MODULE IV DISTRIBUTED EMBEDDED SYSTEMS 8

Communication buses - Shared memory communication - accelerated design- networks for emb

edded systems - networks based design - Internet enabled systems.

MODULE V EMBEDDED SOFTWARE DEVELOPMENT TOOLS 7

Host and target machines - Linkers / Locators for Embedded Software - Debugging techniques - Instruction set simulators Laboratory tools - Practical example - Source code.

MODULE VI SOFTWARE TECHNOLOGY FOR EMBEDDED SYSTEMS 7

Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions -Use of Pointers - NULL Pointers - C" Program compilers - Cross compiler - Optimization of memory codes.

Total Hours:45

TEXT BOOKS:

1. Marilyn Wolf, "Computers as components ", Elsevier, 2012.
2. Qing Li and Carolyn Yao, "Real-Time Concepts for Embedded Systems", CMP Books, 2003.
3. Michael Bass, "Programming Embedded Systems in C and C++", Oreilly, 2003.

REFERENCES:

1. David E.Simon, "An Embedded Software Primer", Pearson Education, 2003.
2. Rajkamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill, First reprint Oct. 2003.
3. Steve Heath, "Embedded System Design", 2nd Edition, Elsevier, 2004.
4. Frank Vahid and Tony Gwargie, "Embedded System Design", John Wiley & sons, 2002.

OUTCOMES:

On completion of this course the student will be able to

- Develop Embedded Programs in C and C++.
- Apply various code minimization techniques.

Physics Elective Courses
(To be offered in II Semester)

PHCX 01	FUNDAMENTALS OF ENGINEERING MATERIALS	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To help students to acquire the properties and applications of conducting and semiconducting materials.
- To familiarize students with basic ideas about the properties of dielectric and magnetic materials and their applications.
- To familiarize students with basic knowledge of nanomaterials and its electrical, electronic, mechanical and magnetic properties.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I CONDUCTING AND SEMICONDUCTING MATERIALS 7

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

MODULE II DIELECTRIC MATERIALS 8

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

MODULE III MAGNETIC MATERIALS 7

Origin of magnetism-magnetic moment, susceptibility, permeability – Bohr magneton – Dia, Para and Ferro magnetism –Spontaneous magnetization- Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites and its application - Giant Magneto-resistance effect (GMR) - Magnetic resonance imaging(MRI).

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, graphene - nanocomposites – applications of nano materials.

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.
4. Determination of time constant of a capacitor using RC circuit.
5. Determination of paramagnetic susceptibility of given liquid.
6. Determination of hysteresis loss in a transformer using BH curve.
7. Analysis of size effect on the absorption spectrum of nanomaterials.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

1. William D. Callister, “Material Science and Engineering”, Wiley Publications, 2006.
2. Raghavan, V., “Materials Science and Engineering”, 5th edition, Printice Hall of India Pvt Ltd. New Delhi, 2004.
3. Wahab. M.A, “Solid State Physics: Structure and Properties of Materials”, Narosa Publishing House Pvt. Ltd., New Delhi , 2nd Edition, 2010.
4. Pillai, S.O., “Solid State Physics”, New Age International, New Delhi, 2005.
5. Charles P. Poole and Frank J. Owens, ”Introduction to nanotechnology”, Wiley (India), 2009.
6. Pradeep. T., “Textbook of Nanoscience and Nanotechnology”, McGraw Hill Education (India) Private Limited, New York, 2012.

OUTCOMES:

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

- apply the concepts of conducting and semiconducting materials for solid state devices.
- comprehend the significance of properties of dielectric magnetic materials and derive these properties from synthesized materials.
- differentiate between the properties of the nanomaterials compared to bulk materials.
- complement the knowledge acquired in the theory class and correlate the results for applications.

PHCX 02	HEAT AND THERMODYNAMICS	L	T	P	C
		2	0	2	3

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 **10**

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 **10**

Thermal conductivity – rectilinear flow of heat – thermal conductivity of a good conductor – Forbe’s method – thermal conductivity of a bad conductor – Lee’s disc method – conduction of heat through compound media - radiation – Planck’s law of blackbody radiation – Wien’s law – Stefan’s law – Newton’s law of cooling from Stefan’s law – Solar constant – Pyrometry.

MODULE III FUNDAMENTALS OF THERMODYNAMICS **10**

Thermodynamic equilibrium – zeroth law of thermodynamics – first law of thermodynamics – Reversible and irreversible processes – second law of thermodynamics - Heat engine – Carnot’s engine – Carnot’s theorem – Internal combustion engines – petrol and diesel engines (qualitative) – Entropy and available energy – temperature – entropy diagram for Carnot’s cycle - Third Law of thermodynamics (qualitative).

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 good conductor-Forbe's method
5. Determination of thermal conductivity of a bad conductor-Lee's disc method

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

1. Mathur. D.S, “Heat & Thermodynamics”, S.Chand & Co., 2009.
2. Brijlal & Subramaniam, “Heat and Thermodynamics”, S.Chand & Co, Delhi, 2010.
3. Gupta. A.B and Roy. H, “Thermal Physics”, Books and Allied Ltd., 2002.
4. Sharma. J.K and Sarkar. K.K, “Thermodynamics and statistical Physics”, Himalaya Publishing House, 1988.

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.
- apply the knowledge of laws of thermodynamics in thermodynamic systems.
- perform heat based experiments and determine its various properties.

PHCX 03	INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To acquire basic knowledge about the nanomaterials and applications.
- To learn about the synthesis and 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**

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 - zeolite, mesoporous materials, carbon nanotubes, grapheme - nanocomposites - applications (qualitative): Molecular electronics-nanoelectronics – nanophotonics - single electron transistor-drug delivery.

MODULE II SYNTHESIS AND IMAGING TECHNIQUES **12**

Top-down and bottom up approaches – mechanical alloying and mechanical ball milling - sol-gel approach - hydrothermal method - precipitation method - spray pyrolysis - spin coating-self assembled monolayer (SAM) - Chemical vapour deposition method – Physical vapour deposition method: laser ablation method, sputtering method.

Optical microscopy – Phase contrast and interference microscopy – confocal microscopy - high resolution Scanning electron microscope (HRSEM) - high resolution Transmission electron microscope (HRTEM) - Atomic force microscope - Scanning Tunnelling microscope (STM).

