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

(Amendments updated upto February 2022)

B.Tech. CSE
(Cyber Security)

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

(Amendments updated upto February 2022)

B.TECH. CSE (CYBER SECURITY)

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 multidisciplinary areas of importance and to play a vital role in the Socio-Economic progress of the Country in a sustainable manner.

MISSION

- To blossom into an internationally renowned Institute.
- To empower the youth through quality and value-based education.
- To promote professional leadership and entrepreneurship.
- 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 COMPUTER SCIENCE AND ENGINEERING

VISION AND MISSION

VISION

The vision of the Department of Computer Science and engineering is to impart quality education, inculcate professionalism and enhance the problem solving skills of the students in the domain of Computer Science and Engineering with a focus to make them industry ready, involve in possible areas of research, to pursue and have continual professional growth.

MISSION

- To equip the students with strong fundamental concepts, analytical capability, programming and problem solving skills.
- To create an academic environment conducive for higher learning through faculty training, self learning, sound academic practices and research endeavors.
- To provide opportunities in order to promote organizational and leadership skills in students through various co-curricular and extra – curricular activities
- To make the students industry ready and to enhance their employability through training and internships.
- To improve department industry collaboration through interaction including participation in professional society activities, guest lecturers and industrial visit.

PROGRAMME EDUCATIONAL OBJECTIVES

- To introduce the fundamentals of science and engineering concepts essential for a computer engineer.
- To inculcate the knowledge of mathematical foundations and algorithmic principles for effective problem solving.
- To provide knowledge in computer systems and professional skills in prevention, investigation and alleviate the cyber-attacks.
- To impart knowledge to analyze, design, test and implement software required for various applications.
- To hone personality skills, trigger social commitment, inculcate societal responsibilities and implementation of best security practices.

PROGRAMME OUTCOMES

PO1: Analyse and build models applying the knowledge of mathematics, statistics, electronic, electrical and computer science discipline and solve the problem.

PO2: Identify the sources of information for data collection, design and conduct the experiments and interpret the result.

PO3: Think out-of-the box and solve the real time problems using their creativity in designing human friendly software systems.

PO4: Comprehend computer engineering concepts of the new research developments and apply them to develop relevant software and hardware products.

PO5: 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.

PO6: Apply the computing knowledge to solve the socially relevant problems.

PO7: Understand the impact of engineering solutions in global, economic, environmental, societal context and apply it in exploring the new developments, research trends and involve them in research.

PO8: Develop professional integrity by understanding and appreciating professional, legal, ethical, cyber security and related issues and act with responsibility.

PO9: Communicate, collaborate and work as a team by involving in the group projects of multi-disciplinary nature.

PO10: To prepare documents as per the standards and present effectively to improve software documentation skills.

PO11: Apply the hardware and software project management techniques to estimate the time and human resources required to complete computer engineering projects.

PO12: 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.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Understand, analyze and develop essential proficiency in the areas related to algorithms, multimedia, web design, big data analytics, networking, cyber security and apply the knowledge to solve practical problems.

PSO2: Apply standard practices and strategies in IT security products for successful career and entrepreneurship.

REGULATIONS - 2017

B.TECH. DEGREE PROGRAMMES

(With Amendments incorporated up to June 2020)

(Under Choice Based Credit System)

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 theory / practical / laboratory integrated theory / mini project / seminar / internship / project and any other subject that is normally studied in a semester like Mathematics, Physics, Engineering Graphics, Fluid Mechanics, 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. Mechanical Engineering
10. Polymer Engineering
11. Biotechnology
12. Artificial Intelligence and Data Science
13. Computer Science and Engineering(Cyber Security)
14. Computer Science and Engineering(Internet of Things)

4.0 STRUCTURE OF THE PROGRAMME

4.1 Every Programme has 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 or 80 hours per semester.

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

4.4 For the award of the degree, a student has to earn a minimum total credits specified in the curriculum of the respective programme of study.

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 shall 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 shall 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) are 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 shall 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 is constituted branch wise and semester wise

8.1 The composition of class committees for first and second semester is 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 is 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 three times during the semester. The first meeting shall 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 shall be decided for the first and second assessment. The second meeting shall be held within a week after the date of first assessment report, to review the students' performance and for follow up action.

8.4 During these two meetings the student members, shall meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process, curriculum and syllabi, etc.

8.5 The third 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 ENROLLMENT

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

9.2 For the subsequent semesters registration for the courses shall be done by the student one week before the last working day of the previous 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 continuous assessment test 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 continuous assessment test 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 shall 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 ENROLLMENT & 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:

Assessments	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 Examination	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 shall 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 for the award of pass grade.

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 shall be evaluated along with an oral examination by a committee of faculty members constituted by the Head of the Department. The student shall also submit an internship completion certificate issued by the industry / research organisation. The weightage for Industry internship 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, an oral examination (viva voce) shall be conducted as semester end examination by an external examiner approved by Controller of Examinations. The weightage for periodic reviews shall be 50%. Of the remaining 50%, 20% shall be for the project report and 30% for the Viva Voce examination.

13.8 Assessment of seminars and comprehension shall 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 shall 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 is absent, for genuine reasons, may be permitted to write a substitute examination for any one of the two continuous assessment tests of a course by paying the prescribed substitute examination fee. 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 Head of the Department / Dean of School for that purpose. However there is no substitute examination for semester end examination.

14.2 A student 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 assessment test. However the substitute examination will be conducted only after the last working day of the semester and before the 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 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 shall 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 redo 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 shall 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 shall 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 is not 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 shall

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 shall 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 the School 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 contains

the following details: a) list of courses enrolled during the semester including redo courses / arrear courses, if any; b) grades scored; c) Grade Point Average (GPA) for the semester and d) 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) is calculated in a similar manner, considering all the courses enrolled from first semester.

“I” and "W" grades are excluded for calculating GPA.

"U", “I”, "AB" and **"W"** grades are 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 shall 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 is not counted. The students who do not satisfy the above two conditions shall be classified as second class. For the purpose of classification, the CGPA shall 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 courses under SWAYAM up to 20% of credits of courses in a semester excluding project semester 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. The credits earned through online courses ratified by the respective Board of Studies shall be transferred following the due approval procedures. The online courses can be considered in lieu of core courses and elective courses.

19.0 SUPPLEMENTARY EXAMINATION

Students of final year can apply for supplementary examination for a maximum of three courses thus providing an opportunity to complete their degree programme. Likewise students with less credits can also apply for supplementary examination for a maximum of three 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 in both Odd and Even Semester.

20.0 PERSONALITY AND CHARACTER DEVELOPMENT

20.1 All students shall enroll, on admission, in any of the personality and character development programmes such as NCC, NSS, NSO, YRC, Rotaract, etc., and undergo related activities during the period of study.

21.0 DISCIPLINE

21.1 Every student is expected to observe disciplined and decorous behaviour both inside and outside the campus and not to indulge in any activity which tends to affect the reputation of the Institution.

21.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the HOD / Dean shall be referred to a Discipline and Welfare Committee constituted by the Registrar 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, etc.

iii) no disciplinary action pending against him/her.

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

23.0 MINOR DEGREES OFFERED FOR STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2020- 21

23.1 The students admitted in the following B.Tech. Programmes from the academic year 2020 – 21 can graduate with a minor degree, which is optional, along with a major degree:

• Civil Engineering	• Mechanical Engineering
• Electronics and Communication Engineering	• Electrical and Electronics Engineering
• Automobile Engineering	• Aeronautical Engineering
• Polymer Engineering	• Biotechnology Engineering
• Electronics and Instrumentation Engineering	• Computer Science and Engineering
• Information Technology	• Artificial Intelligence and Data Science
• Computer Science and Engineering (IoT)	• Computer Science and Engineering (Cyber Security)

23.2 The eligibility for choosing the minor degree is given as below:

Sl. No.	Minor Degree (Optional)	Eligible Major Degree Programmes (from other Departments)
1.	Artificial Intelligence and Machine Learning	Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Biotechnology Electrical & Electronics Engg. Electronics & Instrumentation Engg.
2.	Block Chain	
3.	Cyber Security	
4.	Data Science	
5.	Internet of Things (IoT)	
6.	Virtual and Augmented Reality	Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Biotechnology Electrical & Electronics Engineering Electronics & Instrumentation Engg. Electronics & Communication Engg.

7.	Sensor Technology	Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Biotechnology Electrical & Electronics Engg.
8.	Robotics	Artificial Intelligence and Data Science Computer Science & Engg. (Cyber Security) Computer Science & Engineering (IoT) Computer Science & Engineering Information and Technology Civil Engineering Biotechnology Electrical & Electronics Engg. Electronics & Instrumentation Engg.
9.	3D Printing	Artificial Intelligence and Data Science Computer Science & Engg. (Cyber Security) Computer Science & Engineering (IoT) Computer Science & Engineering Information and Technology Biotechnology Electrical & Electronics Engg. Electronics & Instrumentation Engg. Electronics & Communication Engg.
10.	Electric Vehicles	Artificial Intelligence and Data Science Computer Science & Engg. (Cyber Security) Computer Science & Engineering (IoT) Computer Science & Engineering Information and Technology Civil Engineering Biotechnology Electronics & Communication Engg.
11.	Industrial Automation	Artificial Intelligence and Data Science Computer Science & Engg. (Cyber Security) Computer Science & Engineering (IoT) Computer Science & Engineering Information and Technology Mechanical Engineering Aeronautical Engineering

		Polymer Engineering Automobile Engineering Civil Engineering Biotechnology Electronics & Communication Engg.
12.	GIS and Remote Sensing	Artificial Intelligence and Data Science Computer Science & Engg. (Cyber Security) Computer Science & Engineering (IoT) Computer Science & Engineering Information and Technology Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Biotechnology Electrical & Electronics Engg. Electronics & Instrumentation Engg. Electronics & Communication Engg.
13.	Computational Biology	Artificial Intelligence and Data Science Computer Science & Engg. (Cyber Security) Computer Science & Engineering (IoT) Computer Science & Engineering Information and Technology Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Electrical & Electronics Engg. Electronics & Instrumentation Engg. Electronics & Communication Engg.

23.3 A student shall earn an additional 18 to 20 credits for the award of minor degree.

23.4 A student shall be awarded a minor degree only when he / she completes the requirements for the award of major degree stipulated in the respective programme.

24.0 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.

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

B.TECH – CSE (CYBER SECURITY)
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	CSC 1201	Digital Principles and Applications	2	0	0	2
8.	EC	CSC 1202	Programming in Python	2	0	2	3
9.	EC	CSC 1203	Digital Laboratory	0	0	3	1
							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	CSC 2101	Data Structures	3	1	0	4
5.	EC	CSC 2102	Computer Networks	3	0	2	4
6.	EC	CSC 2131	Computer Security	3	0	0	3
7.	EC	CSC 2103	Software Engineering	3	0	0	3
8.	EC	CSC 2105	Data Structures Laboratory	0	0	2	1
9.	EC	CSC 2132	Object Oriented Programming Using Java	0	0	2	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	ENC 2282	Written Communication	0	0	2	1
4.	EC	CSC 2214	Database Management Systems	2	0	0	2
5.	EC	CSC 2212	Analysis of Algorithms	3	1	0	4
6.	EC	CSC 2231	Information Security Fundamentals	3	0	0	3
7.	EC	CSC 2211	Computer Architecture and Microprocessor	3	0	0	3
8.	EC	CSC 2232	Information Security Laboratory	0	0	2	1
9.	PE		Programme Elective ##1				3*
10.	EC	CSC 2215	DBMS Laboratory	0	0	2	1
							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	ENC 3181	Communication and Soft Skill – I	0	0	2	1
4.	EC	CSC 3101	Operating Systems	3	0	0	3
5.	EC	CSC 3103	Artificial Intelligence and Machine Learning	3	0	0	3
6.	EC	CSC 3131	Web and Mobile Application Security	3	0	0	3
7.	EC	CSC 3132	Web and Mobile Application Security Laboratory	0	0	2	1
8.	EC	CSC 3133	LINUX Operating System Laboratory	0	0	2	1
9.	PE		Programme Elective ##2				6**
							24

SEMESTER VI

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	MS	MSC 3181 MSC 3182	CEO and Leadership Training / SocialEntrepreneurship	3	0	0	3
2.	HS	ENC 3281	Communication and Soft Skill – II	0	0	2	1
3.	EC	CSC 3231	Intrusion Detection and Internet Security	3	0	0	3
4.	EC	CSC 3213	Graph Theory and Application	3	1	0	4
5.	EC	CSC 3232	Ethical Hacking	3	0	0	3
6.	EC	CSC 3233	Intrusion Detection and Internet Security Laboratory	0	0	2	1
7.	EC	CSC 3212	Distributed Computing	3	0	0	3
8.	EC	CSC 3234	Ethical Hacking Laboratory	0	0	2	1
9.	PE	-	Programme Elective ##3				6**
							25

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	CSC 4102	Compiler Design ^	3	0	0	3
3.	EC	CSC 4103	Cloud Computing	3	0	2	4
4.	EC	CSC 4132	Contingency Planning and Disaster Recovery	3	0	0	3
5.	EC	CSC 4104	Compiler Laboratory ^	0	0	2	1
6.	EC	CSC 4105	Internship				1
7.	PE	-	Programme Elective ##4				9**
							24

SEMESTER VIII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	EC	CSC 4211	Project Work	0	0	24	12

Total credits – 177

* Industrial training will be undertaken during Third year summer vacation. The credit will be awarded in the 7th Semester.

^ As approved by BOS of CSE held on 17.08.2023

ELECTIVE LIST

Semester – IV

Programme Elective ##1 3*

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CSCX 201	Multimedia and Animation	3	0	0	3
2.	PE	CSCX 203	Digital Transmission	3	0	0	3
3.	PE	CSCX 204	Information Technology in Organization	3	0	0	3
4.	PE	CSCX 205	Innovation and New Product Development	3	0	0	3
5.	PE	CSCX 208	User Interface Design	3	0	0	3
6.	PE	CSCX 209	Stress Management	1	0	0	1

Cyber Security Elective

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CSCX 206	Fundamentals of Computer Forensics	3	0	0	3
2.	PE	CSCX 210	Information Ethics	1	0	0	1
3.	PE	CSCX 401	Open Source Software and Open Standards	3	0	0	3
4.	PE	CSCX 402	TCP/ IP	3	0	0	3
5.	PE	CSCX 403	Security Architecture	3	0	0	3
6.	PE	CSCX 404	Routing and Switching	3	0	0	3

Semester – V

Programme Elective ##2

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CSCX 123	Sound Editing and Processing	3	0	0	3
2.	PE	CSCX 124	Computer Vision	3	0	0	3
3.	PE	CSCX 126	Scripting Languages	3	0	0	3
4.	PE	CSCX 132	Queuing Theory	3	0	0	3
5.	PE	CSCX 134	Design of Computer Network services	3	0	0	3
6.	PE	CSCX 139	C# and .NET	2	0	0	2
7.	PE	CSCX 115	Internet of Things	3	0	0	3

8.	PE	CSCX 116	Cognitive Science	3	0	0	3
9.	PE	CSCX 114	Theory of Computation	3	0	0	3
10.	PE	CSCX 133	Network Trouble Shooting Tools	1	0	0	1
11.	PE	CSCX 138	Statistics and Analytics using R Programming	2	0	2	3
12.	PE	CSCX 109	Network Management	2	0	0	2
13.	PE	CSCX 110	Network Simulators	1	0	0	1
14.	PE	CSCX 117	Virtualization Techniques	3	0	0	3

Cyber Security Electives

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CSCX 301	Agile Software Development	3	0	0	3
2.	PE	CSCX 302	Malware Analysis	3	0	0	3
3.	PE	CSCX 303	Secure Software Development Life Cycle	3	0	0	3
4.	PE	CSCX 304	Multimedia security	3	0	0	3

Semester – VI

Programme Elective ##3(3+3*)

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CSCX 214	Information Retrieval	3	0	0	3
2.	PE	CSCX 215	Software Risk Management	1	0	0	1
3.	PE	CSCX 218	Software Design and Architecture	3	0	0	3
4.	PE	CSCX 220	Human Computer Interaction	3	0	0	3
5.	PE	CSCX 221	Green Computing	3	0	0	3
6.	PE	CSCX 223	Business Process Management	3	0	0	3
7.	PE	CSCX 228	Information Visualization	3	0	0	3
8.	PE	CSCX 233	Software Quality Assurance	3	0	0	3
9.	PE	CSCX 234	Customer Relationship Management	3	0	0	3
10.	PE	CSCX 236	Genetic Algorithm	3	0	0	3
11.	PE	CSCX 237	Enterprise Resource Planning	3	0	0	3
12.	PE	CSCX 238	API Design	3	0	0	3
13.	PE	CSCX 216	Social Media Security	3	0	0	3
14.	PE	CSCX 231	Biometric Security	3	0	0	3

15.	PE	CSCX 232	Database Security	3	0	0	3

Cyber Security Electives

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CSCX 411	Cyber Crime Investigation and Digital Forensics	3	0	0	3
2.	PE	CSCX 412	Information Security Intelligence and Compliance Analytics Using Big Data	3	0	0	3
3.	PE	CSCX 413	Penetration Testing and Vulnerability Assessment	3	0	0	3
4.	PE	CSCX 414	Legal Issues in Information Assurance	3	0	0	3
5.	PE	CSCX 415	Secure Electronic Commerce	3	0	0	3
6.	PE	CSCX 416	Cloud Security	3	0	0	3

Semester – VII

Programme Elective ###4(3+3+3*)

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CSCX 143	Deep Learning	3	0	0	3
2.	PE	CSCX 147	Writing Skills for Engineering Leaders	3	0	0	3
3.	PE	CSCX 148	Software Reliability	3	0	0	3
4.	PE	CSCX 150	Advanced SAS: Macros & SQL	3	0	0	3
5.	PE	CSCX 157	Software Process and Product Quality	3	0	0	3
6.	PE	CSCX 158	System Integration	3	0	0	3
7.	PE	CSCX 161	Full Stack Mobile Application Development (Front end)	3	0	0	3
8.	PE	CSCX 169	Software Maintenance	3	0	0	3
9.	PE	CSCX 174	5G Wireless Communication Techniques	3	0	0	3
10.	PE	CSCX 145	Security Law and Compliance	3	0	0	3
11.	PE	CSCX 168	Secure Interconnecting Systems	3	0	0	3

Cyber Security Electives

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE	CSCX 328	Block Chain and Crypto Currency Technology	3	0	0	3
2.	PE	CSCX 326	Security in Industry 4.0	3	0	0	3
3.	PE	CSCX 329	Security Governance, Risk and Compliance	3	0	0	3
4.	PE	CSCX 330	Operating System Security	3	0	0	3
5.	PE	CSCX 335	Security in Smart Devices	3	0	0	3
6.	PE	CSCX 336	Cognitive Psychology in Cyber Security	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 Nano Science 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 Non Destructive 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.	CHCX 01	Analytical Instrumentation	2	0	2	3

2.	CHCX 02	Corrosion and its Control	2	0	2	3
3.	CHCX 03	Electrical Materials and Batteries	2	0	2	3
4.	CHCX 04	Engineering Materials	2	0	2	3
5.	CHCX 05	Fuels and Combustion	2	0	2	3
6.	CHCX 06	Fundamentals of Physical Chemistry	2	0	2	3
7.	CHCX 07	Green Technology	2	0	2	3
8.	CHCX 08	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.	SSCX 01	Fundamentals of Economics	2	0	0	2
2.	SSCX 02	Principles of Sociology	2	0	0	2
3.	SSCX 03	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.	SSCX 04	Economics of Sustainable Development	2	0	0	2
2.	SSCX 05	Industrial Sociology	2	0	0	2
3.	SSCX 06	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.	GECX 101	Disaster Management	Civil
2.	GECX 102	Total Quality Management	Mechanical
3.	GECX 103	Energy Studies	Mechanical
4.	GECX 104	Robotics	Mechanical
5.	GECX 105	Transport Management	Automobile
6.	GECX 106	Control Systems	EEE
7.	GECX 107	Introduction to VLSI Design	ECE
8.	GECX 108	Plant Engineering	EIE
9.	GECX 109	Network Security	CSE
10.	GECX 110	Knowledge management	CSE
11.	GECX 111	Cyber security	IT
12.	GECX 112	Genetic Engineering	LS
13.	GECX 113	Fundamentals of Project Management	CBS
14.	GECX 114	Operations Research	Mathematics
15.	GECX 115	Nano Technology	Physics / Chemistry
16.	GECX 116	Vehicle Maintenance	Automobile
17.	GECX 117	Fundamentals of Digital Image Processing	ECE

Group II Courses
(To be offered in VII semester)

Sl. No.	Course Code	Course Title	Offering Department
1.	GECX 201	Green Design and Sustainability	Civil
2.	GECX 202	Appropriate Technology	Civil / Mechanical
3.	GECX 203	Engineering System Modelling and Simulation	Mechanical
4.	GECX 204	Value Analysis and Engineering	Mechanical
5.	GECX 205	Industrial Safety	Mechanical
6.	GECX 206	Advanced Optimization Techniques	Mechanical
7.	GECX 207	Mat Lab Simulation	EEE
8.	GECX 208	Embedded Systems and its Applications	ECE
9.	GECX 209	Usability Engineering	CSE
10.	GECX 210	Supply Chain Management	CBS
11.	GECX 211	System Analysis and Design	CA
12.	GECX 212	Advanced Materials	Physics & Chemistry
13.	GECX 213	National Service Scheme	School of Humanities
14.	GECX 214	Automotive Pollution and Control	Automobile
15.	GECX 215	Motor Vehicle Act, Insurance and Policy	Automobile
16.	GECX 216	Principles of Communication Systems	ECE
17.	GECX 217	Lean Management	Civil
18.	GECX 218	Spatial Data Modeling and Analysis	Civil
19.	GECX 219	Advanced Entreprenuership	MBA

Sl. No.	Course Code	Course Title	Offering Department
20.	GECX 220	Electric Vehicles	EEE
21.	GECX 221	Artificial Intelligence and Evolutionary Computing using Matlab	EEE

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 7+3

EQUATIONS

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, CO_2 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.