MODULE III NANOFABRICATION **8**

Photolithgraphy - electron beam lithography - X-ray and Ion beam lithography - nanoimprint lithography - soft lithograpy - nanoelectromechnical systems (NEMS) - nanoindentation principles.

PRACTICALS

1. Synthesis of nanomaterials by sol-gel method.

2. Synthesis of nanomaterials by hydrothermal method.
3. Synthesis of nanomaterials by solid state reaction method.
4. Synthesis of nanomaterials by chemical bath deposition method.
5. Synthesis of nanomaterials by co-precipitation method.
6. Synthesis of nano thin films by spray pyrolysis 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:

1. Charles P.Poole and Frank J. Owens, ”Introduction to nanotechnology”, Wiley (India), 2009.
2. Cao. G., “Nanostructures & Nanomaterials: Synthesis, Properties & Applications”, Imperial College Press, 2004.
3. Gaddand. W., Brenner. D., Lysherski. S. and Infrate. G.J., “Handbook of NanoScience Engineering and Technology”, CRC Press, 2002.
4. Pradeep. T., “Textbook of Nanoscience and Nanotechnology”, McGraw Hill Education (India) Private Limited, New York, 2012.
5. Chris Mack, “Fundamental Principles of Optical Lithography: The Science of Microfabrication”, John Wiley & Sons, 2008.
6. Bandyopadhyay A.K., “Nano Materials”, New Age International Publishers, New Delhi, 2008.

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.

PHCX 04	LASERS AND THEIR APPLICATIONS	L	T	P	C
		2	0	2	3

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 **8**

Spontaneous and stimulated emission - Population inversion – Einstein's A & B coefficients - Threshold condition – super-radiance Laser – 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 **8**

Laser systems – General description - Laser structure - excitation mechanism - Different laser systems- He-Ne laser, Carbon-dioxide laser - Excimer laser – Free electron laser- Alexandrite laser - Ti-Sapphire laser – Semiconductor diode laser - Diode pumped solid state laser - Pulsed-CW dye laser- Fibre laser.

MODULE III METROLOGICAL AND MATERIAL PROCESSING APPLICATIONS **8**

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 – Biophotonic applications.

MODULE IV LASER INSTRUMENTATION **7**

Laser for measurement of length, current and voltage – 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 (DFDL)
6. Determination of fibre optic losses using semiconductor laser.
7. Bandgap determination of a semiconductor diode.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

1. William T. Silfvast, “Laser Fundamentals”, Cambridge University Press, 2009.
2. Ghatak. A. & Thyagarajan. K. “Optical Electronics”, Cambridge University, 1994.
3. Laud.B.B., “Laser and Non-Linear Optics”, Second Edition, New Age International (p) Limited Publishers, 2011.
4. Nambiar. K.R., “Lasers Principle, Types and Applications”, New Age International (p) Ltd, 2004.
5. Wilson. J. & Hawkes. J.F.B., “Opto Electronics - An Introduction”, Prentice Hall, 1992.
6. William M.Steen, ”Laser Material Processing”, Springer-Verlag, Berlin, Third Edn., 2005.

OUTCOMES:

At the end of the course, the students will be able

- To complement the knowledge acquired in the theory class.
- To work with dye lasers for tunability of laser wavelength.
- To measure the loss of information involved in fibre optic communication.
- To correlate the results for application.

PHCX 05	MATERIALS SCIENCE	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To gain basic knowledge in conducting and semiconducting materials and their properties.
- To provide basic understanding of 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 10

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 7

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 6

Introduction to magnetic materials & origin of magnetic moment - Different types of

magnetic materials and their properties - Ferromagnetism & Domain theory of ferromagnetism - Hysteresis, Soft and Hard magnetic materials - Antiferromagnetic materials - Ferrites and its applications – Applications of magnetic materials : Data storage.

MODULE IV OPTICAL MATERIALS 7

Optical properties of semiconductors - Direct and Indirect bandgap semiconductors – Traps, recombination centre, color center and exciton – Luminescence : Fluorescence and Phosphorescence - Liquid crystal display : twisted nematic crystal display – Applications of Optical materials - Optical Sources : light emitting diode and laser diode - Photo detectors : PIN photodiode and Avalanche Photodiode - Pyroelectric devices - Electro optic effect : Kerr effect and Faraday effect.

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 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:

1. Palanisamy P.K., ''Physics II'', Material Science for ECE, Scitech Publications (India) Pvt. Ltd., 2006.
2. Kasap. S.O., ''Principles of Electronic materials and devices'', McGraw Hill Publishers, 3rd Edition, 2007.
3. Arumugam. M, "Physics II'', Material Science for ECE, Anuradha Publishers, 5th Edition, 2005.
4. Sze. S.M., ''Semiconductor Devices – Physics and Technology'', John Wiley, 2nd Edition. 2002.
5. Raghavan. V, ''Materials Science and Engineering'', Prentice Hall of India, 5th Edition, 2004.

OUTCOMES:

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

- Gain knowledge about fundamentals of conducting and semiconducting materials.
- Understand concepts and applications of Dielectric and 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**

Ultrasonic Testing - Principle of operations - types of sound waves - types of Transducers - transmission and pulse-echo method - straight beam and angle beam, instrumentation - calibration methods - ultrasonic testing technique- data representation, A Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight. Diffraction - thickness determination - advantages, disadvantages and applications.

MODULE II RADIOGRAPHIC INSPECTION METHOD **10**

Radiographic testing – Principle - Interaction of X-ray with matter - X-ray radiography - method of generation-industrial radiography inspection techniques – Equipment - Exposure charts - Types of films – Fluoroscopy - Xero-Radiography – Limitations - Gamma radiography - Equipment, radiation sources - method of generation - film processing - interpretations of radiography - safety in industrial radiography.

MODULE III SURFACE NDT TECHNIQUES **10**

Liquid Penetrant Testing – 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 –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.
9. Demonstration of Radiographic inspection.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

1. Baldev Raj., Jayakumar T.,Thavasimuthu., “Practical Non-Destructive Testing”, Narosa Publishing House, 2009.
2. Ravi Prakash., “Non-Destructive Testing Techniques”, 1st revised edition, New Age International Publishers, 2010.
3. ASM Metals Handbook of Non-Destructive Evaluation and Quality Control, American Society of Metals, Metals Park, Ohio, USA, Volume-17, 2000.
4. Paul E Mix,”Introduction to Non-destructive testing: a training guide”, Wiley, 2nd Edition New Jersey, 2005.
5. Charles J., Hellier, “Handbook of Nondestructive evaluation”, McGraw Hill, New York, 2001.

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	L	T	P	C
		2	0	2	3

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 **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 VISCOSITY **8**

Viscosity- Newton’s formula for viscous flow - Streamline and turbulent motion - Reynolds number - Poiseuille's formula - Determination of coefficient of viscosity- factors affecting viscosity - capillary flow method - Stoke's formula- viscosity of highly viscous liquids – Stoke’s method - Lubricants and its applications –viscosity measurements - Viscometer - Variation of Viscosity with Temperature.

MODULE III ACOUSTICS OF BUILDING **7**

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 **7**

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.
3. Analysis of stress by photo elastic 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:

1. Mathur D.S., "Elements of Properties of Matter", S.Chand & Co, Delhi, 2009.
2. Gaur R.K., Gupta S.L.,"Engineering Physics", Dhanpat Rai Publishers, 2010.
3. Brijlal and Subramaniam.," Properties of Matter", Eurasia Publishing Co, New Delhi, 2002.
4. Smith C.J.," General Properties of Matter", Orient & Longman,1960.
5. Kenneth G. Budinski and Michel K., Budinski, "Engineering Materials Properties and Selection", Pearson, Singapore, 2002.

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.
- apply the fundamental concept of photo elasticity for the stress analysis of the object.

PHCX 08	PROPERTIES OF MATTER AND NONDESTRUCTIVE TESTING	L	T	P	C
		2	0	2	3

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**

Rigid bodies - angular acceleration - Torque on a particle - angular momentum - law of conservation of angular momentum - moment of inertia and its significance - Theorem of parallel and perpendicular axis - moment of inertia of a thin uniform bar - moment of inertia of a rectangular lamina - moment of inertia of uniform circular disc - Moment of inertia of hollow and solid cylinders – flywheel
(qualitative) - kinetic energy of rotating body – Routh rule.

MODULE III NDT TECHNIQUES **6**

Ultrasonic Testing- types of Transducers-transmission and pulse-echo method-Radiographic testing- Principle-Interaction of X-ray with matter-X-ray radiography-method of generation-industrial radiography inspection techniques- Liquid Penetrant Testing**-** Inspection Procedure and Interpretation of results.

MODULE IV LOW TEMPERATURE PHYSICS **8**

Definition of Refrigeration and Air-Conditioning - Types of **Refrigeration Systems-**

Applications- Comfort Air Conditioning, Industrial Refrigeration, Food processing and food chain - **Cryogenic treatment - Low temperature properties of engineering materials: Mechanical properties, Thermal properties, Electrical properties.**

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.
   Inspection of welds using solvent removable fluorescence dye penetrant.
5. Inspection of welds by Magnetic Particle Testing.
6. Determination of moment of inertia of the disc by torsion pendulum method.
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:

1. Mathur D.S.,"Elements of Properties of Matter", S.Chand & Co, Delhi, 2009.
2. Brijlal & Subramaniam," Properties of Matter", Eurasia Publishing Co, Delhi, 2002.
3. Gaur R.K., Gupta S.L., "Engineering Physics" Dhanpat Rai Publishers, 2010.
4. Baldev Raj.,Jayakumar T., Thavasimuthu M.,"Practical Non-Destructive testing", Narosa Publishing House, 2009.
5. Brijlal & Subrahmanyam., "Heat and Thermodynamics" S.Chand & Company Ltd, 2002.
6. Paul E Mix.," Introduction to Non-destructive testing: a training guide", Wiley, 2nd Edition, New Jersey, 2005.
7. Charles J., Hellier.," Handbook of Nondestructive evaluation", McGraw Hill, New York, 2001.

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.
- know the low temperature systems and its applications.

PHCX 09	SEMICONDUCTOR PHYSICS AND OPTOELECTRONICS	L	T	P	C
		2	0	2	3

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 **8**

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 **7**

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 **7**

Modulation of light – birefringence –Modulation Techniques - Electro optic effect – Electro optic materials –Types of Electro optic Modulators : Kerr and Pockel modulators –- Magneto optic effect - Magneto optic Modulators – Acousto Optic modulators.

MODULE IV OPTICAL DETECTORS **8**

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:

1. Arumugam. M, "Physics II", Anuradha Publishers, 5th Edition, 2005.
2. Sze. S.M., "Semiconductor Devices – Physics and Technology", 2nd edn. John Wiley, 2002.
3. Wilson & J.F.B. Hawkes, "Optoelectronics – An Introduction", Prentice Hall, India, 1996.
4. Bhattacharya, "Semiconductor optoelectronic devices", Second Edn, Pearson Education, 2002.
5. Safa O. Kasap, "Optoelectronics & Photonics:Principles & Practices", Second Edn, Pearson Education,2013.
6. Palanisamy P.K., "Semiconductor physics and optoelectronics" Scitech Publications, 2003.

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**

Principle and applications: conductometric titrations – potentiometrIc titrations, ion-selective electrodes and pH-metry – coulometry – voltammetry - polarography, amperometric titrations.

MODULE II CHROMATOGRAPHY **8**

Basic concepts of chromatography – paper chromatography – column chromatography – thin layer chromatography – gas chromatography – high performance liquid chromatography – gel permeation chromatography.

MODULE III SPECTROSCOPY **8**

Absorption spectroscopy (principle, instrumentation and applications): Colorimetric analysis – UV-Visible spectroscopy – FTIR spectroscopy - Emission Spectroscopy (principle, instrumentation and applications): fluorescence, phosphorescence and chemiluminescence – Atomic absorption spectroscopy – flame emission spectroscopy.

MODULE IV THERMAL ANALYSIS **7**

Principle, instrumentation and applications: Thermo gravimetric 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.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

1. Skoog D.A., West D.M., Holler F.J. and Crouch S.R., Fundamentals of Analytical Chemistry, 8th Edition, Thomson Brooks/Cole Publication., Singapore, 2004.
2. Willard H.H., Merritt L.L., Dean J.A. and Settle F.A., Instrumental Methods of Analysis, 7th Edition, CBS Publication, New Delhi Reprint, 2004.
3. A.I. Vogel, Vogel's Textbook of Practical Organic Chemistry, 5th Edition, Prentice Hall, London, 2008.
4. Christian G.D., Analytical Chemistry, 6th Edition, John Wiley, Singapore, 2003.
5. Fifield F.W. and Kealey D., Principles and Practice of Analytical Chemistry, 5th Edition, Blackwell Publication, London, 2000.
6. Settle F. (Editor), Handbook of Instrumental Techniques for Analytical Chemistry, Pearson Education, Singapore, 2004.