CHC 1181	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

To make the student 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

L:30 periods

Total: 30 periods

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 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.

CSC 1201 DIGITAL PRINCIPLES AND APPLICATIONS

L	T	P	C
2	0	0	2

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.

TOTAL HOURS: 30

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.
- Apply the principles of Boolean algebra to manipulate and minimize logic expressions
- Design various combinational logic circuits.
- Design various sequential logic circuits built with different flip- flops.

CSC 1202 PROGRAMMING IN PYTHON

L	T	P	C
2	0	2	3

OBJECTIVES:

1. To understand the fundamentals of python programming.
2. To comprehend data types and conditional loops.
3. To be familiar with functions and modules.
4. To explore strings, sets and files.

Pre requisites: Computer Fundamentals, Programming in 'C' or 'C++'.

MODULE I PYTHON BASICS **8**

Introduction, executing simple programs, exploring python variables, operators and comprehend python blocks.

MODULE II DATA TYPES AND PROGRAM FLOW CONTROLS **7**

Basic data types, numeric data types, string and string operations, list data types and slicing, tuples and its types, conditional blocks, control statements, looping statements, break statements, for loop, while loop using strings and dictionaries.

MODULE III FUNCTIONS , PACKAGES AND MODULES **8**

Organize functions using python code, import libraries and methods internally and externally, usage of external packages, powerful functions in python, understanding packages.

MODULE IV BULIDING BLOCKS OF PYTHON – METHODS **7**

String and dictionary manipulations, list manipulation using inbuilt methods, Tuples and Sets, Files, Exception handling and programs.

Theory : 30 Hrs

Laboratory Practice

1. Implementation of simple python program by installing and exploring python IDE.
2. Programs to implement basic data types, tuples, strings, numeric data types and list data types.
3. Implement control statements and conditional blocks.
4. Implement looping statements – for, while and do-while.
5. Implement strings and dictionaries.
6. Programming using functions in python
7. Programming powerful functions in python.
8. Import basic packages and libraries and execute programs
9. Build methods using list and basic data structures.

10. Implement exception handling using python programs

Lab : 30 Hrs

TOTAL HOURS : 60

TEXT BOOKS:

1. Gowrishankar S.and Veena A, "Introduction to Python Programming", CRC Press, 2019
2. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.
3. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.

REFERENCES:

1. John V Guttag, “Introduction to Computation and Programming Using Python’’, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.

OUTCOMES:

Upon Completion of course the students will be able to :

1. write and execute python programs
2. develop simple python programs to solve problems using control statements.
3. explore libraries in python and modular programs to functions
4. develop data structures based on python programs

CSC 1203 **DIGITAL LABORATORY** **L T P C**

0 0 3 1

OBJECTIVES:

- To design and implement combinational logic circuits.
- To design and implement sequential logic circuits

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 Design and implementation of Registers with flip-flops.

TOTAL HOURS: 45

OUTCOMES:

On completion of the course students will be able to:

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

SEMESTER III

MAC 2181	PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS	L	T	P	C
		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 7 + 3

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 ZTransform - Formation of difference equations - Solving Difference Equations using Z-Transform.

L – 45; T – 15; TOTAL HOURS – 60

TEXT BOOK :

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”, 4 th 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 :

The aims of this course are to

- 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

Making full length presentation (through Voice thread) 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.

CSC 2101 **DATA STRUCTURES** **L T P C**
3 1 0 4

OBJECTIVES :

- To assess how the choice of data structures impacts the performance of programs
- To design and implementation of various basic and advanced data structures
- To expose the different types of searching and sorting algorithms.
- To employ the different data structures to find the solutions for specific problems.
- To improve the logical ability
- To develop application using data structures.

MODULE I OVERVIEW , ARRAYS, RECORDS AND POINTERS 08

Introduction – Basic Terminology- Data Structures – Algorithms – Linear Arrays – Representation of linear arrays in Memory – Traversing linear arrays – Insertion and deletion – Sorting – Searching – Multidimensional arrays – Pointers – Records

MODULE II LINKED LIST 08

Linked list – Representation of linked list in Memory – Traversing a Linked List – Searching a Linked List – Memory allocation – Insertion into a Linked list – Deletion from a Linked List – Header Linked Lists – Two- ways Lists

MODULE III STACKS, QUEUES AND RECURSION 07

Stacks – Array Representation of Stacks-Linked Representation of Stacks – Arithmetic Expressions – Quick sort , an application of stacks – Recursion – Towers of Hanoi – Implementation of Recursive procedures by Stacks – Queues – Linked representation of Queues – Dequeues – Priority Queues

MODULE IV TREES 08

Binary Trees – Representing Binary Trees in Memory – Traversing Binary Trees – Traversal algorithm using Stacks – Header nodes ; Threads – Binary Search Trees searching and inserting in Binary Search Trees –Deleting in a Binary Search Trees - AVL Search Trees – Insertion in an AVL Search Trees – Deletion in an AVL Search Trees – m-way search trees – B trees – Heap; Heap sort – Path Length; Huffman's Algorithms – General Trees

MODULE V GRAPHS AND THEIR APPLICATIONS 07

Graph Theory Terminology – Sequential Representation of Graphs – Warshall's

Algorithm –Linked Representation of a Graph – Operations on a Graph – Traversing a Graph – Posets ; Topological Sorting

MODULE VI SORTING AND SEARCHING 07

Sorting – Insertion Sort – Selection Sort – Merging – Merge Sort – Radix Sort – Searching and Data modification – Hashing

L-45 ;T-15;TOTAL HOURS-60

REFERENCES :

1. Seymour Lipschutz, “Data Structures”, McGraw Hill Education, Revised First edition, ISBN-10: 1259029964, ISBN-13: 978-1259029967, 2014
2. Narasimha Karumanchi ,”Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles” ,CareerMonk Publications, Fifth Edition, ISBN-10: 819324527X, ISBN-13: 978-8193245279, 2016.
3. Reema Thareja, “Data Structures Using C”, Oxford Publisher, Second Edition, ISBN-10: 0198099304, ISBN-13: 978-0198099307 , 2014
4. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education; Second edition, ISBN-10: 9332535841,ISBN-13: 978-9332535848, 2014.

OUTCOMES:

Students who complete this course will be able to

- Examine a given problem and recommend suitable data structure.
- Implement operations on arrays, linked lists, stacks and queues.
- Design, implement, test, and debug programs using a variety of data structures including binary and general tree structures, search trees, heaps, graphs, and B-trees.
- Compare between different data structures and pick an appropriate data structure for a design situation.
- Employ Algorithm for solving problems like sorting, searching, insertion and deletion of data.
- Apply concepts learned in various domains like DBMS, compiler construction etc.

CSC 2102 COMPUTER NETWORKS

L	T	P	C
3	0	2	4

OBJECTIVES:

The aims of this course are to

- To study the networked system organization and architecture, current practices and recent trends.
- To lay the foundation on emerging network and data communication technologies and their potential impact.
- To provide knowledge on socket programming using TCP and UDP.
- To explore the modern network architectures from a design and performance perspective.
- To understand and design the mobile and wireless network protocols.
- To identify various network parameters to increase QoS for multimedia networks.

MODULE I INTRODUCTION TO COMPUTER NETWORKS 7

Need for Networking - Service Description -Connectionless and Connection-oriented Services - Circuit and Packet Switching - Physical Media - Wireless Links and Characteristics - Queuing Delay and Packet Loss - Internet Protocol stack - OSI Reference Model - Service Models.

MODULE II APPLICATION LAYER 7

Principles of Network Applications - The Web and HTTP - FTP - Electronic Mail - SMTP - DNS - Peer-to-Peer Applications.

MODULE III TRANSPORT LAYER 8

Transport Layer Services - Multiplexing and Demultiplexing - UDP – Principles of Reliable Data Transfer - Connection-oriented Transport: TCP – Principles of Congestion Control - TCP congestion control mechanism – Socket Programming with TCP and UDP - Implementation of transport layer protocols using open source network simulators.

MODULE IV NETWORK LAYER AND LINK LAYER 9

Forwarding and Routing - Network Service Models - Virtual Circuit and Datagram Networks - Router - Internet Protocol (IP) - Routing algorithms - Implementation of network layer protocols using open source network simulators - Layer Services - Error Detection and Correction Techniques - Multiple Access Protocols - Switched Local Area Networks - Link Virtualization - Data Center Networking.

MODULE V WIRELESS AND MOBILE NETWORKS 7

Wireless Links and Network Characteristics - WiFi: 802.11 Wireless LAN - Cellular Internet Access - Mobility Management: Principles - Mobile IP - Wireless and Mobility: Impact on Higher-Layer Protocols - Implementation of mobile routing protocols using

open source network simulators.

MODULE VI MULTIMEDIA NETWORKING 7

Multimedia Networking Applications - Voice-over-IP - Protocols for Real-Time Interactive Applications - Network Support for Multimedia.

L – 45; P-30; TOTAL HOURS-75

REFERENCES :

1. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 7th Edition, Pearson Education, ISBN:9780133594140,2017.
2. Larry Peterson and Bruce S Davis “Computer Networks: A System Approach” Elsevier, 5th Edition, ISBN: 978-0123850591, 2012.
3. Douglas E Comer, “Internetworking with TCP/IP, Principles, Protocols, and Architecture” 6th Edition, PHI, ISBN: 9780136085300, 2014.
4. Behrouz A. Forouzan, “Data Communications and Networking”, McGraw-Hill Education, 5th Edition , illustrated, ISBN : 9780073376226, 2012.

OUTCOMES :

Students who complete this course will be able to

- Compare and contrast the OSI reference model and TCP/IP model.
- Examine the various application layer protocols and propose the solutions based on the need.
- Review the protocols, network interfaces, and performance issues in local area networks and wide area networks.
- Identify different congestion control techniques and critique upon them.
- Design and implement the routing and transport protocols for Wireless and Mobile networks.
- Analyze and interpret the effect of QoS Parameters in the multimedia networks.

CSC 2131 COMPUTER SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES :

- To give the fundamental concepts of computer security.
- To learn security measures for secure computer systems.
- To gain knowledge on the various user authentication methods.
- To get familiar with the malicious software that provides threats to the system.
- To give overview on the IT security management and control policies.
- To learn various threats through case studies in physical system.

MODULE I FUNDAMENTALS OF COMPUTER SECURITY 7

Computer security concepts – Objectives of Computer Security – Issues solved in Computer Security – Fundamental Security Design Principles – Computer Security Strategy - Privacy and Ethics.

MODULE II SECURE COMPUTER SYSTEM 8

Risk analysis – External security measures – Structure of a computer system – Secure computer system issues – Security models.

MODULE III USER AUTHENTICATION 7

Cryptographic tools – User Authentication – Authentication methods – Informational keys – Physical keys – Biometric keys - Security issues for user authentication – Password threats – Strong passwords.

MODULE IV MALICIOUS SOFTWARE 8

Types of Malicious software – Virus – Worms – Trojan horses – System corruption – Zoombie, Bots – Key loggers – Backdoors, Root kits - Malware – Data backup – Firewalls – Software patches – Antivirus Software.

MODULE V SECURITY MANAGEMENT 8

Access controls – Intrusion detection – IT Security management - IT Security control ,plans and procedures – Physical and infrastructure security – Human resources security – Security Auditing – Legal and ethical aspects.

MODULE VI CASE STUDIES 7

An Iris Biometric system - Security problems for ATM Systems – RBAC System for a Bank - A Corporate Physical Security Policy - Silver star mines – Hannover Hackers.

TOTAL HOURS : 45

REFERENCES :

1. Gregory B. White, Eric A. Fisch, Udo W. Pooch," Computer System and Network Security",CRC Press, ISBN: 9781351458726,2017.
2. William Stallings, Lawrie Brown,"Computer security-Principles and Practice", Pearson Education,ISBN : 9780134794105,2018
3. Douglas Jacobson, Joseph Idziorek,"Computer security literacy", CRC Press, ISBN : 9781000755626,2016.

OUTCOMES :

Students to complete this course will be able to

- Narrate the fundamentals and design principles of computer security.
- Analyze the risk factors and measures to provide a secure computer system.
- Apply various user authentication methods used for computer security.
- Identify the malicious software that leads to the threats in the physical systems.
- Access management of the corporate security issues through plans, procedures and policies.
- Analyze the vulnerabilities through various aspects of security threats in case studies.

CSC 2103 SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES :

- To introduce the process involved in developing software.
- To guide the importance of requirements gathering.
- To represent the requirements collected using the various design models
- To provide knowledge in developing a software in a systematic method with quality.
- To explore the various testing methodologies.
- To understand how to improve performance of a software product.

MODULE I SOFTWARE PROCESS **07**

Nature of Software – Software Engineering - Software Process – Models – Generic Process Model – Process Assessment - Prescriptive Process Model – Specialized Process Models – Unified Process – Personal and Team Process Models – Process Technology – Product and Process – Agile Model.

MODULE II REQUIREMENTS GATHERING **08**

Requirements Engineering – Understanding Requirements – Requirements Modeling – Scenarios, Information and Analysis Classes, Flow, Behavior, Patterns and Web Apps.

MODULE III DESIGN **09**

Introduction – Design Process – Design Concepts – Design Model – Software Architecture –Component Based Development: Introduction – User Interface Design – Pattern Based Design – WebApp Design.

MODULE IV QUALITY MANAGEMENT **07**

Software Quality – Achieving Software Quality – Review Techniques – SQA Goals and Metrics – Software Reliability.

MODULE V SOFTWARE TESTING **07**

Software Testing – Strategic Approach – Issues – Test Strategies – Validation Testing – System Testing – Debugging – Testing Fundamentals: Path Testing, White Box and Black Box, Control Structure – Testing Applications.

MODULE VI MAINTENANCE **07**

Software Maintenance – Supportability – Reengineering – Software Reengineering – Reverse Engineering – Restructuring – Forward Engineering – Risk Management.

L – 45;TOTAL HOURS-45

REFERENCES :

1. Roger S. Pressman, “Software Engineering – A Practitioners Approach”, Mc Graw Hill, Eighth Edition, ISBN -13: 9789339212087, 2014.

2. Ian Sommerville, “Software Engineering”, Addison-Wesley, 9th Edition, ISBN-13: 978-0137035151, 2010.
3. Jibitesh Mishra, Ashok Mohanty, “Software Engineering”, Pearson Education, ISBN 978-81-317-5869-4, 2012.

OUTCOMES :

Students who complete this course will be able to

- Choose the appropriate process model for the software application to be developed.
- Collect requirements based on the type of the application and its need.
- Design frameworks for the application to be developed.
- Ensure that the software satisfies the quality standards.
- Apply the appropriate testing strategies to the developed products.
- Modify and improve the deployed product based on user needs and performance results.

CSC 2105	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES :

- To make familiar with the data structure concepts.
- To design real time problems and find the way to implement the solution.
- To implement the Stack and Queue ADT.
- To traverse the tree and graph data structures.
- To implement searching and sorting techniques.
- To demonstrate the shortest path algorithm.

SOFTWARE REQUIRED: C/C++/JAVA

Design problems and implement solutions for the following concepts:

1. Basic data structure concepts
2. Linked list
3. Stack ADT and Queue ADT
4. Priority Queue
5. Sorting and Searching
6. Tree traversal
7. Tree Structure - Binary tree, AVL tree
8. Graph traversal
9. Huffman Algorithm
10. Shortest path algorithm

P – 30; TOTAL HOURS: 30

OUTCOMES:

Students who complete this course will be able to

- Identify the data structure to provide a solution for the given problem.
- use object oriented concepts to solve the complex problems.
- apply Stack and Queue ADT.
- develop and implement the algorithm for the application
- analyze the problem and identify the appropriate solution for it.
- implement linear and non-linear data structure concepts through programming.

CSC 2132 OBJECT ORIENTED PROGRAMMING USING JAVA

L	T	P	C
0	0	2	1

OBJECTIVES :

- To expand the java programming skills using programming basics.
- To learn the concept of Classes and Methods.
- To explore the inheritance and interface concepts.
- To impart the importance of exception handling and threading in a code.
- To expose the different type of logical ideas to find the solutions for specific problems.
- To develop a real time application using Java programming.

LIST OF EXPERIMENTS:

1. Looping and Control Structure.
2. Arrays.
3. Functions.
4. Class and Objects.
5. Constructors.
6. Polymorphism.
7. Association and Aggregation.
8. Packages.
9. Interface and Abstraction.

P – 30; TOTAL HOURS –30

REFERENCES :

5. David Parsons, “Foundational Java : Key Elements and Practical Programming” , Second Edition, Springer, 2020.
6. Marc Loy, Patrick Niemeyer & Daniel Leuck, “Learning Java: An Introduction to Real-World Programming with Java”, Fifth Edition, O’Reilly, 2020.
7. Bryson Payne, “Learn Java the Easy Way: A Hands-on Introduction to Programming”, No Starch Press, San Fransico, 2018.
8. Peggy Fisher, “Get Programming with Java”, Manning Publication, 2019.
9. Perry Xiao, “Practical Java Programming for IoT, AI, and Blockchain”, Wiley, 2019.

OUTCOMES :

Students who complete this course will be able to

- Identify the problem-solving skills.
- Develop the competent of looping and control structures for solving problems.
- Various inheritance methodologies according to the problem implementation.

- Implement the types of polymorphism for real time applications.
- Analyze the various packages and interface based on the need of an application.
- Analyze the field of association, abstraction and aggregation in real time problem.

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 resume.
- To make them write different types of reports.

MODULE I **4**

Introduction - process of writing – Fundamentals of academicand 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 resume 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). TechnicalReport 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

CSC 2214 DATABASE MANAGEMENT SYSTEMS

L	T	P	C
2	0	0	2

OBJECTIVES :

- To identify the role of a database management system in an organization.
- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- To study SQL and relational database design.
- To learn the internal storage structures and schema.
- To study the relational algebra operations.
- To learn the ACID properties in transaction management.

MODULE I INTRODUCTION 8

Introduction - An example - Characteristics of Database approach – Roles of database users - Advantages of using DBMS approach - Database applications - Data models, schemas and instances - Three-schema architecture and data independence - Database languages and interfaces - The database system environment - Centralized and client-server architectures - Classification of Database Management systems.

MODULE II RELATIONAL MODEL AND RELATIONAL ALGEBRA 10

Relational Model: Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions and dealing with constraint violations - Basic Retrieval queries in SQL - Insert, Delete and Update statements in SQL - Additional features of SQL - More Complex SQL Retrieval Queries - Unary Relational Operations: SELECT and PROJECT - Relational Algebra Operations from Set Theory - Binary Relational Operations: JOIN and DIVISION.

MODULE III ER MODEL AND TRANSACTION MANAGEMENT 12

Entity Types, Entity Sets, Attributes and Keys - Relationship types, Relationship Sets, Roles and Structural Constraints - Weak Entity Types - Refining the ER Design -ER Diagrams, Naming Conventions and Design Issues – Transaction Management - ACID Properties – Transaction Schedules.

L– 30;TOTAL HOURS: 30

REFERENCES :

1. Elmasri and Navathe, "Fundamentals of Database Systems", 7th Edition, Addison-Wesley, ISBN: 978-0133970777,2015.
2. Silberschatz, Korth and Sudharshan, "Data Base System Concepts", 6th Edition, Mc-

GrawHill, ISBN: 978-0073523323, 2010.

3. Raghu Ramakrishnan and Johannes Gehrke,"Database Management Systems", 3rd Edition, McGraw-Hill,ISBN: 978-9339213114, 2014.
4. C.J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education, ISBN: 978-8131762660, 2012 .

OUTCOMES:

Students who complete this course will be able to

- Describe fundamental elements of a relational database management system.
- Transform an information model into a relational database schema.
- Demonstrate any database applications using ER diagrams.
- Use the Data base model based on the application.
- Write complex queries to solve the real world problems.
- Compare the various transaction schedules.

CSC 2212 ANALYSIS OF ALGORITHMS

L	T	P	C
3	1	0	4

OBJECTIVES :

- To learn the asymptotic performance of algorithms.
- To synthesize efficient algorithms in common engineering design situations.
- To familiar with good principles of algorithm design.
- To provide different algorithmic design strategies.
- To know the limitations of Algorithm Power.
- To define the classes P and NP and explain the significance of NPcompleteness.