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.

CHCX02	CORROSION AND ITS CONTROL	L	T	P	C
		2	0	2	3

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 8

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 embritttlement, decarburization and hydrogen attack – corrosion of silver and copper by sulphur compounds – liquid metal corrosion (embritttlement 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- corrosion current -rate of corrosion.

MODULE II FORMS OF CORROSION 7

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- corrosion in composites.

MODULE III CORROSION CONTROL AND ORGANIC COATINGS 8

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 repellant, heat resistant, temperature indicating and luminous paints.

MODULE IV INORGANIC COATINGS 7

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

1. P.C Jain & Monica Jain, Engineering Chemistry Dhanpatrai Publishing Company (P) Ltd., New Delhi (2013).
2. S S Umare & S S Dara, A text Book of Engineering Chemistry, S. Chand& Company Ltd, New Delhi, 2014.
3. M.G. Fontana and N.G. Green, Corrosion Engineering, McGraw Hill Book Company, NewYork, 1984.
4. S. Banerjee, A.K. Tyagi, Functional Materials- Preparation, Processing and Applications, ELSEVIER Publications, London ; Waltham, MA : 2011

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

CHCX03	ELECTRICAL MATERIALS AND BATTERIES	L	T	P	C
		2	0	2	3

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 **8**

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 **7**

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 **7**

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 **8**

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.
3. Preparation of phenol-formaldehyde.
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:

1. Jain P.C. and Renuka Jain, Engineering Chemistry, Dhanpat Rai Publication Co. (P) Ltd., New Delhi, 2013.
2. Michael L. Berins, Plastics Engineering Hand Book, 5th Edition, Chapman and Hall, New York, 1991.
3. H.F. Mark and N. Gaylord, Encyclopedia of Polymer Science and Technology, Vol. 1 to XIV Interscience, 2nd Ed. 1988.
4. Gowarikar V.R., Viswanathan N.V and Jayadev Sreedhar, Polymer Science, Wiley Eastern Limited, Madras, 1981.
5. R.K. Rajput,A Textbook of Electrical Engineering Materials, Firewall Media, 2004
6. Vladimir S. Bagotsky, Fuel Cells: Problems and Solutions, 2nd Edition, John Wiley and Sons, 2012.
7. B. Viswanathan and M. Aulice Scibioh, Fuel Cells: Principles and Applications, Taylor and Francis Group, 2007.

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.

CHCX04	ENGINEERING MATERIALS	L	T	P	C
		2	0	2	3

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 **8**

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, Cermets - super refractory.

Abrasives : introduction - Moh's scale - natural abrasives: diamond – corundum – emery - garnet and quartz, synthetic abrasives: preparation properties and uses: carborundum (silicon carbide)– alundum - boron (norbide) carbide

MODULE II ADHESIVES AND BINDING MATERIALS **7**

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

MODULE III LUBRICANTS **7**

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

MODULE IV COMPOSITE MATERIALS 7

Introduction – 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:

1. P.C Jain & Monica Jain, Engineering Chemistry Dhanpatrai Publishing Company (P) Ltd., New Delhi (2013).
2. B.Sivasnakar, “Engineering Chemistry”, Tata McGrow-Hill Publication Limited, New Delhi, second reprint 2008.
3. Engineering Chemistry, Wiley India Editorial Team, Willey India Publisher, New Delhi, 2011.
4. S S Umare & S S Dara, A text Book of Engineering Chemistry, S. Chand& Company Ltd, New Delhi, 2014.

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.

CHCX05	FUELS AND COMBUSTION	L	T	P	C
		2	0	2	3

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 **7**

Characteristics of good fuel. Solid fuel – Wood, Coal – Ranking of coal – selection of coal. Analysis of coal – Proximate analysis. Pulverized coal – Metallurgical coke – Carbonization of coal – types. Manufacture of metallurgical coke – Beehive oven and Otto Hoffman's by-product oven methods.

MODULE II LIQUID AND GASEOUS FUELS **8**

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 **8**

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 **7**

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:

1. Jain P.C and Renuka Jain, Physical Chemistry for Engineers, Dhanpat Rai and Sons, New Delhi, 2001.
2. Engineering Chemistry, Wiley India Editorial Team, Willey India Publisher, New Delhi, 2011.
3. John Griswold, Fuels Combustion and Furnaces, Mc-Graw Hill Book Company Inc. University of Michigan, 1946.
4. J.B. Heywood, Internal Combustion Engine Fundamentals, McGraw Hill International Editions, 1989.
5. Bahl B.S., Tuli and Arun Bahl, Essentials of Physical Chemistry, S. Chand and Company Ltd., New Delhi, 2004.

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, votalite 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.

CHCX06	FUNDAMENTALS OF PHYSICAL CHEMISTRY	L	T	P	C
		2	0	2	3

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 – 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.
3. *Kineticsoffirst and second order reactions.*
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:

1. Rajaram J. and Kuriacose J.C., Chemical Thermodynamics: Classical, Statistical and Irreversible, Pearson Education, India, 2013.
2. Samuel Glasstone, Thermodynamics for Chemists, Read Books, United Kingdom, 2007.
3. James E. House, Principles of Chemical Kinetics, 2nd Edition, Academic Press, United States of America, 2007.
4. Keith J. Laidler, Chemical Kinetics, Pearson Education, India, 1987.
5. Douglas M. Ruthven, Principles of Adsorption and Adsorption Processes, John Wiley & Sons, 1984.
6. Puri B.R., Sharma L.R. and Pathania M.S., Principles of Physical Chemistry, 47th Edition, Vishal Publishing Co. India, 2016.

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

CHCX07	GREEN TECHNOLOGY	L	T	P	C
		2	0	2	3

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 – Significance – 12 Principles with examples – R4 model – Life cycle analysis – sustainable and cleaner production - Green Technology: definition, examples: CFC free refrigerants, green building, energy, 3D printers, nanotechnology – Awards for Green chemistry – organization promoting green chemistry.

MODULE II WASTE & WASTE MINIMISATION **8**

Source of wastes: domestic, industrial, medical, nuclear, e-waste; problems; prevention – economy of waste disposal – Waste minimization techniques: general waste treatment and recycling – alternate waste water treatment technologies: hybrid process – Green computing: goals, green cloud, green ICT - Pollution statistics from various industries (Industrial case studies).

MODULE III GREEN SYNTHESIS **7**

Introduction - Solvent free reactions - green reagents, green solvents in synthesis - microwave and ultrasound assisted reactions – supercritical fluid extraction – green oxidation and photochemical reactions – catalyst and biocatalysts.

MODULE IV GREEN INDUSTRIAL PROCESSES **8**

Polymer industry: biodegradable polymer - textile industry: greener approaches of dyeing, waste disposal – ecofriendly agrochemicals: biofertilizers, biopesticides – Pharmaceutical industry: atom economy, reduction of toxicity, use of biocatalyst, zero waste disposal – Leather industry: greener process in tanning, crusting, surface coating – ecofriendly batteries & fuel cells.

PRACTICALS

1. Synthesis of an ionic liquids (Ex: imidazolium) and testing the solubility of organic

chemicals.

2. Green bromination of stilbene (using pyridine hydrobromide).
3. Green synthesis: Photocatalytic reactions, solvent-free organic reaction – Aldol; green oxidation, green reduction.
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:

1. Jain P.C and Renuka Jain, Physical Chemistry for Engineers, Dhanpat Rai and Sons, New Delhi. 2001.
2. V. K. Ahluwalia, Green Chemistry: Environmentally Benign Reactions, Ane Books India, New Delhi, 2006.
3. Paul Anastas, John C.Warner, John Warner Joint; Green Chemistry: Theory & Practice New Ed Edition; Oxford University press, USA, 2000.
4. Rashmi Sanghi, M. M. Srivastava, Green chemistry, Narosa publishers, New Delhi, 2003.

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.

CHCX08	ORGANIC CHEMISTRY OF BIOMOLECULES	L	T	P	C
		2	0	2	3

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**

Structure and functions of carbohydrates: mono, di, oligo and polysaccharides – lipids: phospholipids, glycolipids, sphingolipids – cholesterol – steroids – Structure, functions and deficiency disorders of fat soluble vitamins: A, D, E & K - Water soluble vitamins B & C: Thiamine, riboflavin, pantothenic acid, niacin, pyridoxine, biotin, cobalamine, folic acid and ascorbic acid.

MODULE III AMINO ACIDS, PEPTIDES AND PROTEINS **7**

Aminoacids: classification, properties - peptides – polypeptides – proteins: primary, secondary, tertiary and quaternary structure – glycoproteins – lipoproteins – Enzymes: classification and functions

MODULE IV NUCLEIC ACIDS **8**

Nucleic acids – importance - structure of purines and pyrimidines – nucleotides – polynucleotides - RNA – types & structure - DNA – phosphodiester bonds – chemical, helical structure and functions – DNA replication – gene modification.

PRACTICALS

1. Qualitative tests to identify carbohydrates.

2. Quantitative estimation of carbohydrates.
3. Separation of sugars – TLC and/or paper chromatography.
4. Quantitative estimation of lipids.
5. Separation of amino acids – TLC and/or paper chromatography.
6. Quantitative estimation of proteins by Lowry's method.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

1. V. K. Ahluwalia, Organic Reaction Mechanism, Narosa Publishers, New Delhi, 2002.
2. Johnson Arthur T., Biology for Engineers, CRC Press, Finland, 2011.
3. Jain P.C and Renuka Jain, Physical Chemistry for Engineers, Dhanpat Rai and Sons, New Delhi. 2001.
4. David L. Nelson, Michael M. Cox, Lehninger Principles of biochemistry, Macmillan press, London, 2010

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.

CHCX09	POLYMER SCIENCE AND TECHNOLOGY	L	T	P	C
		2	0	2	3

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.
6. Synthesis of epoxy resin.
7. Synthesis of unsaturated polyester.
8. Preparation of FRP laminates.
9. Demonstration of injection moulding, compression moulding and blow moulding.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

1. Billmeyer F.N., Text Book of Polymer Science, 3rd Edition, John Wiley and Sons, New York, 1994.
2. George Odian, Principles of Polymerisation, 3rd Edition, McGraw Hill Book Company, New York, 1991.
3. Michael L. Berins, Plastics Engineering Hand Book, 5th Edition, Chapman and Hall, New York, 1991.
4. Jacqueline I., Kroschwitz, Concise Encyclopedia of Polymer Science and Engineering, John Wiley and Sons, New York, 1998.
5. Encyclopedia of Polymer Science and Technology, Vol. 1 to XIV, H.F. Mark and N. Gaylord, Interscience, 2nd Ed. 1988.
6. Gowarikar V.R., Viswanathan N.V and Jayadev Sreedhar, Polymer Science, Wiley Eastern Limited, Madras, 1981.

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

Maths Elective Courses

(to be offered in IV

Semester)

MACX 01	**DISCRETE MATHEMATICS AND GRAPH THEORY**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

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

Propositions – Logical connectives – Compound propositions – Conditional and biconditional propositions – Truth tables – Tautologies and contradictions – Contrapositive – Logical equivalences and implications – DeMorgan's Laws – Normal forms – Principal conjunctive and disjunctive normal forms – Rules of inference – Arguments – Validity of arguments.

MODULE II PREDICATE CALCULUS 7+3

Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements – Theory of inference – The rules of universal specification and generalization – Validity of arguments.

MODULE III FUNCTIONS 7+3

Functions – Classification of functions –– Composition of functions – Inverse functions – Binary and n–ary operations – Characteristic function of a set – Hashing functions – Recursive functions – Permutation functions.

MODULE IV ALGEBRAIC SYSTEMS 8+2

Groups, Cyclic Groups, Subgroups, Cosets, Lagrange's theorem, Normal subgroups – Codes and group codes – Basic notions of error correlation – Error recovery in group codes.

MODULE V GRAPH THEORY 7+3

Graphs – incidence and degree – subgraphs – isomorphism – complement of a graph – operations on graphs

MODULE VI PATH AND CIRCUIT 8+2

Walks, trails and paths – Eulerian graphs – Konigsburg bridge problem - Hamiltonian graphs

L – 45; T – 15; Total Hours –60

TEXT BOOKS:

1 Trembly J.P and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 30th Reprint 2011.

2 Kenneth H.Rosen, “Discrete Mathematics and its Applications:, 7th Edition, Tata McGraw-Hill Pub. Co. Ltd, New Delhi, Special Indian Edition, 2011.