MODULE I FUNDAMENTALS OF ANALYSIS OF ALGORITHM 8

Algorithm - Fundamentals of Algorithmic Problem Solving – Important Problem Types - Fundamental Data Structures – Analysis Framework –Asymptotic Notations and Basic Efficiency Classes –Mathematical Analysis of Recursive and Non-Recursive Algorithms-Empirical Analysis of Algorithm-Algorithm Visualization.

MODULE II BRUTE FORCE AND DECREASE AND CONQUER 8

Selection Sort and Bubble Sort – Sequential Search and Brute Force String matching – Closest pair and Convex Hull Problems by Brute Force – Exhaustive Search – Depth First Search and Breadth First Search – Insertion Sort – Topological Sorting – Algorithms for Generating Combinatorial Objects – Decrease by a Constant Factor Algorithms – Variable Size Decrease Algorithms.

MODULE III DIVIDE AND CONQUER AND TRANSFORM AND CONQUER 8

Merge Sort – Quick Sort - Binary Tree Traversals and Related Properties – Multiplication of Large Integers and Strassen's Matrix Multiplication – The Closest Pair and Convex Hull Problems by Divide and Conquer – Presorting – Gaussian Elimination – Balanced Search Trees – Heaps and Heap Sort – Horner's Rule and Binary Exponentiation – Problem Reduction.

MODULE IV DYNAMIC PROGRAMMING AND COMPUTATIONAL COMPLEXITY 7

Sorting by Counting – Input Enhancement in String Matching – Hashing – B-Trees – Knapsack Problems and Memory Functions – Optimal Binary Search Trees – Warshall's and Floyd's Algorithm.

MODULE V GREEDY TECHNIQUE AND ITERATIVE IMPROVEMENT 7

Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman Trees and Codes – The Simplex Method – The Maximum Flow Problem – Maximum Matching in Bipartite Graphs.

MODULE VI COPING WITH THE LIMITATIONS OF ALGORITHM POWER 7

Lower Bound Arguments – Decision Trees – PNP and NP Complete Problems – Challenges of Numerical Algorithms – Backtracking – Branch and Bound – Approximation Algorithms for NP Hard Problems – Algorithms for Solving Non-Linear Equations.

L – 45; P – 15;TOTAL HOURS: 60

REFERENCES :

1. Anany Levitin,"The Design and Analysis of Algorithms",Pearson Education Limited,Third Edition, ISBN 10:0-273-76411-X,ISBN 13:978-0-273-76411-3, 2012.
2. Rajesh K.Shukla,"Analysis and Design of Algorithms",Wiley India Private Limited, ISBN : 978–81-265-5477-5, ISBN:978-81-265-8214-3, 2015.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein," Introduction to Algorithms", MIT Press,Third Edition, ISBN: 978-0-262-03384- 8,ISBN: 978-0-262-53305-8, 2009.
4. Sahni Horowitz,"Fundamentals of Computer Algorithms,University Press, ISBN-10:8173716129,ISBN-13:978-8173716126, 2008.

OUTCOMES:

Students who complete this course will be able to

- Analyze best case, average case and worst-case running times of algorithms using asymptotic analysis.
- Apply design principles and concepts to algorithm design.
- Identify and analyze criteria and specifications appropriate to new problems, and choose the appropriate algorithmic design technique for their solution.
- Have the mathematical foundation in analysis of algorithms.
- Develop new data structures by augmenting existing data structures and design algorithms that employ data structures.
- Design algorithms using the Divide-and-Conquer, Dynamic Programming strategy and recite algorithms that employ this strategy.

CSC 2231 INFORMATION SECURITY FUNDAMENTALS

L	T	P	C
3	0	0	3

OBJECTIVES :

- To give an overview of Information Security terms and terminologies.
- To study the different approaches for information planning process.
- To formulate the prevention process for Information Security.
- To expose different monitoring tools for Information Security Detection process.
- To examine the various security recovery techniques.
- To brief upon real time practices in providing Information assurances and security.

MODULE I INTRODUCTION TO INFORMATION SECURITY 8

Need for Security - Basic concepts - Assets, Threats, Vulnerabilities, Risks, and Controls - Security Professionals and Organizations – Security Management System - Implementing Information Security Strategy into Current Practices, Regulations, and Plans.

MODULE II INFORMATION SECURITY PLANNING PROCESS 8

Introduction-Information security planning and governance- Information security policy, standards and practices-Cryptographic tools-protocols for secure communications-Attacks on cryptosystems.

MODULE III INFORMATION SECURITY PREVENTION PROCESS 7

Information Security in System Development - Physical and Environmental Security Controls - Information Security Awareness, Training, and Education - Preventive Tools and Techniques - Access Control.

MODULE IV INFORMATION SECURITY RECOVERY PROCESS 7

Information Security Incident Handling - Computer Forensics - Business Continuity - Backup and Restoration – Current trends and practices.

MODULE V SECURITY TECHNOLOGY AND PHYSICAL SECURITY 8

Security Technology - Access Controls, Firewalls and VPNs- Intrusion Detection and prevention systems. Physical Security -Introduction-Physical access controls-Fire Security and safety-Failure of supporting utilities and structural collapse.

MODULE VI INFORMATION SECURITY IMPLEMENTATION AND MAINTENANCE 9

Information security project management-technical aspects of implementation-non technical aspects of implementation- Positioning and staffing the security function. Security Management Maintenance Models.

L – 45;TOTAL HOURS : 45

REFERENCES :

1. Michael E. Whitman and Herbert J. Mattor.,"Principles of Information Security: 6thEdition,Cengage Learning,ISBN: 9781337102063, 2017.
2. Corey Schou, Steven Hernandez, "Information Assurance Handbook: Effective Computer Security and Risk Management Strategies", McGraw Hill Education, First edition, ISBN: 9789339222376, 2015.
3. John R.Vacca, "Computer and Information Security Handbook", 3rd Edition, Morgan Kaufmann Publishers, ISBN: 9780123743541,2017.
4. Jason Andress,"The Basics of Information Security", 2nd edition, Syngress Press, Elsevier Publications, ISBN: 9780128008126,2014.

OUTCOMES :

Students to complete this course will be able to

- Identify the terms and terminologies of Information Security
- Develop the approaches of security planning process and security policies
- Analyze and recommend security prevention tools and techniques
- Compare the tools and metrics for information security detection process and enumerate them.
- Compare the relationship between information security and physical security.
- Implement the organizational considerations to be addressed in a project plan and describe the maintenance issues of security.

CSC 2211 COMPUTER ARCHITECTURE AND MICRO PROCESSOR

L	T	P	C
3	0	0	3

OBJECTIVES :

- To conceptualize the basics of organizational and architectural issues of a digital computer
- To develop an in-depth understanding of the operation of Central processing unit and ILP.
- Impart the knowledge about Control unit and the ideas about parallel organization.
- Provide the essentials of the processors and Develop assembly level programs using 8085.
- To understand fundamental architecture of 16 bit and 32 bit microprocessors.
- To offer a necessary ideas on microcontroller.

MODULE I BASIC STRUCTURE OF COMPUTERS 07

Basics – Computer evolution and performance – Computer functions and interconnections – Computer Arithmetic - The Arithmetic and Logic Unit - Integer Representation - Integer Arithmetic - Floating-Point Representation - Floating-Point Arithmetic.

MODULE II PROCESSOR STRUCTURE AND FUNCTION 08

Processor Structure and Function - Processor Organization - Register Organization - Instruction Cycle - Instruction Pipelining - The x86 Processor Family.

MODULE III CONTROL UNIT 07

Control Unit Operation - Micro-operations - Control of the Processor - Hardwired Implementation - Microprogrammed Control - Basic Concepts - Microinstruction Sequencing -Microinstruction Execution.

MODULE IV MEMORY AND I/O 08

Cache Memory - Computer Memory System Overview - Cache Memory Principles - Elements of Cache Design - Internal Memory - External Memory - Input/Output - External Devices - I/O Modules - Programmed I/O - Interrupt-Driven I/O - Direct Memory Access.

MODULE V 8085 ARCHITECTURE 07

Microprocessor based systems hardware and interfacing – Programming 8085 – Interfacing peripherals – PPI (8255).

MODULE VI 8086 ARCHITECTURE 08

Basics of 8086 – Instruction set of 8086 – Assembler Directives –Interrupt systems – Classification – Interrupts of 8086 – PIC (8259).

L – 45; TOTAL HOURS-45

REFERENCES :

1. William Stallings, "Computer Organization and Architecture - Designing for Performance", 10th Edition, Pearson Education, ISBN-13: 978013410613, 2015.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer organization", 5th Edition, McGraw Hill, ISBN 13:9781259005275, 2002.
3. John Kennessy and David Patterson, “Computer Architecture”, 5th edition, ISBN: 9780123838728, 2011.
4. Ramesh Goankar, “Microprocessor architecture, programming and applications with 8085”, 6th edition, Penram International Publishing, ISBN: 978-8187972884, 2013.
5. Mathur Sunil, “Microprocessor 8086: Architecture, Programming and Interfacing”, PHI, ISBN: 9788120340879, 2012.
6. Kenneth J Ayala,” The 8051 micro controller”, 3rd edition, Cengage Learning, ISBN: 9781401861582, 2010.

OUTCOMES :

Students who complete this course will be able to

- Clarify the essentials of the working of the computing units and trace the operation.
- Demonstrate the working of central processing unit.
- Illustrate the computer architectures and design issues and tradeoffs.
- Bring out the design of microprocessors / microcontrollers-based systems.
- Write an assembly language code to program a microprocessor system.
- Elucidate the microcontroller basics and showcase its applications.

CSC 2232 INFORMATION SECURITY LABORATORY

L	T	P	C
0	0	2	1

OBJECTIVES :

- To study and implement simple security algorithm.
- To recognize the concept of public key encryption, its implementation and real time applications
- To know the symmetric algorithms, and its real time applications
- To categorize the various applications of cryptography and security issues practically.
- To analyze the different security parameters by installing the security tool kits.
- To familiar with S/MIME for e-mail communication

SOFTWARE REQUIRED : C/C++/JAVA

1. Implement Substitution and transposition Techniques.
2. Implement DES and MD5 algorithm.
3. Implement RSA and Diffiee-Hellman algorithm.
4. Demonstrate Intrusion Detection System (IDS) using any tool (snort or equivalent software)
5. Demonstrate attack is done using Wireshark Tool.
6. Generate password hashes with OpenSSL.
7. Configuring S/MIME for e-mail communication

P-30;TOTAL HOURS – 30

OUTCOMES :

Students who complete this course will be able to

- Implement secure applications on applying security algorithm.
- Develop skills required to deal with common programming errors that lead to most security problems.
- Implement secure authentication through properly handling application faults.
- Apply authorization and data validation controls to prevent common vulnerabilities.
- Demonstrate wire shark tool to identify the appropriate solution for it.
- Apply different open source tools for network security and analysis.

CSC 2215 **DBMS LABORATORY** **L T P C**
0 0 2 1

OBJECTIVES :

- To learn the concepts of Database Management systems.
- To create, update and query with the data in the databases.
- To make a detailed study on the applications of DBMS.
- To access and manipulate data using PL/SQL blocks.
- To familiarize advanced SQL queries.
- To learn JDBC/ODBC connectivity.

LIST OF EPERIMENTS:

SQL:

1. Creating, altering and dropping tables with integrity constraints using DDL commands.
2. Retrieving and modifying data from a database using DQL and DML Statements.
3. Retrieving data from database using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING clause.
4. Use of scalar and aggregate functions.
5. Retrieving data from a database using Join operations(Inner and Outer Joins).
6. Using sub queries or complex queries for retrieving data.

PL/SQL:

7. Simple PL/SQL Programs.
8. Use of implicit & explicit cursors in data handling.
9. Use of stored procedures & functions in data manipulation.
10. Use of trigger in data manipulation.

APPLICATION DEVELOPMENT (JDBC/ODBC connectivity)

a) Inventory Control System.
b) Material Requirement Processing.
c) Hospital Management System.
d) Railway Reservation System.
e) Blood Donors Information Management System.
f) Web Based User Identification System.
g) Timetable Management System.
h) Hotel Management System

SOFTWARES:

- Front end: VB/VC ++/JAVA or Equivalent

g) Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent.

P-15 ; TOTAL HOURS-15

OUTCOMES :

Students who complete this course will be able to

- Design and implement a database schema for a given problem-domain.
- Populate and query a database using SQL DML/DDL commands.
- Apply the normalization techniquesto a database.
- Create simple applications using Java and Oracle using JDBC connectivity.
- Create and maintain tables using PL/SQL.
- Build applications using VB and Oracle.

SEMESTER V

MSC 3181	LEADERSHIP AND 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 traitsthrough psychometric tests - Multi factor leadership questionnaire and personal reflections

MODULE II LEADERSHIP STYLE AND COMMUNICATION 8

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

MODULE III LEADERSHIP ROLES 8

Facets of leadership- Leader as an individual – personality and leadership, values, attitudes and ethics of a leader. Leader as a relationship builder- empowering people to meet higher order needs, initiating organization wide motivational

programs, involvement with all stakeholders- focusing on organization growth. Leader as an inspirer- motivation and leadership, recognizing and appreciating contributions, empowering others to lead Leader as an innovator –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 9

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 8

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.

MODULE VI TEACHING PEDAGOGY

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

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

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

TOTAL HOURS –45

REFERENCES:

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

MSC 3182 SOCIAL ENTREPRENEURSHIP

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the fit between individual and their entrepreneurial ambitions.
- To identify the customers and find a problem worth solving.
- To create a business model for solving the problems of customer, forming solution and present the Business Model Canvas
- To develop a solution for customers' problem and analyze the problem solution fit & product market fit.
- To build and demonstrate a Minimum Viable Product (MVP) for startup.
- To analyze and understand the impact of social entrepreneurship on society and cases.

MODULE I SELF & OPPORTUNITY DISCOVERY 9

Finding the flow, Effectuation, Entrepreneurial Style, Business Opportunities, Problem Identification, Design Thinking, Potential solutions, Presentation of the problem- Case Study.

MODULE II CUSTOMER , SOLUTION AND BUSINESS MODEL 9

Customers and Markets, Identification of Customer Segment, Niche Segment, Customers Jobs, Pain and Gain, Early Adopters, Value Proposition Canvas, Basics of Business Model and Lean Canvas, Risk and Assumptions.

MODULE III VALIDATION AND MONEY 9

Blue Ocean Strategy, Solution Demo, Problem – Solution Fit, Minimum Viable Product-Product Market Fit, Prototype – Case Study. Cost, Revenues, Pricing, Profitability Checks, Bootstrapping, Initial Financing and Pitching.

MODULE IV TEAM BUILDING AND MARKETING 7

Shared Leadership, Hiring, Fitment , Team Role and Responsibilities , Collaboration Tools and Techniques, Positioning and Branding, Channels

MODULE V SALES & SUPPORT 6

Sales Planning, Selling Skills, Project Management, Project Tracking, Basic of Business Regulation, Startup.

MODULE VI IMPACT OF SOCIAL ENTREPRENEURSHIP ON SOCIETIES AND CASES **5**

Impact of Social Entrepreneurship, NGO vs For-Profit Companies vs. Social Entrepreneurship. Procedures for registration of small scale industry, Overview of venture capital and angel investment, Social entrepreneurship report preparation by students. Case Study of Social Entrepreneurs.

TOTAL PERIODS - 45

TEXT BOOKS

1. Entrepreneurship Rajeev Roy oxford, 2012.
2. Learn wise platform - Wadhwani Foundation, 2018
3. “Social Entrepreneurship and Social Business” Christine K Volkmann, Springer Gabler 2012.
4. The Process of social value creation: A multiple case study on Social Entrepreneurship in India, Archana Singh Springer 2016.

REFERENCES

1. Social Entrepreneurship” Manuel London, Routlege, 2012.
2. The Process of social value creation: A multiple case study on Social Entrepreneurship in India, Archana Singh Springer 2016.
3. Running Lean: Iterate From Plan A To a Plan That Works, Ash Maurya, "O'Reilly Media, Inc.", 28-Feb-2012.

OUTCOMES:

On completion of the course, students will be able to

- Build an entrepreneurial mindset and reach out the customer to identify the problem using design thinking process
- Craft solution to the problem through value proposition canvas and develop a business model using lean canvas
- Provide product solution demo and deliver a minimum viable product
- Work as a team and create brand strategy marketing for product/service
- Prepare, make an outstanding sale pitch for startup.
- Showcase the impact of Social Entrepreneurship on society and cases.

ENC 3181	COMMUNICATION AND SOFT SKILL – I SOFT SKILLS FOR CAREER	L	T	P	C
		0	0	2	1

OBJECTIVES :

- To enable students to gain knowledge about industries, work culture and ethics
- To develop students' critical reading and writing skills.
- To develop students' problem solving, analytical and leadership skills.
- To train them in presentation, group discussion and team building skills.

MODULE I **6**

Brief about industries- Analyzing work culture and ethics of multinational companies and SME(Small and Medium Enterprises) - Knowledge about etiquette (different types).

MODULE II **6**

Visiting industries and writing reports based on their visit

MODULE III **4**

Analysing industry related problems-case studies.

MODULE IV **6**

Developing Leadership skills- various aspects of leadership - time management - people skills.

MODULE V **8**

Team building skills- group discussions -- preparing for interviews- interpersonal skills

TOTAL HOURS-30

REFERENCES :

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

OUTCOMES :

Students who complete this course will be able to

- Demonstrate knowledge about industries/workplace.
- Write reports in simple and clear language.
- Exhibit problem solving and leadership skills.
- Make presentations and take part in discussions.

CSC 3101 OPERATING SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES :

- To know the objectives, functions and architecture of operating systems.
- To understand process management concepts.
- To study the functions of process concurrency and synchronization .
- To provide knowledge about how the memory management is done with the help of operating systems.
- To learn the techniques for managing the I/O devices.
- To illustrate techniques for managing the files.

MODULE I OVERVIEW OF OPERATING SYSTEMS **8**

Operating Systems Objectives and Functions - Evolution of the Operating systems - Operating System Structures.

MODULE II PROCESS MANAGEMENT & SCHEDULING **8**

Process Life cycle - Process control - Threads - Multi Threads - Scheduling criteria - Types of scheduling - Scheduling Algorithms.

MODULE III PROCESS SYNCHRONIZATION **7**

Concurrent process - Principles of Concurrency - IPC - Semaphores – Deadlock - Deadlock Prevention, Avoidance, Detection and recovery.

MODULE IV MEMORY MANAGEMENT **7**

Introduction - Partitions - Paging - Segmentation - Segmentation and paging - Need for virtual memory management - Demand Paging - Page fault and page replacement policies.

MODULE V I/O MANAGEMENT **7**

Organization of I/O functions - Evolution of I/O Functions - Logical Structure of I/O functions - I/O Buffering and Blocking

MODULE VI **DISK SCHEDULING** **8**

Disk I/O - Disk Scheduling algorithms - File Management: Principles - File management Techniques - File directories - File System Architecture - File allocation.

L – 45; TOTAL HOURS-45

REFERENCES :

1. Abraham Silberschatz, Peter B galvin , Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley & Sons Inc, 2013, ISBN:978-1-118-06333-0.
2. Deitel H M, "Operating Systems", 3rd Edition, Pearson education India, New Delhi, 2007,ISBN : 978-0-536-21215-3.
3. Dhamdhere D M, "Operating Systems", 1st reprint, Tata McGraw Hill, New Delhi, 2006, ISBN 978–0–07–295769–3.

OUTCOMES :

Students who complete this course will be able to

- State the functioning of operating systems.
- Compare the performance of various process scheduling algorithms.
- Evaluate the implementation of processes and problems related to process synchronization.
- Analyze resources like memory , I/O devices can be managed.
- Discuss the features of various file management techniques.
- Interpret the mechanisms adopted for disk scheduling algorithms

CSC 3103	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce the fundamentals of artificial intelligence.
- To focus on knowledge representation and reasoning techniques.
- To equip the student on machine learning problems and applications.
- To provide understanding on the machine learning architecture for big data.
- To gather knowledge on the installation of various machine learning tools.
- To have a deeper knowledge on the types of learning based on tools.

PREREQUISITES :

Data Structures and Algorithms

MODULE I PRODUCTION SYSTEMS AND AI 8

Production systems, specialized production systems, Different types of production systems, search strategies for AI production systems, backtracking strategies, graph search strategies, uninformed graph search, heuristic graph search, related algorithms, and measures of performance.

MODULE II DECOMPOSABLE PRODUCTION SYSTEMS 8

AND/OR graphs, AO* a heuristic procedure for AND/OR graphs, relationship between decomposable and commutative systems, searching game trees, predicate calculus in AI, resolution, use of predicate calculus in AI, resolution refutation systems, control strategies for resolution methods, simplification strategies, extracting answers from resolution refutations.

MODULE III RULE BASED DEDUCTION SYSTEMS 8

A forward deduction systems, backward deduction systems, resolving within AND/OR graphs, computation deduction and program synthesis, control knowledge for rule based deduction systems

MODULE IV PLAN-GENERATING SYSTEM 7

Basic plan generating systems, robot problem solving, forward production systems, representation of plans, backward production systems, STRIPS, using deduction systems to generate robot plans.

MODULE V MACHINE LEARNING MODELS 7

Introduction to machine learning – machine learning applications – supervised learning – learning class with example – learning multiple classes – unsupervised learning – PAC learning.