REFERENCES:

1 Ralph.P.Grimaldi, “Discrete and Combinatorial Mathematics: An Introduction”, 4th Edition, Pearson Education Asia, Delhi, 2007.

2 Thomas Koshy, “Discrete Mathematics with Applications”, Elsevier Publications, 2006.

3 C.L.Liu, D.P.Mohapatra, “Elements of Discrete Mathematics”, 4th Edition, Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 2012.

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.

MACX 02 PROBABLITY AND STATISTICS L T P C
3 1 0 4

OBJECTIVES:

The aims of this course are to impart the

- 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 – Addition, multiplication rules – conditional probability, Independent events - Total probability – Baye's theorem - Descriptive Statistics.

MODULE II ONE DIMENSIONAL RANDOM VARIABLE AND PROBABILITY DISTRIBUTION FUNCTIONS 7+3

Discrete random variable –continuous random variable – Expectation - probability distribution - Moment generating function – Binomial, Poisson, Geometric, Uniform (continuous), Exponential and Normal distributions.

MODULE III TWO DIMENSIONAL RANDOM VARIABLES 8+2

Joint, marginal, conditional probability distributions –covariance, correlation - transformation of random variables.

MODULE IV SAMPLING AND ESTIMATION 7+3

Sampling distributions – basic knowledge on Random , simple random , stratified and cluster samplings – Test of Hypotheses - concepts- Point estimation and Interval estimation.

MODULE V THEORY OF INFERENCE 8+2

Large sample tests – test for single and difference on proportions, single mean, difference of means, difference of variances – confidence intervals. Small sample tests – Student'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 – two way classification – Completely

Randomised Block Designs – Randomised Block Design – Latin square designs - Interpretations - case studies.

L – 45; T – 15; Total Hours –60

TEXT BOOKS:

1. T.Veerarajan, “Probability and Statistics”, Tata McGraw-Hill Education, 2008.
2. Miller, I., Miller, M.,Freund, J. E., “Mathematical statistics”, 7th Edition, Prentice Hall International, 1999.
3. S.P.Gupta, “Applied Statistics”, Sultan Chand & Sons

REFERENCES:

1. S.M.Ross, “Introduction to Probability and Statistics for Engineers and Scientists” Fifth Edition, Elesvier.
2. S.C.Gupta and V.K.Kapoor, “Fundamentals of Mathematical Statistics” First edition, Sultan Chand and Sons.
3. Arora and Arora, “Comphrensive 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.

MACX 03	RANDOM PROCESSES	L	T	P	C
		3	1	0	4

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 – Addition, multiplication rules – conditional probability, Independent events - Total probability – Baye's theorem - Tchebychev's inequality.

MODULE II One dimensional Random variable and Probability Distribution functions 7+3

Discrete random variable –continuous random variable – Expectation - probability distribution - Moment generating function – 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 – 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 – Ergodicity.

MODULE VI SPECTRAL DENSITY 8+2

Power spectral Density Function - Properties - System in the form of convolution - Unit Impulse Response of the System – Weiner-Khinchine Theorem - Cross Power

Density Spectrum.

L – 45; T – 15; Total Hours –60

TEXT BOOKS:

1. Veerarajan T., “Probability, Statistics and Random Processes”, Tata McGraw Hill,3rd edition, 2008.
2. Papoulis, “Probability, Random Variables and Stochastic Processes”, 4th Edition, Tata McGraw Hill Company, 2002.
3. S.M.Ross, “Introduction to Probability and Statistics for Engineers and Scientists” Fifth Edition, Elesvier

REFERENCES:

1. Scott L. Miller,Donald G. Childers, Probability and Random Processes, Academic Press,2009.
2. Trivedi K S, “ Probability and Statistics with reliability, Queueing and Computer Science Applications”,Prentice Hall of India,New Delhi,2nd revised edition, 2002

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.

MACX 04 APPLIED NUMERICAL METHODS L T P C
3 1 0 4

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

Bisection method - Regula Falsi method – Secant method - Fixed point iteration method - Newton's Raphson method –Gauss Elimination method - Gauss-Jordon method – Gauss Jacobi method - Gauss-Seidel method.

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 7+3

DIFFERENTIAL EQUATIONS

Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace equation.

L – 45; T – 15; Total Hours –60

TEXT BOOKS:

1. Grewal, B.S., “Numerical methods in Engineering and Science”, 7th edition, Khanna
   Publishers, 2007.
2. C.F.Gerald, P.O.Wheatley, “Applied Numerical Analysis” ,Pearson Education, New Delhi, 2002.

REFERENCES:

1. Chapra S.C, Canale R.P. “Numerical Methods for Engineers”, 5th Ed., McGraw Hill, 2006.
2. M.K.Jain, S.R.K.Iyengar, R.K.Jain, “Numerical methods for Scientific and Engineering Computation”, New Age International Publishers, New Delhi, 2003

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.

Maths Elective Courses
(To be offered in VI Semester)

MACX 05	MATHEMATICAL PROGRAMMING	L	T	P	C
		2	0	0	2

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

Linear programming – formulation of the problem - graphical interpretation of optimality - Simplex method – to obtain basic feasible solution – types of linear programming solution – complications and their resolution.

MODULE II ADVANCED LINEAR PROGRAMMING PROBLEMS 8

Artificial variable - Big M method – Two phase method – alternative optimal solution – unbounded solution - Duality – primal dual relationships.

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 Hours –30

TEXT BOOKS:

1. Hamdy A Taha, “Operations Research - An introduction”, 8th edition, Phil Pearson, 2007.
2. Winston.W.L., “Operations Research”, 4th edition, Thompson-Brooks/Cole, 2003.

REFERENCES:

1. Wayne.L. Winston, “Operations Research Applications and Algorithms”,

4th edition, Thomson learning, 2007.

2. Frederick. S. Hiller and Gerald J Lieberman, “Operations Research Concepts and Cases”, 8th edition (SIE), Tata McGraw – Hill Pub. Co. Ltd., New Delhi, 2006.
3. A. Ravindran, D. T. Phillips and J. J. Solberg, "Operations Research: Principles and Practice", 2nd edition, John Wiley & Sons, New York, 1992.
4. Robertazzi. T.G., “Computer networks and systems-Queuing theory and performance evaluation”, 3rd edition, Springer, 2002.

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.

MACX 06	STATISTICAL METHODS FOR DATA ANALYSIS	L	T	P	C
		2	0	0	2

OBJECTIVES:

The aim of the course is to

- introduce statistical quality control tools.

MODULE I TESTS OF HYPOTHESES AND STATISTICAL INFERENCES 8

Small sample tests – 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

Process and product control – attribute charts – P, np and C charts – control charts performance.

Total Hours –30

TEXT BOOKS:

1. Douglas C.Montgomery, George C. Runger "Applied Statistics and probability for Engineers" V Edition – John Wiley & Sons Inc.
2. Miller, I., Miller, M., Freund, J. E. "Mathematical statistics" 7th Edition. Prentice Hall International, 1999.

REFERENCES:

1. Dekking, F.M., Kraaikamp, C., Lopuhaä, H.P., Meester, L.E. "A Modern Introduction to Probability and Statistics" Springer, 2nd Edition.
2. Chin Long chiang "Statistical Methods of Analysis "World Scientific Books,

2003.
3. S.C.Gupta and V.K. Kapoor, “Mathematical Statistics” , Sultan Chand publications.
4. Veerarajan “Fundamentals of Mathematical Statistics” I Edition, Yes Dee Publishing Pvt. Ltd., 2017.

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

L	T	P	C
2	0	0	2

OBJECTIVES:

- This course aims to solve numerically integral and differential equations.

MODULE I NUMERICAL INTEGRATION **8**

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 **6**

Double integrals using trapezoidal and Simpson's 1/3 rules

MODULE III NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS **8**

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 **8**

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 Hours –30

TEXT BOOKS:

1. M.K.Jain, S.R.K.Iyengar, R.K.Jain, "Numerical methods for Scientific and Engineering Computation", New Age International Publishers, New Delhi, 2003.
2. Grewal, B.S., "Numerical methods in Engineering and Science" 7th edition, Khanna Publishers, 2007

REFERENCES:

1. C.F.Gerald, P.O.Wheatley, "Applied Numerical Analysis" Pearson Education, New Delhi 2002.
2. P.Dechaumphai, N. Wansophark, "Numerical Methods in Engineering", Narosa Publications, 2012.

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.

MACX 08 MATHEMATICAL MODELLING

L	T	P	C
3	0	0	3

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

L	T	P	C
2	0	0	2

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 Hours –30

TEXT BOOKS:

1. G . Ledder , “Calculus, modelling , probability and dynamic systems”, Springer 2013
2. Kei Velten, “Mathematical modelling and simulation”, J. Wiley and sons,2009

REFERENCES:

1. Michael D Alder, “An introduction to Mathematical modelling”, Heaven for Books.com
2. Alfio Quarteroni, “Mathematical models in science and engineering”, Notices of AMS
3. J.N. Kapur, “Mathematical models in Biology and Medicine”, Affiliated East-

West Press Private Limited, New Delhi, 1992.

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

MACX 09 **GRAPH THEORY** **L T P C**

3 0 0 3

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 – sub graphs-walks, paths and circuits – connected and disconnected graphs- Euler graphs – operation on a graph.

MODULE III TREES AND FUNDAMENTAL CIRCUITS **7**

Trees- some properties of trees- pendent vertices in a tree – rooted binary tree-spanning trees-fundamental circuits.

MODULE IV CUT SETS AND CUT VERTICES

Cut sets – some properties of cut sets- fundamental circuits and cut sets-network flows.

Total Hours –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:

1. Trembly J.P and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 30th Reprint 2011
2. Kenneth H.Rosen, “Discrete Mathematics and its Applications”, 7th Edition, Tata McGraw-Hill Pub. Co. Ltd, New Delhi, Special Indian Edition, 2011

3. Md. Saidur Rahman, “Basic graph theory”, Springer, 2017

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

(To be offered in III Semester)

		L	T	P	C
SSCXO1	**FUNDAMENTALS OF ECONOMICS**	**2**	**0**	**0**	**2**

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

Classification of economy – open and closed economy, Demand - Types of demand - Determinants of demand – Law of Demand - Demand elasticity - Supply - Determinants of Supply – Law of Supply - Supply elasticity - Pricing strategies.

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

Money – Meaning, types, functions, importance - Commercial Banks - Central Bank - Monetary policy – meaning, objectives, Methods of Credit Control By RBI, Government Budget – Government revenue and Expenditures – Fiscal policy - Its objectives, instruments and limitations - Deficit Financing - The Fiscal Responsibility and Budget Management Act, 2003 (FRBMA) .

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.

L – 30; T – 0; Total Hours –30

TEXT BOOKS:

1. Dutt and Sundharam (2013), *Indian Economy*, S. Chand & Company Pvt. Ltd, New Delhi.
2. Hussain, Moon Moon (2015), *Economics for Engineers*, Himalaya Publishing House, New Delhi.

REFERENCES:

1. Cleaver Tony (2004), "*Economics: The Basics*", Routledge, London.
2. Mell Andrew and Walker Oliver (2014), "*The Rough Guide to Economics*", Rough Guide Ltd.

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.

SSCXO2 PRINCIPLES OF SOCIOLOGY.

L	T	P	C
2	0	0	2

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 8

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 7

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 7

Concepts- inequality, hierarchy, differentiation, Social Exclusion, and Social Stratification. Forms of Social Stratification- Caste, Class and Estate. Gender and Social Stratification- sex and gender, patriarchy, factors perpetuating gender stratification; Globalization and gender inequality

MODULE IV SOCIAL CHANGE AND GLOBALIZATION 8

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

L – 30; T – 0; Total Hours –30

TEXT BOOKS:

1. Giddens A. 1989. “Sociology” Cambridge: Polity Press.

2. Heald Haralambos, R.M(2014) . ‘‘Sociology Themes and Perspectives”, Oxford, New Delhi-92
3. Bhushan Vidya and D.R. Sachdeva (2012). ‘‘Fundamental of Sociology”, Pearson, Delhi.

REFERENCES:

1. Das Gupta, Samir and Paulomi Saha (2012), ‘‘An Introduction to Sociology”, Pearson, Delhi
2. Bottomore, T.B. 1972. *Sociology- A Guide to Literature and Problems*, New Delhi,

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.