MODULE VI APPLICATIONS AND TOOL

Data set Collection – Tools - R, Python - Implementation of AI Concepts with Tools – Applications – Case Study.

L – 45; TOTAL HOURS : 45

REFERENCES :

1. Nils J. Nilsson, “Principles of Artificial Intelligence”, 1 st Edition, Morgan Kauffman publishers, ISBN: 1483295869 2014.
2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, ISBN 9780262028189, 2014.
3. Shai Shalev - Shwartz, Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press, ISBN 9781107057135, 2014.

OUTCOMES :

Students to complete this course will be able to

- Identify the production systems and the search strategies.
- Acquire knowledge on the representation and reasoning techniques.
- Have an exposure on machine learning problems and applications.
- Examine the learning applications for machine learning
- Examine the installation of machine learning tools and its packages.
- Address the types of learning based on machine learning tools

CSC 3131 WEB AND MOBILE APPLICATION SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To expand the web security skills.
- To learn the concept of mobile application security.
- To explore the application development vulnerability.
- To impart the importance of mobile forensics.
- To expose the logical ideas to find the solutions for security specific problems.
- To audit a real time application using security tools.

MODULE I WEB APPLICATION SECURITY 6

OWASP – Injection – XSS – CSRF – URL Access – Transport Layer Protection - Security Fundamentals – Input Validation – Attack surface reduction – Classifying and Prioritizing Threats.

MODULE II SECURITY PRINCIPLES 8

Authentication – Fundamentals – Two and Three Factor authentication – Web application – Securing password – Authorization – Access control – Session management – Securing web application.

MODULE III BROWSER SECURITY PRINCIPLES 8

Same - Origin policy - Client and Server side - Exceptions - HTML script - JSONP - iframe - XMLHttpRequest - Database security – SQL Injection – Database permissions – Stored Procedure – File Security – Source code secret – Forceful Browsing – Directory Traversal.

MODULE IV MOBILE ISSUES AND DEVELOPMENT STRATEGIES 7

Issues Facing Mobile Devices – Physical security – Secure Data Storage – Operating System – SSL -CSRF – Secure Mobile Application Development – TLS/SSL – Android Security – Development and Debugging – Securable IPC Mechanisms – Security Model – Permission Review – Broadcasts – Services – Binder Interface – Security Tools.

MODULE V MOBILE SECURITY 7

Apple iPhone Security – Testing – Application Format – Permissions – Local Data Storage – Networking - Java Mobile Edition Security – JSRs - Security– Permissions - WebOS Security – Architecture – Development - Code Security - User Controls.

MODULE VI WAP 7

Authentication - Encryption - Application Attacks - Browser Weaknesses - Case Study.

L – 45; TOTAL HOURS –45

REFERENCES :

1. Andrew Hoffman, “Web Application Security: Exploitation and Countermeasures for Modern Web Applications”, O'Reilly Media, 2020.
2. Sougata Mukherjea, “Mobile Application Development, Usability, and Security”, IGI Global, 2016.
3. Liu, Vincent; Sullivan, Bryan, “Web application security a beginner's guide”, McGraw-Hill, 2012.
4. Himanshu Dwivedi, Chris Clark, David Thiel, “Mobile Application Security”, McGraw-Hill Osborne Media, 2010.
5. Bryan and Vincent, “Web Application Security, A Beginners Guide”, McGraw-Hill, 2011.

OUTCOMES:

Students who complete this course will be able to

- Identify the web security knowledge in applications.
- Apply Security principles and factors in web applications.
- Analyze browser security policies and database security based on the problem.
- Identify the type of mobile issues in real time applications.
- Develop mobile application with security.
- Analyze the WAP and security tools in real time applications.

CSC 3132	WEB AND MOBILE APPLICATION SECURITY LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To design an effective secure web application.
- To discover the language of the web: XHTML and CSS.
- To become familiar with web application and development careers.
- To explore the application development vulnerability.
- To learn the concept of mobile application security.
- To expose the logical ideas to find the solutions for security specific problems.

SOFTWARE REQUIRED:

Basic tools: Java JDK 1.6 and above, AJAX, MySQL, Dream Weaver, Apache Server, Android Studio.

LIST OF EXPERIMENTS:

1. Design a web application.
2. Develop a real time security web application.
3. Webpage Design Using Style sheet.
4. Designing and Validating Bio-Data using HTML Script.
5. JDBC Connectivity in web security.
6. Design a mobile application for User Interface features.
7. Develop Layout designs and Action Listeners in mobile devices.
8. Create a secure mobile application.
9. An application development-Mini Project.

P- 30; TOTAL HOURS - 30

OUTCOMES:

Students who complete this course will be able to

- Define modern protocols and systems used on the Web such as HTML.
- Apply client-server internet approaches to web design and implementation.
- Design and implement interactive secure web sites.
- Justify and explain particular internet application concepts, relevant alternatives and decision recommendations, including design considerations for internet security.
- Develop mobile application using development tool.
- Create a mobile application that supports web access.

CSC 3133 LINUX OPERATING SYSTEM LABORATORY

L	T	P	C
0	0	2	1

OBJECTIVES :

- To explore overview on basic Linux general purpose commands.
- To learn network Unix commands.
- To develop C programming in Unix editor environment.
- To learn shell script and sed concepts.
- To get knowledge on file management and permission advance commands.
- To stimulate UNIX commands using C programming.

SOFTWARE REQUIRED : C/C++/JAVA

(Implement the following on LINUX platform. Use C for high level language implementation)

1. Shell programming
   - command syntax
   - write simple functions
   - basic tests
2. Shell programming
   - loops
   - patterns
   - expansions
   - substitutions
3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4. Write programs using the I/O system calls of UNIX operating system (open, read,write, etc)
5. Write C programs to simulate UNIX commands like ls, grep, etc.

P- 30;TOTAL HOURS – 30

OUTCOMES :

Students who complete this course will be able to

- Implement the basic set of commands and utilities in Linux/UNIX systems.
- Develop software for Linux/UNIX systems.
- Apply C programming code in Linux operating system.
- Discover the important Linux/UNIX library functions and system calls.
- Demonstrate the inner workings of UNIX-like operating systems.
- Develop application with shell programming concepts.

SEMESTER VI

MSC 3181	CEO AND LEADERSHIP 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 traitsthrough psychometric tests - Multi factor leadership questionnaire and personal reflections

MODULE II LEADERSHIP STYLE AND COMMUNICATION 8

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

MODULE III LEADERSHIP ROLES 8

Facets of leadership- Leader as an individual – personality and leadership, values, attitudes and ethics of a leader. Leader as a relationship builder- empowering people to meet higher order needs, initiating organization wide motivational programs, involvement with all stakeholders- focusing on organization growth. Leader as an inspirer- motivation and leadership, recognizing and appreciating contributions, empowering others to lead Leader as an innovator –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 9

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 8

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.

MODULE VI TEACHING PEDAGOGY

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

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

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

Total Hours –45

REFERENCES:

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 SharmaJaico Publishing House;

OUTCOMES:

The students will be able to

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

MSC 3182 SOCIAL ENTREPRENEURSHIP

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the fit between individual and their entrepreneurial ambitions.
- To identify the customers and find a problem worth solving.
- To create a business model for solving the problems of customer, forming solution and present the Business Model Canvas
- To develop a solution for customers' problem and analyze the problem solution fit & product market fit.
- To build and demonstrate a Minimum Viable Product (MVP) for startup.
- To analyze and understand the impact of social entrepreneurship on society and cases.

MODULE I SELF &OPPORTUNITY DISCOVERY 9

Finding the flow, Effectuation, Entrepreneurial Style, Business Opportunities, Problem Identification, Design Thinking, Potential solutions, Presentation of the problem- Case Study.

MODULE II CUSTOMER , SOLUTION AND BUSINESS MODEL 9

Customers and Markets, Identification of Customer Segment, Niche Segment, Customers Jobs, Pain and Gain, Early Adopters, Value Proposition Canvas, Basics of Business Model and Lean Canvas, Risk and Assumptions.

MODULE III VALIDATION AND MONEY 9

Blue Ocean Strategy, Solution Demo, Problem – Solution Fit, Minimum Viable Product-Product Market Fit, Prototype – Case Study. Cost, Revenues, Pricing, Profitability Checks, Bootstrapping, Initial Financing and Pitching.

MODULE IV TEAM BUILDING AND MARKETING 7

Shared Leadership, Hiring, Fitment , Team Role and Responsibilities , Collaboration Tools and Techniques, Positioning and Branding, Channels

MODULE V SALES & SUPPORT 6

Sales Planning, Selling Skills, Project Management, Project Tracking, Basic of Business Regulation, Startup.

MODULE VI IMPACT OF SOCIAL ENTREPRENEURSHIP ON SOCIETIES AND CASES 5

Impact of Social Entrepreneurship, NGO vs For-Profit Companies vs. Social

Entrepreneurship. Procedures for registration of small scale industry, Overview of venture capital and angel investment, Social entrepreneurship report preparation by students. Case Study of Social Entrepreneurs.

Total Periods- 45

TEXT BOOKS

1. Entrepreneurship Rajeev Roy oxford, 2012.
2. Learn wise platform - Wadhwani Foundation, 2018
3. “Social Entrepreneurship and Social Business” Christine K Volkmann, Springer Gabler 2012.
4. The Process of social value creation: A multiple case study on Social Entrepreneurship in India, Archana Singh Springer 2016.

REFERENCES

1. Social Entrepreneurship” Manuel London, Routlege, 2012.
2. The Process of social value creation: A multiple case study on Social Entrepreneurship in India, Archana Singh Springer 2016.
3. Running Lean: Iterate From Plan A To a Plan That Works, Ash Maurya, "O'Reilly Media, Inc.", 28-Feb-2012.

OUTCOMES:

On completion of the course, students will be able to

- Build an entrepreneurial mindset and reach out the customer to identify the problem using design thinking process
- Craft solution to the problem through value proposition canvas and develop a business model using lean canvas
- Provide product solution demo and deliver a minimum viable product
- Work as a team and create brand strategy marketing for product/service
- Prepare, make an outstanding sale pitch for startup.
- Showcase the impact of Social Entrepreneurship on society and cases.

ENC 3281 **COMMUNICATION AND SOFT SKILL - II** **L T P C**

ENGLISH FOR WORKPLACE

3 0 0 3

OBJECTIVES :

- To develop students' proficiency in English at CEFR B2 level (Business Vantage).
- To develop students' receptive skills (Listening and Reading) in a wide range of situations.
- To develop students' productive skills (Speaking and Writing) in a wide range of situations.
- To expose students to the nuances of the English language, grammar and usage

MODULE I **6**

SPEAKING

Taking part in interview sessions by assuming roles of an interviewer and interviewee-exchanging information in question answer format-use of question tags, direct questions-all in real life contexts, Pronunciation.

READING

Reading short passages and answering matching tasks and error identification

LISTENING

Listening to audio recordings of short extracts of business-related texts and making note completion tasks.

WRITING

Writing intra office communication like a note, message for about 40-50 words.

MODULE II **6**

SPEAKING

Role play, participating in short talks relating to business topics-Discussion on a business related topic.

READING

Reading longer texts and answering questions.

LISTENING

Listening to audio recordings of telephone calls, face to face conversations and attempting exercises on gap filling involving information in words on numerical data and completing the task.

WRITING

Writing a memo or email to a colleague or colleagues within a company-Writing letter of application with resume, Writing reports on conference, seminars etc.

MODULE III **6**

SPEAKING

Giving presentations on business related topics involving decision making for one minute.

READING

Reading texts related to business topics and answering multiple- choice questions.

LISTENING

Listening to audio recordings of interviews and answering multiple-choice questions.

WRITING

Writing a short report, proposal from the notes given in about 120-140 words, writing replies to customers.

MODULE IV **8**

SPEAKING

Group Discussion-Taking part in discussions-Exchanging information.

READING

Reading excerpts taken from newspapers, magazines and answering questions.

LISTENING

Listening to a range of business related conversations, interviews, telephone calls, face to face conversations and attempting questions based on them.

WRITING

Writing a letter of enquiry, letter of complaint, sales letter.

MODULE V **4**

GRAMMAR &VOCABULARY

Use of sequence words, collocations, linking words and phrases, coherence and cohesion, Business Vocabulary

TOTAL HOURS- 30

REFERENCES :

1. Alasdair Gilchrist, “Industry 4.0 - The Industrial Internet of Things”, Apress,ISBN: 101484220463, 2017.
2. S. Jeschke, C. Brecher, H. Song, and D. B. Rawat, Industrial Internet of Things: Cybermanufacturing Systems, Springer, 1st edition, ISBN: 13 -978-3319425580, 2017.
3. Emiliano Sisinni,” Industrial Internet of Things: Challenges, Opportunities, and Directions”, IEEE Transactions on Industrial Informatics, ISBN: 15513203, 2018.
4. Giacomo Veneri, and Antonio Capasso, “Hands-on Industrial Internet of Things: Create a powerful industrial IoT infrastructure using Industry 4.0”, Packt Publishing, ISBN: 9781789537222, 2018.

5. Sudip Misra, Chandana Roy, AnandarupMuherjee, “Introduction to Industrial Internet of Things and Industry 4.0”, CRC Press, ISBN: 9780367644710, 2021.

OUTCOMES :

Students who complete this course will be able to

- Differentiate the Industrial Internet and Industrial Internet of Things.
- Describe the Industrial IoT architecture and business models.
- Analyze the various Industrial IoT Layers and their relative importance.
- Expose the importance of Data Analytics in IIoT.
- Examine the access network topology and protocols.
- Apply the Industry IoT concepts in different application domains.

CSC 3231 INTRUSION DETECTION AND INTERNET SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES :

- To study the basic concepts of Intrusion Detection Systems.
- To learn the network attacks and detection approaches.
- To expose the theoretical foundation of Intrusion Detection system.
- To gain knowledge on collaborative decision model.
- To train how to choose the appropriate algorithm for designing intrusion detection networks.
- To give outline the commercially available Collaborative Malware Detection.

MODULE I INTRODUCTION 8

Cyber Intrusions – Intrusion Detection systems – Collaborative intrusion detection Networks - Overview of existing Intrusion Detection Networks – Selected Intrusion Detection Networks.

MODULE II NETWORK ATTACKS AND DETECTION APPROCHES 7

Attack Taxonomies – Probes – Privilege Escalation Attacks – DoS and DDoS Attacks – Worm attacks – Routing Attacks – Misuse Detection – Anomaly Detection – Specification Detection – Hybrid Detection.

MODULE III DESIGN OF INTRUSION INFRASTUCTURE 7

Collaboration Framework – Privacy issues – Insider Attacks – Trust Management model – Text Message Exchange rate and Scalability – Robustness against common Treats.

MODULE IV COLLABORATIVE DECISION 7

Collaborative Decision Model –Sequential Hypothesis Testing – Performance Evaluation - Resource Management and Incentive Design – Primal and Dual Iterative algorithm.

MODULE V COLLABORATORS SELECTION AND MANAGEMENT 8

IDS Identification and Feedback Aggregation-Acquaintance Management- Evaluation - Knowledge sharing IDN Architecture- Knowledge Sharing and Propagation Model.

MODULE VI COLLABORATIVE MALWARE DETECTION NETWORKS 8

Collaborative Malware Detection- Collaborative framework - Collaborative Decision Model - Evaluation.

L-45; TOTAL HOURS – 45

REFERENCES :

1. Kwangjo Kim, Muhamad Erza Aminanto, Harry Chandra Tanuwidjaja “Network Intrusion Detection Using Deep Learning”, Springer Singapore,ISBN: 9789811314438,2018.
2. Carol Fung, Raouf Boutaba, Intrusion Detection Networks: A Key to Collaborative Security, CRC Press Taylor and Francis Group, ISBN:978-1-4665-6412-1, 2014.
3. Ali A. Ghorbani, Wei Lu and Mahbod Tavallaee, Network Intrusion Detection and Prevention Concepts and Techniques, Third Edition, Springer, ISBN: 978-0-387-88770-8, 2010.
4. Brad Lhotsky, Instant OSSEC Host-Based Intrusion Detection System, Packt Publishing, ISBN: 978-1-78216-764-8,2013.
5. Al-Sakib Khan Pathan, The State of the Art in Intrusion Prevention and Detection, CRC Press Taylor and Francis Group, ISBN 978-3-4822-0353-6, 2014.
6. Ankit Fadia, Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection, Thomson Course Technology,.ISBN - 1 – 59863-413, 2008.

OUTCOMES :

Students who complete this course will be able to

- Apply intrusion detection principles and detection approaches of Intrusion detection Systems.
- Design of intrusion infrastructure and evaluate the performance of the system.
- Identify the theoretical foundations for intrusion detection.
- Analyze quality attributes of intrusion detection algorithms.
- Determine appropriate mechanisms for protecting information.
- Develop the current techniques for Knowledge Sharing and Propagation Model.

CSC 3213 GRAPH THEORY AND APPLICATION L T P C
3 1 0 4

OBJECTIVES :

- To introduce the students to graphs and their properties.
- To introduce graph applications as models of networks
- To improve the ability to use recursive definitions and solve recurrence relations.
- To deal with non-polynomial time graph problems.
- To impart knowledge on applying graph algorithms in the domain of Computer Science.
- To apply concept of graph theory to represent and use in communication networks.

MODULE I INTRODUCTION TO GRAPHS 08

Fundamentals of Graph Theory - Families of Graphs and Digraphs - History of Graph Theory – Graph Representation

MODULE II GRAPH THEORY 07

Graph Isomorphism - Recursively Constructed Graphs - Structural Graph Theory - Directed Graphs - Basic Digraph Models and Properties - Directed Acyclic Graphs – Tournaments.

MODULE III CONNECTIVITY AND REVERSIBILITY 08

Connectivity: Properties and Structure - Eulerian Graphs - Chinese Postman Problems - Hamiltonian Graphs - Traveling Salesman Problems - High Connectivity – Bounded Connectivity.

MODULE IV COLORINGS 08

Graph Coloring - Independence and Cliques - Factors and Factorization - Applications to Timetabling - Graphs in Computer Science – Searching - Dynamic Graph Algorithms - Algorithms on Recursively Constructed Graphs - Fuzzy Graphs.

MODULE V GRAPHS IN COMPUTER SCIENCE 08

Searching - Dynamic Graph Algorithms - Dynamic Problems on Undirected Graphs - Dynamic Problems on Directed Graphs - Drawings of Graphs - Types of Graphs and Drawings - Combinatorics of Some Geometric Graphs - Properties of Drawings and Bounds - Complexity of Graph Drawing Problems.

MODULE VI NETWORKS AND FLOWS 06

Maximum Flows - The Basic Maximum Flow Problem - Minimum Cuts and Duality - Max-Flow Min-Cut Theorem - Algorithms for Maximum Flow - Variants and Extensions of Maximum Flow - Minimum Cost Flows - The Basic Model and Definitions - Residual Networks - Optimality Conditions - The Dual Problem - Algorithms for Minimum Cost Flow - Extensions to Minimum Cost Flow - Matchings and Assignments.

L – 45; T-15; TOTAL HOURS-60

REFERENCES :

1. “Handbook of Graph Theory”, Ping Zhang, Jay Yellen, Jonathan L. Gross, Chapman and Hall/CRC, 2nd Edition, ISBN: 9781439880197, 2015.
2. “Advanced Graph Theory and Combinatorics, Michel, John Wiley & Sons, ISBN: 9781848216167, 2016.
3. “Algorithmic Graph Theory and Perfect Graphs”, Martin Charles Golumbic, North Holland, 2nd Edition, ISBN: 9780444515308, 2004.

OUTCOMES :

Students who complete this course will be able to

- Formulate problems in terms of graphs.
- Solve graph theoretic problems and apply algorithms taught in the course.
- Use generating functions to solve a variety of combinatorial problems.
- Identify the biconnected components in a graph or a circuit.
- Apply principles and concepts of graph theory in practical situations
- Apply concepts of graph theory in Computer networks.

CSC 3232	ETHICAL HACKING	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To learn various hacking techniques and attacks.
- To get knowledge on protecting data assets against attacks from the Internet.
- To assess and measure threats to information assets.
- To provide information on the benefits of strategic planning process
- To evaluate where information networks are most vulnerable.
- To perform penetration tests into secure networks for evaluation purposes.

MODULE I INTRODUCTION TO HACKING 5

Hacking windows – Network hacking – Web hacking – Password hacking. A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks.

MODULE II FUNDAMENTALS OF COMPUTER FRAUD 7

Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process.

MODULE III VARIOUS ATTACKING MECHANISM 9

Mapping the application - Bypassing client side control -- Attacking authentication - Attacking session management -- Attacking access control - Attacking path traversal - Attacking application logic - Attacking other users - Session fixation - Local privacy attacks -Advanced exploiting techniques -Its prevention.

MODULE IV INFRASTRUCTURE HACKING 9

Remote Connectivity and VoIP Hacking – PBX Hacking – Voicemail Hacking – Voice over IP attacks –Hacking Hardware: Hacking Devices – Default configurations – Reverse Engineering Hardware – ICE Tools.

MODULE V APPLICATION and DATA HACKING 8

Web server Hacking: Web server vulnerability scanners – Canonicalization attacks – Web application Hacking – Database Hacking: Database Discovery – Database Vulnerabilities – Mobile Hacking: Hacking Android.

MODULE VI CASE STUDY 6

System hacking Case study: DNS High Jinx - Pwning the internet - Hacking windows - Hacking Unix-Infrastructure hacking - Case study: Read It and WEP-Wireless hacking Application and data hacking - Case study: Session Riding.

TOTAL HOURS : 45

REFERENCES :

1. Stuart McClure, Joel Scambray, George Kurtz Hacking Exposed 7: Network Security Secrets & Solutions, Seventh Edition, McGraw Hill Professional 2012.
2. Kenneth C.Brancik “Insider Computer Fraud” Auerbach Publications Taylor & Francis Group– 2008.
3. Ankit Fadia “Ethical Hacking” second edition Macmillan India Ltd, 2006.
4. Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", 2nd Edition, 2011.

OUTCOMES :

Students to complete this course will be able to

- Analyze hacking attacks and protect data assets.
- Assess a variety of different types of security attacks.
- Classify LAN protection against a variety of different types of security attacks
- Apply the hacking techniques to secure the Applications
- Identify the legal and ethical issues surrounding cyber crime and forensics
- Categorize authentication mechanisms used to test and guard against the vulnerabilities

CSC 3233	INTRUSION DETECTION AND INTERNET SECURITY LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES :

- To study Intrusion Detection tools and techniques
- To apply knowledge on fundamentals and history of Intrusion Detection.
- To analyze intrusion detection alerts and logs to distinguish attack types from false alarms.
- To expose the students to various detection approaches.
- To gain knowledge mobile malware and avoidance strategies.
- To detect unauthorized personnel entry into a facility.

SOFTWARE REQUIRED : C/C++/JAVA

1. DoS and DDoS Attacks
2. Hashing, password cracking
3. Biometrics
4. Memory corruption exploits
5. Insider Attacks
6. Mobile malware, decompilation and analysis
7. Malware evasion strategies
8. Penetration testing, IDSs

P-30; TOTAL HOURS – 30

OUTCOMES :

Students who complete this course will be able to

- Detect network attacks and troubleshoot network problems.
- Apply knowledge of Malware evasion strategies and network protection.
- Identify the DoS and DDoS attacks to provide a solution for the given problem.
- Apply password cracking concepts to solve the complex problems.
- Demonstrate the security posture of an activity.
- Analyze the penetration testing and identify the appropriate solution for it.

CSC 3212 DISTRIBUTED COMPUTING

L	T	P	C
3	0	0	3

OBJECTIVES :

- To identify the fundamental principles to design basic distributed systems.
- To describe about the various distributed computing paradigms for Client-Server communication based on the application.
- To analyze the key issues related to communication across a distributed infrastructure and across multiple heterogeneous resources.
- Illustrate the principles of naming and coordinating distributed systems and evaluate the effectiveness and shortcomings of this solution.
- To interpret how various identify and apply design principles when consistency and replication is addressed in architecture.
- To recognize and analyze the failure detection algorithms for fault tolerance and how recovery from failure can be carried out.

MODULE I DISTRIBUTED COMPUTING ARCHITECTURE 08

Design goals-Types of distributed system-Architecture styles-Middleware organization-System architecture.

MODULE II PROCESSES 08

Threads-Virtualization-Clients-Servers-design issues-object servers-Code migration-Migration in heterogeneous systems.

MODULE III COMMUNICATIONS 08

Layered protocols-Types of communication-Remote procedure call-Message oriented communication-Multicast communication.

MODULE IV NAMING AND CO-ORDINATION 07

Flat naming-Structured Naming-Attribute-based naming-Clock synchronization-Logical clocks-Mutual Exclusion-Election Algorithms-Distributed event matching-Gossip based coordination.

MODULE V CONSISTENCY AND REPLICATION 07

Introduction-Data-Centric consistency models- Client-Centric consistency models-Replica management-Consistency protocols-Caching and replication in web.

MODULE VI FAULT TOLERANCE AND SECURITY 07

Failure Models-Process resilience-Reliable client-server communication-Reliable group communication-Distributed commit-Recovery-Security threats-Cryptography-Secure channel-Access control-Secure Naming-Security Management.

L – 45;
TOTAL HOURS-45

REFERENCES :

1. Andrew S Tanenbaum, Maartenvan Steen, "Distributed Systems – Principles and Paradigms", 2nd Edition, Pearson Education,ISBN=1543057381, 2017.
2. Pradeep K. Sinha, "Distributed Operating Systems - Concepts, Systems and Applications", 3rd Edition, Prentice Hall India, New Delhi, ISBN=8120313801,2008
3. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", 3rd Edition, Pearson Education, ISBN=0321263545,2009
4. A.D. Kshemkalyani, M. Singhal, "Distributed Computing: Principles, Algorithms and Systems", Paperback Edition, Cambridge University Press, ISBN=1139470310, 2011.

OUTCOMES :

Students who complete this course will be able to

- Recognize the design principles underlying the functioning of distributed systems.
- Design a distributed system and migrate process when required.
- Apply various communication algorithms and techniques to distributed system environment.
- Build distributed system environment using various naming strategies and coordination techniques based on application.
- Improve the performance and reliability of distributed programs analyzing various security factors.
- Describe and distinguish synchronization and concurrency control for a parallel or distributed computing system.

CSC 3234 ETHICAL HACKING LABORATORY

L	T	P	C
0	0	2	1

OBJECTIVES:

- To become familiar with security tools.
- To know the principles of methodologies framework tools
- To expand the skills of enhancing security.
- To get knowledge on various attacks and their detection
- To identify the Security in Evolving Technology
- To gain knowledge on how to build the security in websites

SOFTWARE REQUIRED:

Basic tools: NS2, Rootkits Burp suit tool, jcrypt tool

LIST OF EXPERIMENTS:

1. Setup a honey pot and monitor the honey pot on network.
2. Study of Packet sniffer tools like Wireshark, Ethereal, tepdump etc. Use the tools to do the following:
3. Create a social networking website login page using phishing techniques.
4. Write a script or code to demonstrate SQL injection attacks
5. Install rootkits and study variety of options
6. Study of Techniques uses for Web Based Password Capturing.
7. Implement Passive scanning, active scanning, session hijacking, cookies extraction using Burp suit tool
8. Mini Project

P – 30;,TOTAL HOURS: 30

OUTCOMES:

Students to complete this course will be able to

- Identify and Evaluate the modern tools.
- Analyze the packet capturing in network.
- Categorize the methodologies framework tools.
- Implement the Security in various web applications.
- Identify the use and availability of tools to support an ethical hack.
- Apply the knowledge of interpreting the results of a controlled attack.

SEMESTER VII

CSC 4102	**COMPILER DESIGN**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES :

- To outline the history and algorithms for compiler construction.
- To introduce high-level programming language implementation.
- To provide fundamental principles of compiler design.
- To have an in-depth knowledge of inner process of compiler.
- To understand the workings of and add to a language processor for each of the modern paradigms.
- To give knowledge on writing programs using compiler construction tools.

MODULE I INTRODUCTION 07

Introduction – A simple traditional modular compiler/interpreter – Structure of compiler –Compiler architecture – Properties of good compiler- History of Compiler Construction – Grammar- Closure algorithm.

MODULE II LEXICAL ANALYSIS 08

Reading the program text – Regular expressions and regular descriptions – Creating lexical analysis by hand and by automatically – Transition table compression – Error handing in lexical analyzers – Lexical identification of tokens – Macro processing and file inclusion.

MODULE III SYNTAX ANALYSIS 09

Two classes of parsing methods – Error detection and error recovery – Creating top down parser manually and automatically – LL(1) parsing – Creating bottom up parser automatically – SLR (1) parsing – LR(1) parsing – LALR (1) parsing – Recovering grammars from legacy code.

MODULE IV SEMANTIC ANALYSIS AND INTERMEDIATE CODE 06

Types and types checking – Storage management – Syntax directed translation – Intermediate code - Assemblers, Dissemblers, Linkers and Loaders.

MODULE V CODE GENERATION 08

Optimization techniques – Local Optimization and Basic blocks – Control and data flow - Code generation – Target machines – Register allocation – Stack management – Automatic Code generation construction.

MODULE VI COMPILER CONSTRUCTION TOOLS 07

Implementation issues – Cross compilation – Implementation languages – Compiler construction tools – Structure – Simple programs.

L – 45;TOTAL HOURS-45

REFERENCES :

1. Des Watson, “A Practical Approach to Compiler Construction”, Springer, 2nd Edition, ISBN: 3319527894, 9783319527895, 2017
2. Dick Grune, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs, Koen Langendoen, "Modern Compiler design", Springer Science & Business Media, 2012, 2nd Edition, ISBN : 1461446996, 9781461446996,2012.

OUTCOMES :

Students who complete this course will be able to

- Describe the fundamental steps for designing a compiler.
- Generate tokens for any programming syntax.
- Construct syntax tree and parse the input.
- Implement a translator for a programming language.
- Optimize the code using the techniques provided.
- Use compiler construction tools such as LEX/FLEX and YACC/BISON.

CSC 4103 CLOUD COMPUTING

L	T	P	C
3	0	2	4

OBJECTIVES :

- To lay the foundation on various types of cloud services, technologies and service providers.
- To comprehend the technical capabilities and business benefits of virtualization and cloud computing.
- To study the design challenges of cloud infrastructure.
- To have a knowledge on different programming models and cloud software.
- To elaborate on energy efficient, privacy and security issues in cloud environments.
- To study the fundamental concepts of cloud storage and demonstrate their use in storage systems.

MODULE I CLOUD FUNDAMENTALS 07

Scalable Computing Service over The Internet - Technologies for Network based Computing - System Models for Distributed and Cloud Computing - Introduction to Cloud Computing – Essential Characteristics - Benefits and challenges of cloud computing- Cloud Delivery Models - Deployment models -cloud computing vendors.

MODULE II VIRTUALIZATION 07

Implementation Levels of Virtualization - Virtualization Structures - Virtualization of CPU, Memory and I/O Devices - Virtual Clusters and Resource Management - Virtualization for Datacenter Automation.

MODULE III CLOUD INFRASTRUCTURE 08

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Implementation of resource scheduling algorithm using cloud simulation tool kits

MODULE IV PROGRAMMING MODEL 08

MapReduce programming model - MapReduce and extensions – Relational operations – Parallel Efficiency of Map Reduce- Cloud File Systems - MongoDB - Hadoop - Cloud platforms in Industry – Google App Engine - Cloud Software Environments -Eucalyptus

MODULE V ENERGY EFFICIENT CLOUD COMPUTING 08

Energy efficiency in clouds – Green Computing - Energy efficient cloud computing architecture – energy aware virtual machine placement in data centers -Energy aware dynamic resource allocation – case studies – Implementation of energy aware scheduling algorithm using open source cloud simulation tool kit.

MODULE VI CLOUD SECURITY AND APPLICATIONS 07

Cloud security fundamentals- Privacy and Security in cloud - Security Architecture – cloud applications – scientific applications – Healthcare – Geosciences – Social networking - media applications - Multiplayer online gaming.

L – 45; P – 30;TOTAL HOURS-75

REFERENCES :

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, — “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, ISBN : 9780123858801, 2012.
2. Rajkumar Buyya, Christian Vecchiola, S.ThamaraiSelvi, “Mastering Cloud Computing”, McGraw-Hill Education Private Ltd., ISBN : 9781259029950, 2013
3. Thomas Erl, Zaigham Mahmood, Ricardo Puttini, “Cloud Computing: Concepts, Technology & Architecture”, 1st Edition, Prentice Hall/ Pearson PTR, 2013.
4. Michael J. Kavis “Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)” 1st Edition, wiley, ISBN:9781118617618, 2014.

OUTCOMES :

Students who complete this course will be able to

- Demonstrate the different taxonomy of parallel and distributed computing.
- Articulate the main concepts, key technologies, strengths and limitations of Virtualization and Cloud computing
- Compare and contrast the delivery and deployment models of cloud computing
- Analyze the core issues of cloud computing such as energy efficiency, security, privacy and interoperability
- Recognize the cloud file systems and their applications in industry.
- Identify problems, explain, analyze, and evaluate various cloud computing solutions.

CSC 4132	CONTINGENCY PLANNING AND DISASTER RECOVERY	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To have a contingency plan that's mapped out your corporation's strategy to minimize the impact on the daily functions or life of the corporation.
- To give insights on business continuity management process.
- To get familiar with various risk assessments components and risk management process.
- To provide the information on development of mitigation strategies.
- To gain knowledge on the disaster prevention and recovery in computer systems.
- To give overview on testing, auditing and maintenance of continuity planning and disaster recovery.

MODULE I CONTINGENCY PLANNING 7

Contingency planning – Essentials of business continuity management – Need of plan – Business continuity plan outline – Types of disaster.

MODULE II BUSINESS CONTINUITY MANAGEMENT 8

Five step Business continuity cycle - Business Continuity Planning Process - Obtain Management Support - Assemble a Planning Team- Collect Data- Evaluate Operations- Determine Recovery Strategies - Create, Communicate, Test, and Regularly Update Your Written Plan-Insurance Coverage.

MODULE III RISK MANAGEMENT 7

Risk management basics – Risk management process – Threat assessment – Vulnerability assessment – Impact assessment – People, process, technology and infrastructure in risk management – IT specific risk management – Risk assessment components.

MODULE IV MITIGATION STRATEGY DEVELOPMENT 8

Business impact analysis – Risk Mitigation strategies – Risk mitigation process – Cost versus capability of recovery process – Developing risk mitigation strategy – IT risk mitigation – Backup and recovery considerations.

MODULE V DISASTER PREVENTION AND RECOVERY 8

Causes and Costs of IT Disasters - IT Disaster Prevention- Laptop and Cell Phone Protection - Network Security - Operating in the "Cloud" - Creating an IT Disaster Recovery Plan - Cyber Insurance.

MODULE VI TRAINING,TESTING AND AUDITING 7

Training for disaster recovery and business continuity - Testing principles – IT Disaster Recovery testing – Business recovery testing – Crisis management exercising – Maintenance – Performing IT Systems and Security audits.

TOTAL HOURS : 45

REFERENCES :

1 Jennifer H. Elder, Samuel F. Elder, ”Faster Disaster Recovery “,Wiley Publication, ISBN : 9781119570967,2019.

2 Jamie Watters, Janet Watters,” Disaster Recovery, Crisis Response, and Business Continuity”,Apress, ISBN: 9781430264071,2014.

3 Susan Snedaker, “Business Continuity and Disaster Recovery Planning for IT Professionals”, Elsevier Science,ISBN 9780080553726,2011.

OUTCOMES :

Students to complete this course will be able to

- Analyze the need of contingency plan in the corporation environment.
- Implement the five-step of business continuity plan process.
- Differentiate the various risk assessment components and risk management process.
- Apply the risk mitigation strategies for the corresponding disasters in the corporate.
- Identify the disaster prevention and recovery procedures under various circumstances.
- Apply training, testing and auditing the disaster recovery and business continuity.

CSC 4104 COMPILER LABORATORY

L	T	P	C
0	0	2	1

OBJECTIVES :

- To expose the working of various phases of compiler.
- To introduce various compiler construction tools.
- To illustrate tools to design lexical analyzer and produce a parser for a given grammar.
- To implement various methods for converting three address code to assembly level program.
- To introduce concept of code optimization of three address code for different programming statements.
- To generate assembly code for the input program.

SOFTWARE REQUIRED :

Basic tools :C/C++/JAVA, LEX/FLEX, YACC/BISON

Compiler construction tools based on the selection of projects.

LIST OF EXERCISES:

1. Design a lexical analyzer for a given High Level Language. Ignore redundant space, tabs and new lines.
2. Study of compiler construction tools.
3. Implement a lexical analyzer.
4. Design and implement Top-Down parsing techniques and Bottom up parsing techniques.
5. Implement a scientific calculator.
6. Generate abstract syntax tree and intermediate code for the given language.
7. Implement code optimization phase of the compiler.

P-30;TOTAL HOURS-30

OUTCOMES :

Students who complete this course will be able to

- Illustrate the working of compiler.
- Design lexical analyzer and generate tokens.
- Parse the string for the given grammar.
- Develop and implement the mathematical operations.
- Construct syntax tree and intermediate code.
- Implement various phases of complier through construction tools.

ELECTIVE LIST - SEMESTER IV

Programme Elective ##1

CSCX 201 MULTIMEDIA AND ANIMATION

L	T	P	C
3	0	0	3

OBJECTIVES :

- To introduce the various components of Multimedia.
- To expose the principles of animation and design for developing multimedia applications.
- To adapt professional workflows into the design process of animation industry.
- To effectively create and develop animated content for multimedia projects.
- To develop multimedia content for Hand held devices.
- To develop interactive and animated multimedia content.

MODULE I MULTIMEDIA 09

Introduction-Uses of Multimedia-Nyquist's Sampling Theorem-Visual Display Systems-Text-Type of Text- Font, Compression, File formats-Image-Data Representation-Acquisition—Image Processing-Grayscale and Color Processing-Image output on Monitors- Image output on Printers.

MODULE II GRAPHICS 08

Components of Graphic System-Transformations-Line and Circle Drawing Algorithm-Filling and Clipping Algorithms-2d modeling-3D Graphics-Transformations-3D Modeling-Quad Tree

MODULE III VIDEO BASICS FUNDAMENTALS 07

Animation Principles - Techniques - File Formats - Analog Video -Digital Video-Codecs - Format Converters - Shooting and Editing Videos

MODULE IV MULTIMEDIA REQUIREMENTS 07

Stages of Making Multimedia -Intangibles - Multimedia Hardware Requirements-Multimedia Software Requirements - Authoring Systems - Acquiring Content- Internet and Multimedia.

MODULE V MULTIMEDIA SKILLS 07

Multimedia Skills - Planning - Costing - Designing - Producing - Talent Acquisition - Delivery Mechanism.

MODULE VI MULTIMEDIA PROCESS AND TOOLS 07

Designing for World Wide Web- Designing for Handheld Devices- Macromedia Flash Introduction -Understanding the Interface - Drawing and Color Tools.

L – 45; TOTAL HOURS-45

REFERENCES :

1. Ranjan Parekh",”Principles of Multimedia”, Tata McGraw Hill, 2nd Edition, ISBN: 9780070588332, 2013.
2. Tay Vaughan, "Multimedia: Making It Work”, Tata McGraw Hill, 8th Edition, ISBN: 9780071748469, 2010 .
3. James Gonzalez, "Macromedia Flash Professional 8 Hands-On Training", Peachpit Press,2nd Edition, ISBN: 9780321293886, 2006.

OUTCOMES :

Students who complete this course will be able to

- Identify the basic components, basic hardware and software requirements for multimedia development and playback.
- Apply animation principles in Multimedia application development..
- Identify and describe the function of the general skill sets in the multimedia industry..
- Apply animated contents in any Multimedia projects.
- Design Multimedia content for handheld devices.
- Design and create animation using computerized animation tools.

CSCX 203 **DIGITAL TRANSMISSION** **L T P C**
3 0 0 3

OBJECTIVES :

- To introduce the fundamental components of digital transmission system.
- To provide knowledge about performance objectives the established for digital transmission system.
- To prepare mathematical background for communication signal analysis.
- To expose the working of different digital systems.
- To explore the importance of synchronization in digital transmission.
- To study the performance of digital communication systems.

MODULE I **BASIC TERMINOLOGIES** **07**

Principles of System Design – Analog to Digital Conversion Techniques – Pulse Code Modulation – Time Division Multiplexing.

MODULE II **BASEBAND TRANSMISSION** **08**

Baseband Transmission – Binary Coding – Power Spectral Density – Error Performance – Pulse Shaping and Inter Symbol Interference – Multilevel Baseband Transmission – Partial Response coding – Eye Patterns – Equalization – Data Scrambling Techniques Modulation Techniques.

MODULE III **DIGITAL TRANSMISSION** **09**

Digital Modulation Techniques – ASK- FSK – BPSK – Comparison – M-ary FSK – M-ary PSK – Quadrature Amplitude Modulation – Offset QPSK – Minimum Shift Keying – Quadrature Partial Response – Digital Transmission – Telephone Networks – FDM – Transmission Parameters – Conditioning – Voice Band Modems- Wideband Modems – Transmultiplexers – Hybrid Transmission Systems.

MODULE IV **DIGITAL SYSTEMS** **07**

Digital Cable Systems – Introduction – Characteristics – Regenerative Repeaters – Clock Recovery and Jitter – Crosstalk – Error Performance – Repeater Spacing – Implementation – Digital Radio Systems – Line of Path Propagation – Multipath Fading – Frequency Allocation – Interference Effects – Digital Radio Design – Radio Link Calculation.

MODULE V **NETWORK TIMING AND SYNCHRONIZATION** **07**

Time Standards – Frequency Sources – Clocks – Synchronization Techniques – Dissemination Systems: Time, Frequency – Synchronization Schemes – Transmission System – Testing Techniques.

MODULE VI MONITORING AND CONTROL 07

Performance Monitoring – Fault Isolation – Monitoring and Control System – Future of Digital Transmission – New Digital Services – Technology – Transmission in Local Areas – ISDN.

L – 45; TOTAL HOURS-45

REFERENCES :

1. David R.Smith, “Digital Transmission Systems”, Springer, 4th Edition, ISBN 978–1–4757-1187-5, 2013.
2. Simon S. Haykin, “Digital Communication Systems”, Wiley Publications, ISBN 978-0-471-64735-5, 2013.