SSCXO3	SOCIOLOGY OF INDIAN SOCIETY.	L	T	P	C
		2	0	0	2

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 7

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 7

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 8

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 8

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.

L – 30; T – 0; Total Hours –30

TEXT BOOKS:

1. Sharma,K.L.2008. *Indian Social Structure and Change*. Jaipur: Rawat Publications,.
2. Shah, A.M. 1998. *The Family in India: Critical Essays*. New Delhi: Orient Longman,
3. Ahuja Ram. 1999. *Social problems in India*, Rawat Publication: New Delhi.
4. Ahuja Ram. 2014. *Society in India,*, Rawat Publication: New Delhi.

REFERENCES:

1. Jayapalan, N.(2001), **"**Indian Society and Social Institutions" Atlantic Publishers & Distri,
2. Atal, yogesh (2006), "Changing Indian Society" Rawat Publications, Jaipur

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

Humanities Elective II

(To be offered in IV Semester)

		L	T	P	C
SSCXO4	**ECONOMICS OF SUSTAINABLE DEVELOPMENT**	**2**	**0**	**0**	**2**

OBJECTIVES:

- To have an increased awareness on the concept and components of sustainable development.
- To develop the ability to demonstrate the need of sustainable development and international responses to environmental challenges.
- To have an insight into global environmental issues and sustainable globalization.
- To establish a clear understanding of the policy instruments of sustainable development.

MODULE I CONCEPT OF SUSTAINABLE DEVELOPMENT 7

Evolution of the Concept – 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 8

Need for sustainability – 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 8

Impact of Globalization on sustainable development, Co - existence of globalization and Environment sustainability, Globalization and Global Governance.Green economy - Renewable energy, sustainable transport, sustainable construction, land and water management, waste management.

MODULE IV POLICIES FOR ACHIEVING SUSTAINABLE DEVELOPMENT 7

Principles of environmental policy for achieving sustainable development: precautionary principle and polluter pays principle – Business Charter for Sustainable Development.Policy instruments for sustainable development: direct regulation – market based pollution control instruments such as pollution tax, subsidy, pollution permits.

L – 30; T – 0; Total Hours –30

TEXT BOOKS:

1. Anderson, David A (2010), "*Environmental Economics and Natural Resource Management*", Routledge, 3rd edition.
2. Karpagam M (1999), "*Environmental Economics: A Textbook*", Sterling Publishers Pvt. Ltd, New Delhi.

REFERENCES:

1. Karpagam M and Jaikumar Geetha (2010), "*Green Management Theory and Applications*", Ane Books Pvt. Ltd, New Delhi.
2. Sengupta Ramprasad (2004), "*Ecology and Economics: An Approach to Sustainable Development*", Oxford University Press, New Delhi.

OUTCOMES:

On successful completion of this course,

- The students will have understood the concepts and components of sustainable development.
- The students will have a holistic overview on the challenges of sustainable development and International responses to environmental challenges.
- The students will have gained knowledge on the global environment issues and demonstrate responsible globalization through global governance.
- The students will have developed awareness of the ethical, economic, social and political dimensions that influence sustainable development.

SSCXO5 INDUSTRIAL SOCIOLOGY

L	T	P	C
2	0	0	2

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 8

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 7

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 8

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 7

Concepts- values- morals, and ethics, Integrity, work ethics , service learning - Civic Virtue - caring - Sharing - Honesty - Courage - Valuing Time - Co-operation - commitment - empathy - Self-Confidence - Environmental Ethics, Cyber issues - computer ethics, cyber crimes, plagiarism Ethical living-concept of harmony in life.

L – 30; T – 0; Total Hours –30

TEXT BOOKS:

1. Narender Singh, Industrial Sociology, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.
2. Gisbert Pascal, Fundamentals of Industrial Sociology, Tata Mc. Graw Hill Publishing Co., New Delhi, 1972
3. Schneider Engeno. V, Industrial Sociology 2nd Edition, Mc. Graw Hill Publishing Co., New Delhi, 1979.

REFERENCES:

1. Robbins, Stephen, Organizational Behaviour , Prentice Hall of India PVT ltd new Delhi, 1985
2. Devis Keith , Human Behaviour at work place, Mc. Graw Hill Publishing Co., New Delhi,1984

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.

SSCXO6	LAW FOR ENGINEERS	L	T	P	C
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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 8

Constitution – salient features, Preamble, Citizenship, Fundamental rights, Fundamental duties, Directive principles, Union executive, Legislature – Union – State and union territories – Election Commission – Election for parliament and state legislature, Judiciary- basic functioning of the Supreme Court and High Courts, Right to information Act 2005 – evolution – concept – practice.

MODULE II HUMAN RIGHTS 7

Human rights – meaning and significance, Covenant on civil and political rights, Covenant on Economic, Social and Cultural rights, UN mechanism and agencies, The Protection of Human Rights Act, 1993 – watch on human rights and enforcement.

MODULE III INDUSTRIAL, CORPORATE AND LABOUR LAWS 8

Corporate laws – meaning and scope, Companies Act 1956 – Indian Contract Act 1872 - Principles of Arbitration - Industrial Employment (Standing Orders) Act 1946 - Industrial Disputes Act 1947 - Workmen's Compensation Act 1923 - The Factories Act, 1948.

MODULE IV LAWS RELATED TO IPR 7

IPR – meaning and scope, International organization – WIPO – TRIPS, Major Indian IPR Acts – Copyright laws, Patent and Design Act, Trademarks Act, Trade Secret Act, Geographical Indicator.

L – 30; T – 0; Total Hours –30

TEXT BOOKS:

1. M.P. Jain (2005) *Indian Constitutional Law*, Wadhwa & Co.

2. H. D, Agarwal (2008), *International Law and Human Rights,* Central Law Publications,
3. Rao, Meena (2006), *Fundamental Concepts in Law of Contract*, 3rd edn., Professional offset.
4. Ramappa (2010), *Intellectual Property Rights Law in India*, Asia Law House.
5. Singh, Avtar (2007), *Company Law*, Eastern Book Co.
6. R.F, Rustamji (1967)*, Introduction to the Law of Industrial Disputes*, Asia Publishing House.

REFERENCES:

1. Acts: Right to Information Act, Industrial Employees (standing order) Act, Factories Act, Workmen Compensate Act.

OUTCOMES:

On successful completion of this 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.