OUTCOMES :

Students who complete this course will be able to

- Analyze the different components and their respective roles in communication systems.
- Design a digital system employing the common transmission technologies
- Apply the performance objectives on the designed digital systems.
- Compare and contrast the different technologies applied to digital transmission systems.
- Advice upon choosing appropriate testing strategies employed in signal transmission.
- Identify the practical issues that impact reliable communication in real world scenarios.

CSCX 204 INFORMATION TECHNOLOGY IN ORGANIZATION

L	T	P	C
3	0	0	3

OBJECTIVES :

- To describe the role of digital technology in the organizational context.
- To depict the management and flow of data through the digital networks.
- To expose the approachability and management of consumers in organizations.
- To be acquainted with the basics of support systems and enterprise systems in organizations.
- To familiarize the techniques involved in operational and strategic information systems.
- To examine the impacts of Information Technology on individuals, organization and society.

MODULE I DIGITAL TECHNOLOGY 07

Technology transformation-Business process management-Competitive advantage and SWOT analysis-Entrepreneurship technology trends-IT expertise-Data governance strategy-Enterprise IT architecture-Information and decision support systems-Data center and cloud computing-Cloud services delivery models.

MODULE II DATA MANAGEMENT AND DIGITAL NETWORKS 08

Database Management Systems-Big data and Analytics-Data and Text mining-Business Intelligence-Data Networks and API-Wireless and Mobile Infrastructure-Messaging and collaboration Technology-Sustainability and the triple bottom line.

MODULE III REACHING & MANAGING CONSUMERS 09

Search Technology-Organic search and search engine optimization-paid search strategies and metrics-Semantic web and search-recommendation engines-Social media strategies and communities-Social communities and engagement-Social monitoring, metrics and analytics-Social media failures-Retail, mobile and E-commerce.

MODULE IV SUPPORT SYSTEMS AND STRATEGIC ENTERPRISE SYSTEMS 07

Business challenges-Manufacturing, production and transportation management systems-Sales and marketing systems-Accounting and finance systems-Human resource systems and ethics-Enterprise systems-Enterprise social platforms-Enterprise resource planning systems-Supply chain management systems-Customer relationship management system.

MODULE V OPERATIONAL AND STRATEGIC INFORMATION SYSTEMS 07

Data visualization-Enterprise data mashups-Digital dashboards-Geographic information systems-IT strategies-IT business alignment-Balanced scorecard method-cloud and vendor strategies-project Management and SDLC.

MODULE VI IMPLEMENTING AND MANAGING IT 07

Information Technology for strategic advantage-Information Technology economy-acquiring IT applications and infrastructure-Managing information resources and security-impacts of Information Technology on individuals, organization and society.

L – 45;TOTAL HOURS-45

REFERENCES :

1. Turban, Volonino, Wood,"Information Technology for management", 10th edition, John Wiley and sons Inc., ISBN: 978-1-118-96126-1, 2016.
2. Turban, Leidnar, McLean and Weatherbe, "Information Technology for Management", 5th edition, John Wiley and sons Inc., ISBN: 0-471-705225, 2012.
3. James A O'Brien, George M Marakas, Ramesh Behl, "Management Information Systems", tenth edition, McGraw Hill Education, ISBN 13: 9780073376813, 2013.

OUTCOMES :

Students who complete this course will be able to

- Analyze the various digital technologies and sort out the appropriate one that suits for the IT organization.
- Implement the different techniques in data management and transmits data through digital networks.
- Examine the impact of the internet for enabling companies to become smarter and closer to the consumer.
- Realize the value of enterprise systems in providing a seamless flow of information within the organization.
- Differentiate between operational systems for transaction processing and Information Support Systems for decision-making, and their impact on setting IT priorities and the IT organization.
- Apply information technology in business environments, with consideration of the cultural context of the organizations.

CSCX 205 INNOVATION AND NEW PRODUCT DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES :

- To recognize the importance of innovation in organizational context.
- To identify the changing views of innovation over time and innovation management in organization.
- To explore the significance of discontinuous products.
- To restate the new product development process and strategic features of new product development.
- To appreciate strategic thinking and planning abilities throughout the early product design stage.
- To state various techniques for new product planning and market research.

MODULE I INTRODUCTION TO INNOVATION MANAGEMENT 07

The importance of innovation - the study of innovation- the need to view innovation in an organizational context-Entrepreneurship-Design-Innovation and invention-Different types of innovations - Technology and science -Popular views of innovation- Models of innovation-Innovation as a management process-Case study: European Innovation Scoreboard.

MODULE II MANAGING INNOVATION WITHIN FIRMS 07

Theories about organizations and innovation- The dilemma of innovation management- Managing uncertainty- Organizational characteristics that facilitate the innovation process- Industrial firms are different: a classification- Organizational structures and innovation-Individual's role in the innovation process-IT systems and their impact on innovation-Establishment and propagation of an innovative environment- Case study: Gore-Tex® and W.L. Gore & Associates: An innovative company and a contemporary culture .

MODULE III INNOVATION AND OPERATIONS MANAGEMENT 07

Operations management- The nature of design and innovation in the context of operations- Process design and innovation- Innovation in the management of the operations process- Design of the organization and its suppliers- Operations and technology- Case study: Novels- new products and Harry Potter.

MODULE IV MANAGING INTELLECTUAL PROPERTY 09

Intellectual property- An introduction to patents- Exclusions from patents-The patenting of life-Human genetic patenting-The configuration of a patent-Patent harmonization- famous patent cases-Patents in practice-Expiry of a patent and patent extensions- The use of patents in innovation management- Trademarks-Brand names-Using brands to protect intellectual property- Duration of registration-

infringement and passing off-Registered designs-Copyright-Remedy against infringement- Cast study: Pricing- patents and profits in the pharmaceutical industry.

MODULE V **TECHNOLOGY TRANSFER & NEW PRODUCT DEVELOPMENT** **08**

Introduction to technology transfer-Models of technology transfer-limitations and barriers to technology transfer-Internal organizational factors and inward technology transfer-Developing a receptive environment for technology transfer-Identifying external technology: the importance of scanning and networking-Managing the inward transfer of technology- Product and brand strategy- New product development- Packaging and product development.

MODULE VI **MARKET RESEARCH & NPD TEAM MANAGEMENT** **07**

Market research and new product development-The purpose of new product testing-Testing techniques-Influence of market research-Discontinuous new products-Market research and discontinuous new products-hindrance of market research-Technology-intensive products-convention and winning new markets-ignoring customers-balance between new technology and market research-The challenge for senior management- Managing the new product development team -Practical Steps to help Innovation and New Product Development.

L – 45;TOTAL HOURS-45

REFERENCES :

1. Paul Trott," Innovation Management and New Product Development", 5th edition, Pearson Education, ISBN-13: 9780273736561, 2012.
2 Crawford C.M.and Di Benedetto C.A.," New Products Management",11th edition, McGraw Hill Education, ISBN-13: 9780078029042, 2015.
3. Joe Tidd- John Bessant- "Managing Innovation: Integrating Technological-Market and Organizational Change", 4th edition, John Wiley & Sons Inc, ISBN 13: 9781118360637, 2013.

OUTCOMES :

Students who complete this course will be able to

- Realize the generation of product concepts that satisfy the needs of customers.
- Explore and analyze market needs and appreciate their direct relationship with new products.
- Discover new product opportunities based on the market research.
- Evaluate the financial, environmental, social and cultural considerations with regard to design decisions.
- Analyze the performance of the product based on the requirement.
- Evaluate the business value and impact of the design product in business class

CSCX 208 **USER INTERFACE DESIGN** **L T P C**
3 0 0 3

OBJECTIVES :

- To expose the relation between interaction design and user's expectations.
- To employ a set of usability engineering methods to refine a designed user-interface.
- To learn about human computer interaction with the help of interfaces that has high usability.
- To address a user-interface using suitable evaluation methodology.
- To demonstrates interaction design process.
- To acquire the concepts of usability, design principles, guidelines, heuristics and other fundamentals of Human-Computer Interaction.

MODULE I INTERACTION DESIGN 7

Introduction, Good and Poor design, Interaction design, User experience, Process of Interaction design, Interaction design and User experience. Understanding the problem space and conceptualizing interaction, Interaction paradigms

MODULE II DEVELOPMENT PROCESS 9

Managing design process – organizational design to support usability – Four phases of design – development methodologies – Ethnographical observation – Participatory design – scenario development. Develop System Menus and Navigation menus-Select the proper kinds of windows-Select the proper device based controls.

MODULE III PROTOTYPING AND CONSTRUCTION 8

Process of Interaction Design – Establishing Requirements – Design, Prototyping and Construction – Evaluation and Framework. Usability Heuristics – Simple and Natural Dialogue, Users' Language, Memory Load, Consistency, Feedback, Clearly Marked Exits, Shortcuts, Error Messages, Prevent Errors, Documentation, Heuristic Evaluation.

MODULE IV PLATFORM AND POSTURE 7

Designing Desktop Software ,Web sites, Web Applications, Internet-enabled Applications, Intranet – Other Platforms Handhelds, Kiosks, Television-based Interfaces, Automotive Interfaces, Appliances, Audible Interfaces

MODULE V MULTISCREEN UX DESIGN 7

Four Screens – Context of use – Strategies – Mobile First, Simultaneity, Social TV, Device Shifting, Complementarity, Synchronization, Screen Sharing, Coherence, Fluidity, Smart Content, Communification, Mashability, Gamification – Hybrid Media– Technical Challenges.

MODULE VI TOOLS FOR DESIGN AND ANALYTICS 7

Tools - UX Design – Responsive UI Design – Prototyping – Web Analytics – Case Study.

L – 45; TOTAL HOURS : 45

REFERENCES :

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, Niklas Elmqvist, and Nicholas Diakopoulos, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, 6th edition, Pearson Education Limited, 2018.
2. Marcin Treder, “UX Design for Startups”, UXPin , 2013
3. Wolfram Nagel, “Multiscreen UX Design Developing for a Multitude of Devices”, Elsevier Inc., 2013.
4. Jenifer Tidwell, “Designing Interfaces”, O’Reilly Media, Inc.,2010
5. Wilbert O. Galitz, “The Essential Guide to User Interface Design An Introduction to GUI Design Principles and Techniques” 3rd Edition, Wiley Publishing, Inc., 2007.
6. Alan Cooper, Robert Reimann, and Dave Cronin, “About Face 3 The Essentials of Interaction Design”, Wiley Publishing, Inc., 2007.
7. Jenny Preece, Yvonne Rogers, Helen Sharp, “Interaction Design beyond human-computer interaction”, John Wiley & Sons, Inc., 2002

OUTCOMES :

Students to complete this course will be able to

- Demonstrate knowledge about some interaction design patterns and their applicability.
- Select and execute an appropriate interaction design pattern for a particular user interface situation.
- Use several of the important concepts for interface design (i.e. color and typography) in their designs
- Analyze users’ needs, usability goals and user experience goals of a small-to-medium- sized software application.
- Develop and construct suitable user interface for a given scenario.
- Implement basic user interface prototypes based on the design process

CSC X209 STRESS MANAGEMENT L T P C
1 0 0 1

OBJECTIVES :

- To bring awareness on the existence of stress in day-today activities.
- To differentiate between obstacles and opportunities.
- To understand the process of confidence building.
- To discriminate the work life activities and instill work life balance.
- To analyze the causes of occupational stress.
- To enumerate the strategies for stress management at work place.

MODULE I STRESS AND TAMING STRESS 07

Stress to success, The 50% rule, Obstacles to opportunities, Strategies to reduce workload.

MODULE II SOLUTIONS FOR STRESS MANAGEMENT 08

Building confidence, Elimination of Anxiety, Self criticism to self confidence, Anger to a cool head, stop other people stressing you, Work life balance,

L - 15; TOTAL HOURS - 15

REFERENCES :

1. Sharon Melnick, “Success Under Stress: Powerful Tools for Staying Calm, Confident, and Productive When the Pressures On”, Amacom Publishers, ISBN-13: 978-0814432129, 2013.
2. D M Pestonjee, “Stress and Work: Perspectives on Understanding and Managing Stress”, SAGE Response publisher, First edition, ISBN-13: 978-8132110880, 2013.

OUTCOMES :

Students who complete this course will be able to

- Analyze and identify the stress issues in everyday activities.
- Recognize obstacles and opportunities and suggest strategies to utilize the opportunities.
- Create confidence building action plan.
- Assess work life activities and recommend strategies to inculcate work life balance.
- Enumerate the causes of occupational stress and prescribe plans to overcome them.
- Devise simple procedures and plans to minimize stress at work place.

CYBER SECURITY ELECTIVES

CSCX 206	FUNDAMENTALS OF COMPUTER FORENSICS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To inculcate the fundamentals of digital forensics from the viewpoint of courtroom legalities.
- To establish forensics concepts on networks and internet.
- To create digital forensics investigator role.
- To elaborate upon the evidence gathering over the internet.
- To gain the knowledge on digital investigations.
- To search the current techniques for forensic examinations.

MODULE I INTRODUCTION 9

Foundations of digital Forensics-Language of Computer Crime Investigation- Digital Evidence in the courtroom-Cybercrime law - Benefits of Professional Forensics Methodology

MODULE II DIGITAL INVESTIGATIONS 8

Conducting Digital investigations-Handling a Digital Crime Scene-Investigative reconstruction with Digital Evidence-Modus Operandi motive and technology

MODULE III CRIME AND DIGITAL EVIDENCE 8

Role of Computers in Violent Crime – Processing the digital Crime Scene-Investigative Reconstruction –Digital Evidence as Alibi – Investigating an Alibi – Time –Location as Alibi- Identifying and processing Digital evidence- Cyberstalking.

MODULE IV COMPUTER BASICS FOR DIGITAL INVESTIGATIONS 7

Basic Operation of Computers –Representation of Data-Storage Media and Data Hiding-File Systems and Location of Data – Dealing with Password Protection and Encryption –Applying Forensic Science to Computers – Preparation –Survey – Documentation-Preservation-Examination and Analysis-Reconstruction and Reporting.

MODULE V FORENSICS AND NETWORKS 7

Network basics for Digital Investigators-Network Technologies - Applying Forensic science to Networks- Digital Evidence on the internet- Evolution of 5G networks.

Module VI CASE STUDIES 6

Cyber stalking case example – Offenders on the internet –Case studies - Email Forgery and Tracking – Mobile network Forensics - Forensics Tools.

L – 45 – Total Hrs - 45

REFERENCES :

1. Eoghan Casey, “Digital Evidence and Computer Crime: Forensic Science, Computers and the Internet“, Published by Elsevier, 3rd Edition, ISBN: 9780123742681, 2011.
2. Keith John Jones, Richard Bejtlich, Curtis W. Rose, “Real Digital Forensics: Computer Security and Incident Response”, Addison Wesley Professional, 5th edition, ISBN: 9780321240699, 2008.
3. Terrence V. Lillard, Clint P. Garrison, “Digital Forensics for Network, Internet, and Cloud Computing: A Forensic evidence Guide for Moving Targets and Data”, Elsevier, 1st Edition, ISBN: 9781597495370, 2010.
4. John Sammons, “The Basics of Digital Forensics, The Primer for Getting Started in Digital Forensics”, 2nd Edition, Elsevier, ISBN: 9780128016350, 2014.

OUTCOMES :

Students who complete this course will be able to

- Recognize the role of digital forensics in the real world.
- Identify and extract digital evidence from varied networking layers.
- Apply forensics techniques for analyzing computer systems and networks.
- Assess digital evidence and practice forensic investigation.
- Describe the legalities, penalties, and punishment associated with cyber.
- Identify the current techniques and tools for forensic examinations.

CSCX 210	INFORMATION ETHICS	L	T	P	C
		1	0	0	1

OBJECTIVES :

- To expose the issues of morality and technology at the Internet age.
- To give an idea on the development of computer ethics.
- To provide an overview ethics for the IT professional.
- To highlight the importance of computer crimes.
- To understand information security policy management.
- To aware the crime prevention, detection and response in internet.

MODULE I OVERVIEW OF ETHICS 08

Definition of Ethics, Importance of ethics, the difference between Morals, Ethics and Laws – Ethics in the business world, fostering good business ethics Importance, Improving corporate ethics, Creating an ethical work environment, Ethical considerations in decision making – Ethics in information technology - IT professionals – IT users.

MODULE II COMPUTER AND INTERNET CRIME 07

IT security incidents: A major concern, Types of exploits, Types of perpetrators, Federal laws for prosecuting computer attacks – Implementing trustworthy computing, Risk assessment, Establishing a security policy, Educating employees and contract workers, Prevention, Detection and Response.

L - 15; TOTAL HOURS - 15

REFERENCES :

1. George W. Reynolds - “Ethics in Information Technology”, Fifth and Edition, Cengage Learning, ISBN: 1285197151, 2015.
2. Toni Samek and Lynette Shultz – “Information Ethics Globalization and Citizenship “McFarland & Company, ISBN: 9781476667720, 2017.

OUTCOMES :

Students who complete this course will be able to

- Identify the issues of morality and technology at the Internet age.
- Acquire the idea on the development of computer ethics.
- Illustrate the knowledge about the ethics of IT professional.
- Evaluate the security issues over internet.
- Identify security policy concerns in information management.
- Recognize the crime prevention, detection and response.

CSCX 401 OPEN SOURCE SOFTWARE AND OPEN STANDARDS

L	T	P	C
3	0	0	3

OBJECTIVES :

- To learn open source standards and its evolution.
- To gain knowledge on adoption of open standards.
- To explore on the various open source software.
- To expose the open source grid computing and clouds.
- To get familiar with open source communities and development process.
- To analyze various open source software and open standards through case studies.

MODULE I INTRODUCTION TO STANDARDS AND EVOLUTION 7

Introduction to Standards - Types of Standards - Open and Closed Standard - Evolution of Standards - Life Cycle - Importance of Standards and Benefits of Open Standards Standard Organizations .

MODULE II ADOPTION OF OPEN STANDARDS 8

Drivers for adoption - Network effects, Lower costs, Impending benefits - Adoption methods and Process - Degree of association, Methods, process - Examples of Open Standards adoption in the world.

MODULE III OPEN SOURCE SOFTWARE – I 7

History of Open Source Software, Initiation of Open Source project start - Open Source Software examples: The Origins, The GNU projects, The Operating System GNU/Linux, The Graphical User Interface KDE/GNOME, Apache Web Server, Application Software - Strengths and Advantages of Open Source Software - Network effects, Lower cost, Availability, Maintainability.

MODULE IV OPEN SOURCE SOFTWARE – II 8

Android – PHP Basics & Advanced – MySQL database – Python – PERL – Grid computing – Open source cloud.

MODULE V OPEN SOURCE COMMUNITIES AND DEVELOPMENT PROCESS 8

Open Source Initiative (OSI) - Open Source definition- Free Software foundation - Open source development process – Call for Contributions, MythBuster, Brook's law - Open Source Community - Apache Software Foundation (ASF).

MODULE VI CASE STUDIES 7

Mozilla – LINUX operating system - Transfer Account Procedure (TAP) - Open Document Format (ODF)

TOTAL HOURS : 45

REFERENCES :

1. M.N.Rao,"Fundaments of Open Source software",PHI Learning, ISBN : 9788120350120, 2014.
2. Brian Fitzgerald, Jay P. Kesan, Barbara Russo, Maha Shaikh, Giancarlo Succi,"Adopting Open source software",MIT Press, ISBN : 9780262297349,2011
3. Johan Söderberg," Hacking Capitalism", Taylor & Francis Publication , ISBN : 9781135916381,2015.

OUTCOMES :

Students to complete this course will be able to

- Trace the evolution of open source standards.
- Identifythe way to adopt open source standards in the world.
- Identify various open source software and analyze it.
- Narrate the structure of open source software languages.
- Access open source communities through the contribution.
- Analyze various case studies on open source software and open standards.

CSCX 402	TCP/IP	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce the current architecture and operation of the Internet.
- To explain the perspective of the various technologies and protocols that can be used to provide basic security services at the transport layer of the TCP/IP protocol stack.
- To give an insight into IPV4 and IPV6 addressing concepts
- To give an emphasis on the TCP congestion control algorithms and strategies used.
- To estimate security measures of the system and using the techniques detect or protect the security related issues.
- To obtain an in depth knowledge about the timers that governs TCP/IP

MODULE I INTRODUCTION 5

Architectural principles-The Architecture and Protocols of the TCP/IP Suite-Internet Address Architecture- Expressing IP Addresses- Basic IP Address Structure- SpecialUse Addresses- Allocation - Unicast Address Assignment-Attacks Involving IP Addresses-ARP-RARP.

MODULE II INTERNET PROTOCOL 9

IP Datagram–IP Package–IP forwarding and routing algorithms–computing paths–RIP–OSPF–ICMP–IGMP.

MODULE III TCP 8

TCP header- services– Connection establishment and termination – Interactive data flow – Bulk data flow – Flow control and Retransmission – TCP timers – Urgent Data processing – Congestion control – Extension headers.

MODULE IV IP SWITCHING AND TRAFFIC ENGINEERING 9

Switching technology– MPLS fundamentals – signaling protocols – LDP – IP traffic engineering – ECMP – SBR – Routing extensions for traffic engineering – Traffic engineering limitations and future developments.

MODULE V IPv6 8

IP security protocol–IPv6 addresses – Packet format–Multicast-Anycast–ICMPv6–Interoperation between IPv4 and IPv6-QoS –Auto configuration

MODULE VI TRANSPORT LAYER SECURITY 6

Introduction – protocol evolution – SSL Protocol – Record protocols -

Handshake protocol – Change cipher spec protocol – Alert protocol – Application Data Protocol – Traffic analysis of a SSL session - Security analysis

TOTAL HOURS : 45

REFERENCES :

1. Douglas E. Comer," Internetworking with TCP/IP Principles, Protocols, and Architecture"- 5th edition Volume-1, Prentice Hall-2006.
2. Adrian Farrel," The Internet and its Protocols- A Comparative approach" Morgan Kaufmann, 2004
3. Pete Loshin"IPv6 Theory, Protocol and Practice, 2nd edition", Morgon Kaufmann-December-2003.
4. W.Richard Stevens "TCP/IP Illustrated, The Protocols". Volume I, Pearson Education India 2003.

OUTCOMES :

Students to complete this course will be able to

- Evaluate and contrast the OSI reference model and TCP/IP model
- Investigate the latest trends in networking including IPV6.
- Categorize the characteristics of Internet routing protocols.
- Analyze the major networking protocols and select protocols based on the application.
- Assess the security services based on the security standards.
- Exhibit the working of TCP/IP using appropriate tools.

CSCX 403	SECURITY ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To identify and assess business risks associated with information and information technology.
- To understand how to communicate risk.
- To describe the key information security concerns of confidentiality, integrity, and availability.
- To identify and describe the features found in typical information systems architectures including networks, operating systems, and applications.
- To describe how security fits with architecture and systems development methodologies
- To identify and describe business analytics architecture.

MODULE I SECURITY ARCHITECTURE OF SYSTEMS 7

The “Security” in “Architecture” – Diagramming for Security Analysis – System Architecture diagrams and Protocol Interchange Flows – Applying principles and patterns to specific design.

MODULE II INFORMATION SECURITY RISK 7

Components of Risk – Business Impact –Risk Audience- Process Review – Architecture and Artifacts – Threat Enumeration – Attack Surfaces.

MODULE III ENTERPRISE ARCHITECTURE 8

Enterprise Architecture Pre-work:DigitalDiskus – Digital Diskus’ Threat Landscape – Conceptual Security Architecture- Enterprise Security Architecture imperatives and Requirements – Digital Diskus’ Component Architecture – Enterprise Architecture Requirements.

MODULE IV BUSINESS ANALYTICS 9

Business Analytics Architecture – Threats – Attack Surface Enumeration – Mitigations – Administrative Controls – Requirements.

MODULE V SECURE PROCESSOR ARCHITECTURE 9

Real-World Attacks: Coldboot, Rowhammer, Meltdown, Spectre– Architecture for Different Software Threats and Hardware threats- Limitations.

MODULE VI SECURITY VERIFICATION OF PROCESSOR ARCHITECTURE 8

Motivation for Formal Security Verification – Security Verification Approaches – Security Verification Assumption

L – 45;
TOTAL HOURS – 45;

REFERENCES :

. 1. Brook S.E.Schoenfield, “Secrets of a Cyber Security Architect”, CRC Press, 9th Edition, ISBN-13: 9781498741996, 2020.
2. JakubSzefer, “Principles of Secure Processor Architecture Design”, Morgan & Claypool Publishers,ISBN: 9781681730028,2018.
3. Brook S.E.Schoenfield forewords by John N.Stewart and James F.Ransome, “Securing Systems Applied Security Architecture and Threat Models”, CRC PRESS, ISBN -13: 9781482233988, 2015.
4. Charles P.Pfleeger,Shari Lawrence Pfleeger, DevenN.Shah Foreword by Willis H.Ware, “Security in Computing”, Pearson Education, Fourth Edition, ISBN 978-81-317-5869-4, 2016.

OUTCOMES :

Students who complete this course will be able to

- Analyze and evaluate the security needs of an organization
- Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
- Measure the performance and troubleshoot cyber security systems.
- Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.
- Identify risk management processes, risk treatment methods, and key risk and performance indicators.
- Analyze insecure programming patterns and know how to replace them with secure alternatives.

CSCX 404 **ROUTING AND SWITCHING** **L T P C**
3 0 0 3

OBJECTIVES :

- Design and implement effective and efficient IP addressing.
- To study Variable Length Subnet Mask (VLSM), Network Address Translation (NAT) and Dynamic Host Configuration Protocol (DHCP).
- Work out a basic configuration of an IP router connecting a local network to the Internet.
- Analyze, configure, implement, and verify access control lists within a router.
- Configure and evaluate the major characteristics of the most used routing protocols within an autonomous system.
- Administer a switch in switched Ethernet LAN with redundant cabling and possibly with functional groupings based on Virtual LANs.

MODULE I **ESSENCE OF NETWORKS** **5**

The OSI reference model for data communications - TCP/IP-architecture for the Internet - Application and transport layer protocols - Internet Protocol IP addressing and subnetting - Local Area Networks (LAN) and Ethernet technology.

MODULE II **ROUTING** **9**

Managing the router as a core internetworking device - Basic router configuration – Routing - Path Determination algorithms - Routing Protocol RIP as distance-vector routing protocol. IP addressing with variable subnet mask (VLSM) beside some addressing methods like Dynamic IP configuration (DHCP) address translation (NAT).

MODULE III **SWITCHING ESSENTIALS** **8**

Switching Basics - Managing the LAN switch as a networking device - basic switch configuration - Spanning Tree protocol (STP) - Virtual LANs and frame-tagging - Routing between VLANs - Securing network devices using packet filters and firewall by applying access control lists (ACL).

MODULE IV **SCALING NETWORKS** **9**

Troubleshooting routers and switches - resolve common issues with using single-area OSPF - multiarea OSPF - Enhanced Interior Gateway Routing Protocol (EIGRP) - STP in both IPv4 - IPv6 networks.

MODULE V ATM AND CELLULAR WIRELESS NETWORKS 8

Introduction - ATM Frames - ATM Connection - ATM Architecture - Service Categories - PNNI Routing - PNNI Interface - PNNI Hierarchy - Building the Network Topology - Peer Group Leader - Advertizing Topology - Setting up Connection - Routing in Cellular Wireless Networks - Introduction - Basics of Cellular Wireless Networks - Resource Allocation - Routing in GSM Networks - Challenges in Mobile Computing.

MODULE VI CONNECTING NETWORKS 6

Network monitoring - troubleshooting using syslog – SNMP - NetFlow - Borderless networks - data centers and virtualization.

TOTAL HOURS : 45

REFERENCES :

1. Comer D. E. "Internetworking with TCP/IP, Principles, Protocols and Architecture", 6th edition, Pearson Education.2013
2. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach", 7th Edition, Pearson Education,2017.
3. Sudip Misra, Sumit Goswami, “Network Routing: Fundamentals, Applications, and Emerging Technologies”, Wiley publication, ISBN: 978- 0-470-75006-3, 2017.

OUTCOMES :

Students to complete this course will be able to

- Assess the fundamentals of network routing protocol.
- Analyze the working of distance vector routing and link state routing protocol.
- Discuss various characteristics of Internet routing protocols.
- Classify the network topology of ATM and Cellular wireless networks.
- Identify the issues in existing routing protocol and mobile routing protocols.
- Gather knowledge on switching essentials

SEMESTER V

CSCX 123	SOUND EDITING AND PROCESSING	L	T	P	C
		2	0	2	3

OBJECTIVES :

- To gain knowledge about existing supporting technologies for sound and editing
- To learn about various speech and audio technologies
- To identify the basic concepts of digital audio and speech
- To gain knowledge about speech analysis and classification
- To gain of the scientific principles relevant to the generation and propagation of musical sound, including the functioning of musical instruments
- To recognize audio signal processing and Parameterization

MODULE I INTRODUCTION TO SOUND AND SPEECH 07

Basic audio-processing-Normalization-Continuous audio processing-Visualization-Sound generation-The human voice-characteristics of speech –types of speech

MODULE II BASIC AUDIO PROCESSING 08

Sound in MATLAB-Normalization-Continuous audio processing- Segmentation-Analysis window sizing-Visualization- Sound generation

MODULE III THE HUMAN VOICE 09

Speech production-Characteristics of speech-Types of speech-Speech understanding

MODULE IV THE HUMAN AUDITORY SYSTEM 07

Physical processes -Perception -Amplitude and frequency models

MODULE V PSYCHOACOUSTICS 07

Psychoacoustic processing-Auditory scene analysis -Psychoacoustic modeling -Hermansky-style model-MFCC model-Masking effect of speech

MODULE VI SPEECH COMMUNICATIONS 07

Quantization - Parameterization -Pitch models - Analysis-by-synthesis- Perceptual weighting

L – 30; P-30; TOTAL HOURS-60

REFERENCES :

1. Ian Vince McLoughlin "Speech and Audio Processing: A MATLAB-based Approach", Cambridge University Press, ISBN: 1107085462, 2016.
2. David Miles Huber , Robert E. Runstein"Modern Recording Techniques (Audio Engineering Society Presents) , Focal Press; 8 edition, ISBN-10: 0240821572, ISBN-13: 978-0240821573, 2013
3. Michael Talbot-Smith "Sound Engineering Explained", Focal Press; 2 edition, ISBN: 0240516672, 2012

OUTCOMES :

Students who complete this course will be able to

- Apply the basics of audio theory and musical acoustics to real world recording situations
- Proficiently operate and interpret specifications of audio recording and live sound equipment.
- Produce audio recordings by using digital audio workstations (Avid Pro Tools, Cockos, Reaper, etc.
- Run sound at live events. Show proficiency in music production techniques for genres such as Classical, Jazz and Rock
- Demonstrate basic video recording and editing skills to facilitate additional opportunities in the broader digital media field. Read and perform music at an intermediate level
- Write and speak effectively about music.

CSCX 124 COMPUTER VISION

L	T	P	C
3	0	0	3

OBJECTIVES :

- Describes the foundation of image mating, composting and editing
- Understand the camera parameters and calibration
- Grasp the principles of match moving and motion capture
- Develop the practical skills necessary to build computer vision applications.
- Provides knowledge on three dimensional data acquisition
- Showcase the different Methods of three dimensional Computer Vision

MODULE I INTRODUCTION AND IMAGE MATTING 08

Introduction – Computer Vision for Visual Effects – Matting Terminology – Blue-Screen, Green-Screen and Difference Matting – Bayesian Matting – Closed-Form Matting – Markov Random Fields for Matting – Random-Walk Methods – Poisson Matting – Hard-Segmentation-Based Matting – Video Matting – Matting Extensions

MODULE II IMAGE COMPOSITION AND EDITING ,FEATURES AND MATCHING 08

Compositing Hard-Edged Pieces – Poisson Image Editing – Graph-Cut Compositing – Image Inpainting –Image Retargeting and Recompositing - Video Recompositing, Inpainting, and Retargeting - Feature Detectors – Feature Descriptors – Evaluating Detectors and Descriptors – Color Detectors and Descriptors – Artificial Markers

MODULE III MATCHMOVING AND MOTION CAPTURE 08

Feature Tracking for Matchmoving – Camera Parameters and Image Formation – Single Camera Calibration- Extension of Matchmoving - Environment – Marker Acquisition and Cleanup – Forward Kinematics and Pose Parameterization – Inverse Kinematics – Motion Editing – Facial Motion Capture – Markless Motion Capture

MODULE IV THREE-DIMENSIONAL DATA ACQUISITION 07

Light Detection and Ranging (LiDAR) – Structured Light Scanning – Multi-View Stereo – Registering 3D Datasets

MODULE V METHODS OF 3D COMPUTER VISION 07

Triangulation-Based Approaches to Three Dimensional Scene Reconstruction – Three Dimensional Pose Estimation and Segmentation Methods

MODULE VI INTENSITY BASED AND POLARISATION BASED APPROACHES TO 3D SCENE RECONSTRUCTION 07

Intensity based and polarisation based approaches to 3d scene reconstruction - Shape from Shadow – Shape from Shading – Photometric Stereo – Shape from Polarisation – Point Spread Function Based Approaches to 3D Scene Reconstruction – The Point Spread Function – Reconstruction of Depth from Defocus –Reconstruction of Depth from Focus

L - 45;TOTAL HOURS - 45

REFERENCES :

1. Richard J Radke, “Computer Vision for Visual effects”, First Edition, Cambridge University Press, ISBN:978-0-521-76687-6, 2013.
2. Christian Wohler, “3D Computer Vision”, Second Edition, Springer – ISBN:9781-4471-4149-5 , 2013.
3. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, ISBN: 978-0-123-96549-3, 2012.
4. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer, ISBN: 978-1-84882-934-3, 2011.
5. Ethem Alpaydin, “Introduction to Machine Learning”, 3rd Edition, MIT Press, ISBN: 978-0-262-02818-9, 2014.
6. Amar Mitiche, J.K. Aggarwal,”Computer Vision Analysis of Image Motion by Variational Methods”, ISBN: 978-3-319-00711-3, 2013.
   Christian Woohler,”3D Computer Vision: Efficient Methods and Applications”, Second Edition, Springer, ISBN: 978-1-4471-4150-1, 2013

OUTCOMES :

Students who complete this course will be able to

- Familiar theoretical aspects of computing with images;
- Differentiate the mage, video Retargeting and Recompositing
- Analyze the camera parameters and form the image
- Gaining exposure to three dimensional data acquisition
- Construct 3D stereo and video images.
- Apply the 3D models in different applications

CSCX 126	SCRIPTING LANGUAGES	L	T	P	C
		2	0	2	3

OBJECTIVES :

- To study the basics in JavaScript programming.
- To recognize the object models and event handling in JavaScript.
- To practice embedded dynamic scripting on client side Internet Programming.
- To be familiar with the fundamentals of PHP.
- To expose the object oriented concepts and web security in PHP.
- To provide the knowledge and ability to write computer scripts using PHP, a server-side scripting language to web to interact with and dynamically generate HTML code.

MODULE I INTRODUCTION TO JAVASCRIPT 07

Introduction to JavaScript: adding JavaScript to XHTML documents-Usage considerations-History and uses of java script- Core language features: Variables- basic data types-Composite types: objects, arrays, functions-Expressions-flow control-Loops.

MODULE II OBJECT MODELS AND EVENT HANDLING 07

JavaScript regular expressions: RegExp object-String methods for Regular expressions-Advanced regular expressions-Limitations-Object model-Document object-simple event handling-Standard document object model-Event Handling.

MODULE III APPLIED JAVASCRIPT 07

Windows, frames, overlays-Form handling-User interface elements-Ajax and remote JavaScript-Browser management-Media management-Trends and practices-writing quality code-Security-Security policy-Performance.

MODULE IV FUNDAMENTALS OF PHP 09

Introduction-simple PHP program-Converting between data types-Arithmetic operators-Initializing and manipulating arrays-String comparisons-String processing with regular expressions-Reusing code and writing functions.

MODULE V OBJECT ORIENTED PHP AND WEB APPLICATION SECURITY 08

Object Oriented PHP-Error and exception handling-Form processing and business logic-Reading from a database-Cookies-Dynamic content-Web application security risks-Building a secure web application-Implementing authentication methods with PHP.

MODULE VI ADVANCED PHP TECHNIQUES 07

Interacting with file system and server-network and protocol functions-Managing date and time-Internationalization and localization-Generating images-Session control-Integrating java script and PHP.

L – 30 ; P-30; TOTAL HOURS-60

REFERENCES :

1. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, McGraw Hill Education, ISBN: 978-0-07-174120-0, 2013.
2. Harvey Deitel, Paul Deitel, Abbey Deitel,”Internet and World Wide Web How To Program”, fifth edition, Pearson Education, ISBN: 13:978-0-273-76402-1, 2012.
3. David Flanagan, “JavaScript: The Definitive Guide”, Sixth Edition, O'Reilly Media, ISBN: 978-0-596-80552-4, 2012.
4. Luke Welling, Laura Thomson,” PHP and MySQL Web Development”, fifth edition, Addison Wesley, ISBN: ISBN 13: 9780321833891, 2016.

OUTCOMES :

Students who complete this course will be able to

- Implement basic JavaScript programs with simple and composite data types.
- Write simple JavaScript code to automate system administration tasks and rapidly develop simple applications using object models and event handling mechanisms.
- Design Client side validation using JavaScript.
- Create patterns and evaluate it using PHP script.
- Implement the authentication methods to enable security for the web application.
- Develop a code that integrates JavaScript with PHP Script.

CSCX 132 **QUEUING THEORY** **L T P C**
3 0 0 3

OBJECTIVES :

- To develop the modeling and mathematical skills for network design.
- Analytically determine computer systems and communication network performance.
- To read and understand the current performance analysis and queuing theory literature upon completion of the course.
- Elaborate strengths and weaknesses of Queuing Models.
- Impart knowledge of Queuing models and its applications to enable them to apply them for solving real world problems.
- To expose the students for modeling practical, present and future telecommunications traffic and networking applications.

MODULE I INTRODUCTION 07

Basic System Elements - Problems in a Queuing System - Probability Distributions as Models - Identification of Models - Distribution Selection - Basic Concepts in Stochastic Processes.

MODULE II MARKOVIAN QUEUING SYSTEMS 07

A General Birth and Death Queuing Model - The Queue M/M/1 - The Queue M/M/s - The Finite Queue M/M/s/K - The Infinite Server Queue M/M/∞ - Finite Source Queues - Other Models - Imbedded Markov Chains - The Queue M/G/1 - The Queue G/M/1 - Extended Markov and Renewal Models.

MODULE III QUEUING NETWORKS 07

The Markovian Node Network - Queues with Blocking - Open Jackson Networks - Closed Jackson Networks - Cyclic Queues - Matrix-Analytic Queuing Models - Phase Type Distributions - Markovian Arrival Process - Analysis of Queuing Models Using MAM – The Queue G/G/1 and Approximations - Bounds for Mean Waiting Time - Little's Law $L = \lambda W$ – Approximations.

MODULE IV STATISTICAL INFERENCE 08

Birth and Death Process Models - Imbedded Markov Chain Models for M/G/1 and G/M/1 - The Queue G/G/ 1.

MODULE V METHODS OF ESTIMATION 08

Tests of Hypotheses - Control of Traffic Intensity in M/G/1 and G/M/1 - Decision Problems in Queuing Theory - Performance Measures - Design Problems in Decision-Making - Control Problems in Decision-Making.

MODULE VI COMPUTER AND COMMUNICATION SYSTEMS 08

Modeling Computer Systems - Modeling Communication Systems - Modeling and Analysis using Computational Tools - Simulating Queuing Systems - Using MATLAB - Other Tools for Simulating and Analyzing.

L – 45; TOTAL HOURS - 45

REFERENCES :

1. "An Introduction to queuing theory modeling and analysis in applications", Bhat, U. Narayan, 2015, ISBN: 978-0-8176-8420-4.
2. "Fundamentals of Queueing Theory", Donald Gross, John F. Shortle, James M. Thompson, Carl M. Harris, 2008,4th Edition, ISBN: 978-0-471-79127-0.
3. Queueing Theory for Telecommunications, AttahiruSule Alfa, Springer US, 2010, 978-1-4419-7313-9.

OUTCOMES :

Students who complete this course will be able to

- Define and explain basic concepts in descriptive statistics and probability theory.
- Solve some standard problems that include Queuing systems.
- Define and explain basic concepts in the theory Markov processes, M/M/m, M/M/m/K and M/M/m/K/C queuing systems.
- Derive and apply main formulas for some properties (such as stationary probabilities, average waiting and system time, expected number of customers in the queue, etc.) of M/M/m, M/M/m/K and M/M/m/K/C queuing systems.
- To estimate the traffic intensity, blocked traffic and the utilization of some queueing systems.
- Analyze and solve problems using computer aid (Maple, Matlab or Mathematica).

CSCX 134 DESIGN OF COMPUTER NETWORK SERVICES

L	T	P	C
3	0	0	3

OBJECTIVES :

- To expose multimedia services with real-time and non real-time components delivered over the Internet.
- To gain knowledge about various QoS and QoE measures for audio and video streams.
- To illustrate the protocols for SIP and IMS for setting up multimedia services.
- To study the various architectures and protocols to provide QoS guarantees in the IP network.
- To identify the parameters influencing the control functions.
- To provide an overview on the various models for capacity planning.

MODULE I BASICS OF NETWORK SERVICES 06

Network services basics - Process-Services: Definition, Characteristics and Frameworks-IT infrastructure Library-Process Modeling - Process design patterns - Example using BPMN

MODULE II QUALITY OF SERVICE AND QUALITY OF EXPERIENCE 08

QoS measures- Subjective evaluation of voice and video quality- Objective evaluation of audio and video quality - Session initiation protocol(SIP) - Format of a SIP message- SIP response messages - SIP methods-Session description protocol - Examples of SIP messages - Locating SIP servers

MODULE III IP MULTIMEDIA SUBSYSTEM 09

IMS entities and functionalities - User identification - Setting up a session in IMS -Service provision - Setting up an emergency IMS session - SIP compression - Networking Services over IMS - Multimedia Service Continuity-VPN

MODULE IV QOS ARCHITECTURES IN THE TRANSPORT NETWORK 06

Connection-oriented networks - MPLS architecture - DiffServ architecture - MPLS support for DiffServ - Label distribution protocol - Resource reservation protocol- The resource reservation protocol-traffic engineering (RSVP-TE)

MODULE V CONTROL FUNCTIONS 09

Traffic characterization - Congestion control - QoS and Bandwidth requirements - The resource and admission control functions - MPLs virtual private networks - VPN models - pseudowires – Ethernet pseudowires –Virtual private LANservice.

MODULE VI CAPACITY PLANNING 07

Measuring the response time of Solr - Performance modeling - Some basic concepts of Queuing models - Simulation Project.

L – 45;TOTAL HOURS-45

REFERENCES :

1. Harry Perros, Networking Services QoS, Signaling, Processes, Createspace Independent Publications, ISBN: 1495437485, 978-1-49-543748-9, 2014.
2. Peterson, Larry L., and Bruce S. Davie, Computer networks: a systems approach, Elsevier, ISBN:978-0-12-374013-7, 2012.
3. Jin, Cheng, Jamin Sugih, Danny Raz, and Yuval Shavitt, Building scalable network services: theory and practice, Springer Science & Business Media, ISBN: 978-1-44-198897-3, 2011.

OUTCOMES :

Students who complete this course will be able to

- Identify the attributes that impact the network services.
- Assess the QoS and QoE measures of audio and video streams.
- Summarize the functionalities of IP multimedia subsystem.
- Compare the different Qos architecture along with their protocols.
- Analyze the control functions with the underlying transport network and assess Qos of a multimedia session.
- Design capacity planning models for real time scenarios.

CSCX 139 **C# .NET** **L T P C**
2 0 0 2

OBJECTIVES :

- To learn the .NET Architecture
- To explain the strings, collections and exceptions.
- To learn the object oriented concepts and the application
- To acquire the knowledge of windows applications.
- To describe the Server side programming with ADO.NET data Access.
- To explain the Simple Object Access Protocol (SOAP) and ASP.NET Web Services.

MODULE I INTRODUCTION TO C# 10

.NET Architecture - Core C# -Objective and Types – Arrays - Operators and Casts – Strings – Collections - Errors and Exception.

MODULE II OBJECT ORIENTED ASPECTS OF C# 10

Classes - Objects-Inheritance - Polymorphism-Interfaces – Operator Overloading – Delegates – Events- Building Windows Applications - Accessing Data with ADO.NET.

MODULE III .NET FRAMEWORK 10

Understanding Server Object Types - Specifying a server with an Interface - Building a server, Building the Client - Using Single Call -Threads - Develop ASP.NET Web Services - Web Services (SOAP).

L-30;TOTAL HOURS- 30

REFERENCES :

1. Christian Nagel,Bill Evjen,Jay Glynn,"Professional C# 2012 and .NET 4.5",2nd Edition,ISBN:978-1-118-31442-5,2013.
2. E.Balagurusamy , "Programming in C#", Pearson Education, 7th Edition, ISBN: 978813170205, 2002.
3. J. Liberty, "Prgramming in C#", O'Reilly", 2nd Edition, ISBN: 0-596-00309-9, 2002.

OUTCOMES :

Students who complete this course will be able to

- Develop and deploy the concepts of object oriented programming.
- Utilize the .NET framework to build distributed enterprise applications.

- Develop the experiment with the deployment of windows applications.
- Develop the ASP.NET Web Services and threads.
- Develop network applications using Web Services (SOAP).
- Build the client and server side programming using single call.

CSCX 115	INTERNET OF THINGS	L	T	P	C
		2	0	0	2

OBJECTIVES :

- Comprehend the design concepts and principles of IoT
- Understand the role of electronics and embedded computing in IoT
- Interpret the limitations and opportunities of wireless and mobile networks for Internet of Things
- Attain exposure to varied software and hardware platforms for realization of IoT
- Determine applications of IoT in various fields
- Analyze trade-offs in interconnected wireless embedded sensor networks or IoT

MODULE I IoT FUNDAMENTALS AND APPLICATIONS 10

Definitions – IoT communications Model – Device to Device communications- Device to Cloud communications – Device to Gateway Model – Back-End Data Sharing Model- Issues in ToT - Technological Aspects - Design Principles of Connected Devices – IPv6 concepts – IPV6 packet – IPV6 addressing- Addressing and Protocols relevant to IoT – Applications - Smart Cities and Environments – Smart Metering – Applications in Security – Healthcare – Retail – Industrial Control –Smart Farming and Agriculture.

MODULE II IoT PROTOTYPING CONCEPTS AND PHYSICAL DESIGN 10

Prototyping and Production – Open Source vs Closed Source – Electronics and Embedded Computing Fundamentals : Sensors - Actuators - Microcontrollers – System on Chips – Platform considerations- Physical Design - Sketch- Iterate-Explore – Non-Digital Methods- Laser Cutting – 3D Printing – CNC Milling – Repurposing and Recycling.

MODULE III IoT TECHNOLOGY PLATFORMS AND SOFTWARE DESIGN PRINCIPLES 10

Raspberry Pi – Raspbian - Arduino – Case Studies: Healthcare, Smart Cities, Analytics- IoT Connectivity Considerations – IoT and Cloud Access - REST – MQTT – CoAP – XMPP IOT.

L – 30;TOTAL HOURS-30

REFERENCES :

1. Adrian McEwen and Hakim Cassimally , “Designing the Internet of Things”, Wiley, ISBN-13: 978-1118430620, 2013.
2. Cuno Pfister, "Getting Started with the Internet of Things”,1st Edition, Shroff, ISBN-

13: 978-1449393571,O'REILLY, 2011.

3. Donlad Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", McGraw-Hill Education - Europe, ISBN10 0071835202, 2015

OUTCOMES :

Students who complete this course will be able to

- Describe the IoT concepts and design principles in detail.
- Analyze the different devices, components, antenna and standards are available in IoT.
- Explore the design of simple IoT devices for different application domains
- Compare and choose appropriate software and hardware platform for realization of IoT devices
- Apply the IoT concepts in real time applications using the IoT devices
- Identify the security issues faced by IoT in various areas.

CSCX 116	COGNITIVE SCIENCE	L	T	P	C
		2	0	0	2

OBJECTIVES :

- Introduce the domain of cognitive science
- Present the different methods of representation of thought
- Outline mind as an information processor
- Categorize the models of attention
- Expose case studies in mind representation
- Relate language with cognitive science

MODULE I MIND AND PHILOSOPHY 09

Definition – Representation types – Computation – Tri-level hypothesis – Classical and connectionist views of computation – Various Approaches to Cognitive science - Reasoning - Philosophy – Mind body problem – Knowledge acquisition problem

MODULE II VISION AND ATTENTION 09

Mind as an Information Processor -Modularity of Mind - Theories of Vision and Pattern Recognition - Feature Detection Theory - Theories of Attention - Models of Attention

MODULE III MIND, LANGUAGE AND COGNITION SCIENCE 12

The Network Perspective - Semantic Networks: Meaning in the Web - Overall Evaluation of the Network Approach - The Linguistic Approach: The Importance of Language - Nature of Language - Language Use in Primates - Language Acquisition - Philosophy and Linguistics: The Linguistic - Neuroscience and Linguistics - Artificial Intelligence and Linguistics.

L – 30;TOTAL HOURS-30

REFERENCES :

1. Jay Friedenberg and Gordon Silverman, “Cognitive Science: An Introduction to the study of the Mind”, Sage Publishers, Third Edition - ISBN-13: 978-1483347417, October 2015.
2. Bernard J. Baars and Nicole M. Gage, Cognition, Brain, And Consciousness Introduction to Cognitive Neuroscience, Second Edition, Elsevier Publication, 2010, ISBN :978-0-12-375070-9.

OUTCOMES :

Students who complete this course will be able to

- Define cognitive science and relate its various disciplines
- Illustrate thinking as a computational problem
- Model the way mind works as an information processor
- Demonstrate the theories and models of attention
- Illustrate the way in which knowledge is represented
- Showcase the evolution of language in humans and describe how artificial intelligence approaches can work

CSCX 114 **THEORY OF COMPUTATION** **L T P C**
3 0 0 3

OBJECTIVES :

- Identify the type of problems that can be solved using computation
- Describe the models through which computation can be expressed.
- Enhance students' ability to conduct mathematical proofs for computation.
- Demonstrate the key notions, such as algorithm, computability, decidability, and complexity through problem solving.
- Describe the challenges of theoretical computer science and its contribution to other sciences.
- Exemplify the features of a turing machine and identify its suitability for the given task.

MODULE I INTRODUCTION 07

Why study Automata Theory- Introduction to Formal Proof - Additional Forms of Proof Inductive Proofs- The Central Concepts of Automata Theory

MODULE II REGULAR EXPRESSIONS 09

An Informal Picture of Finite Automata- Deterministic Finite Automata-Nondeterministic - Finite Automata- Finite Automata With Epsilon Transitions-Equivalence and Minimization of Automata.

MODULE III REGULAR EXPRESSIONS 08

Regular Expressions- Finite Automata and Regular Expressions-Pumping Lemma of regular languages- Properties of regular languages.

MODULE IV CONTEXT-FREE GRAMMARS AND LANGUAGES 08

Context-Free Grammars- Parse Trees- Ambiguity in Grammars and Languages- Normal - Forms of Context Free Grammars- Pumping Lemma of Context Free Languages.

MODULE V PUSH DOWN AUTOMATA 07

Definition of the Pushdown Automaton - The Languages of a PDA Equivalence of PDA's and CFG's- Deterministic Pushdown Automata

MODULE VI TURING MACHINES 06

The Turing Machine- Programming Techniques for Turing Machines- Extensions to the Basic Turing Machine- Turing Machines and Computers.

L – 45;TOTAL HOURS-45

REFERENCES :

1. John Hopcroft, Rajeev Motwani & Jeffry Ullman "Introduction to Automata Theory, Languages & Computation", 3rd Edition, Pearson Education, 2012, ISBN : 978-0201029888.
2. John C Martin, "Introduction to Languages and Automata Theory", 3rd Reprint Edition, Tata McGraw-Hill, 2008. ISBN: 978-1118014783.
3. Michael Sipser, "Introduction to the Theory of Computation", 3rd Edition, PWS Publishing Company, 2013. ISBN: 978-1133187790.

OUTCOMES :

Students who complete this course will be able to

- Apply mathematical proof to real time computation problem.
- Solve simple problems in RE's, DFA's, NFA's, Turing machines and Grammars.
- Prove/disprove the basic results of the Theory of Computation.
- Describe the Grammars of Context Free Languages.
- Analyze the core concepts relating to the theory of computation and computational models including (but not limited to) decidability and intractability.
- Knowledge of recent technologies to enable them to face the world.

CSCX 133 NETWORK TROUBLESHOOTING TOOLS

L	T	P	C
1	0	0	1

OBJECTIVES :

- Give an in-depth training on Wireshark and TCP/IP communications analysis.
- Use Wireshark to identify the most common causes of performance problems in TCP/IP communications.
- Develop a thorough understanding of how to use Wireshark efficiently to spot the primary sources of network performance problems
- To be able to provide effective packet analysis.

MODULE I NETWORK ANALYSIS 06

Introduction to Network Analysis and Wireshark - Capture Methods and Capture Filters - Customize for Efficiency: Global Preferences Configuration – Quick Navigation and Colouring Techniques - Network and Application Issues with Time Values and Summaries - Creation and Interpretation of Basic Trace File Statistics - Traffic Analysis Using Display Filters.

MODULE II TRAFFIC ANALYSIS 09

TCP/IP Communications and Resolutions Overview - DNS Traffic Analysis - ARP Traffic Analysis - IPv4 Traffic Analysis - ICMP Traffic Analysis - UDP Traffic Analysis - TCP Protocol Analysis - Graph Traffic Characteristics Analysis - HTTP Traffic Analysis - TLS-Encrypted Traffic (HTTPS) Analysis.

Lab Exercises:

- Capture Traffic to/from the Hardware Address
- Create a Troubleshooting Profile & Set Basic Preferences for Your Troubleshooting Profile
- Find, Mark, Save, and Colorize Packets, Detect and Colorize High Latency Indications
- Find the Top Talkers and Protocols/Applications on a Network
- Create and Use an IO Graph to Spot Performance Issues
- Locate a Text String in a Trace File
- Create a Coloring Rule to Detect DNS Error Responses and Suspicious DNS Responses
- Analyze a Network Problem Indicated by ARP
- Filter on a Range of IPv4 Addresses
- Detect Suspicious Traffic with a New ICMP Coloring Rule
- Analyze UDP-Based Multicast Streams and Queuing Delays
- Use an IO Graph to Locate TCP Performance Issues

- Determine the Cause of Slow File Downloads
- Use TCP Graphs to Detect the Cause of Performance Problems
- Create a Filter Expression Button to Detect HTTP Error Responses
- Export an HTTP Object
- Decrypt HTTPS Communications

L-15; TOTAL HOURS-15

REFERENCES :

1. Anish Nath, " Packet Analysis with Wireshark",Packt Publishing, 1st Edition, 2015.
2 Laura Chappell , "Wireshark Network Analysis: the Official Wireshark Certified Network Analyst™ Study Guide", 2nd Edition, Protocol Analysis Institute, Inc, dba Chappell University, 1-893939-94-4, 2015.
3. https://www.wireshark.org/docs/

OUTCOMES :

Students who complete this course will be able to

- Troubleshoot and optimize TCP/IP networks
- Analyze the network traffic with Wireshark
- Detect Suspicious Traffic in the network
- Detect and report the causes of performance problems

CSCX 138 **STATISTICS AND ANALYTICS USING R PROGRAMMING**

L	T	P	C
2	0	2	3

OBJECTIVES :

- To teach basic of R programming.
- To express the sample data visually using charts, graphs and plots.
- To diagnose the research problem and set the objectives.
- To emphasise the need for confidence intervals and estimation of error rates.
- To evolve the statistical inference and summarize the inferences.
- To develop regression models and evaluate the findings

MODULE I BASIC CONCEPTS 08

Introduction to R, Variables and the Case Format, Central Tendency and Variability, Descriptive Statistics, Data acquisition and inspection, PDFs and CDFs, Using the Normal Model.

MODULE II CHARTS, GRAPHS, AND PLOTS 08

Bar Charts, Histograms, Segmented Bar Charts, Box Plots, Comparative Box Plots, Pie and Waffle Charts, Pareto Charts. QQ Plots and Tests for Normality, Scatterplots, Contingency Tables

MODULE III FOUNDATIONS FOR RESEARCH 08

Randomness and Sampling Strategies, Experiments vs. Observational Studies, R's 12 Steps, The Art of Developing Research Questions, Power Analysis to Determine Sample Size, Sampling Distributions and The Central Limit Theorem, P-Values, Confidence Intervals and Controversy.

MODULE IV CONFIDENCE INTERVALS AND STANDARD ERROR 07

One Mean, Two Means, Paired Means, One Proportion, Two Proportions, One Variance, Two Variances, Regression Slope and Intercept.

MODULE V STATISTICAL INFERENCE 07

One Sample t-test, Two Sample t-test (Equal Variance), Two Sample t-test (Unequal Variance), Paired t-test, One Proportion z-test & Binomial Test, Two Proportion z-test, Chi-square Test of Independence, Chi-square Test for One Variance, F Test for Homogeneity of (Two) Variances, One-way Analysis of Variance (ANOVA)

MODULE VI REGRESSION AND INFERENCES ON REGRESSION 07

Simple Linear Regression, Multiple Regression, Hypothesis Tests of Regression Coefficients, Real time case study and inference presentation.

L – 30; P – 30;TOTAL HOURS - 60

REFERENCES :

1. Nicole M. Radziwill, “Statistics (The Easier Way) with R: an Informal Text on Applied Statistics”, Lapis Lucera Publishers, ISBN-13: 978-0692339428, 2015.
2. John M. Quick, “Statistical Analysis with R – Beginner’s Guide”, Packt Publishing, ISBN: 9781849512084, 2010.
3. Richard Cotton, “Learning R”, O'Reilly Publications, First edition, ISBN-13: 978-9351102861, 2013.

OUTCOMES :

Students who complete this course will be able to

- Acquire the basics of R programming and apply it for statistical problem solving
- Study the given samples set and express using visual tools like charts, graphs and plots.
- Formulate the research problem and set the objectives
- Distinguish between the confidence error intervals and estimate the error rate.
- Apply Statistical inferences and propose actions based on the findings.
- Analyse a given real time scenario, apply regression and interpret the results.

CSCX 109 **NETWORK MANAGEMENT** **L T P C**
2 0 0 2

OBJECTIVES :

- To acquire knowledge on networking and networking technologies.
- To explore difference between SNMP V1,V2 and V3.
- To study about Remote monitoring and its application.
- To discuss the basic terminologies and application of telecommunication management system.
- To expose the application of network management .
- To examine the importance of broadband Networks..

MODULE I BASIC TERMINOLOGIES 07

Network Management Goals, organization and Functions, Network Management Architecture and organization, Network Management Perspective, NMS platform, Current Status and future of Network Management.

MODULE II SIMPLE NETWROK MANAGEMENT PROTOCOL V1,V2,V3 12

SNMP V1 Network Management, Basic Foundation Standards, Models and languages, Organization and information Models, Communication and functional Models.
SNMP V2 - Changes , System Architecture, Structure of Management Information, MIB, Protocol, Compatibility. SNMP V3 – Key Features, Architecture, Application, MIB, Security.

MODULE III REMOTE MONITORING 05

RMON SBI MIB, RMON1, RMON2, ATM ROM, Case Study.

MODULE IV TELECOMMUNICATION MANAGEMENT 05

TMN conceptual Model, Standards, Architecture, Management Service Architecture, integrated View, Implementation

MODULE V NETWORK MANAGEMENT APPLICATION 08

Network Management Application –Configuration Management, Fault Management, Performance Management, Event Correlation techniques, Security Management.

MODULE VI BROADBAND NETWORKS MANAGEMENT 08

ATM Technology, ATM Network Management, Wireless Access Network, Basic Principles, Fixed Broadband Wireless access networks, Mobile Wireless Networks, Satellite Networks,

Broadband Home Networks.

L – 30;TOTAL HOURS-30

REFERENCES :

1. Mani Subramanian “Network Management : Principles and Practice Pearson Edition “2nd edition, ISBN : 978-8131734049, 2010.
2. Adrian Farrel ,”Network Management –Know it all”, Morgan Kaufmann Publishers, 1st Edition ISBN : 9780080923420, 2008.

OUTCOMES :

Students who complete this course will be able to

- Acquire the knowledge about the basic terminologies of network management.
- Illustrate the standards and models of SNMP V1.,V2 & V3.
- Analyze the challenges faced by remote monitoring and suggest suitable solutions.
- Recommend telecommunication management network standards for real time scenarios.
- Evaluate the various applications of network management system.
- Compare and contrast the different broadband network strategies.

CSCX 110 NETWORK SIMULATORS

L	T	P	C
1	0	0	1

OBJECTIVES :

- To illustrate the need for network simulators.
- To study the network simulator tools for analyzing the performance of computer networks.
- To test the performance of any one of the wired, wireless network routing protocol using the network simulator.

MODULE I NS3 and OMNET++5.1 09

Downloading – Installing - Building – Testing – Tweaking: using Logging Module, Command Line Arguments, Tracing System – Building Topologies – Tracing – Data Collection.

MODULE II NETWORK PERFORMANCE ANALYSIS 06

Case Study : Analyze the performance of wired or wireless network routing protocol in terms of QoS parameters.

L-15;TOTAL HOURS- 15

REFERENCES :

1. https://omnetpp.org/, https://www.nsnam.org
2. Thomas Bonald, Mathieu Feuillet, “Network Performance Analysis”, John Wiley & Sons, ISBN : ISBN :1118602854, 9781118602850, 2013.
3. Matthew N.O. Sadiku, Sarhan M. Musa, “ Performance Analysis of Computer Networks”, Springer Science & Business Media, ISBN : 3319016466, 9783319016467, 2013.

OUTCOMES :

Students who complete this course will be able to

- Do modifications in the existing routing protocol depending upon the requirement.
- Illustrate the performance of wired and wireless networks.
- Implement and analyze the performance of network routing protocols.

CSCX 117 VIRTUALIZATION TECHNIQUES

L	T	P	C
3	0	0	3

OBJECTIVES :

- To lay down the foundation of virtualization and its importance.
- To learn the essentials required to build virtualization.
- To provide an overview of the taxonomy of virtualization.
- To identify security implications in virtualization
- To expose the students to create and manage the virtual machine.
- To comprehend the technical capabilities and business benefits of virtualization.

MODULE I OVERVIEW OF VIRTUALIZATION 08

Describing Virtualization - Moore's Law - Importance of Virtualization –Types - Current Trends - Virtualization and Cloud Computing - Virtualization Software Operation - Virtualizing Servers - Virtualizing Desktops - Virtualizing Applications - Hypervisor - Type 1 Hypervisors - Type 2 Hypervisors - Role of a Hypervisor - Resource Allocation - Current Hypervisors - VMware ESX - Microsoft Hyper V

MODULE II INTRODUCTION TO VIRTUAL MACHINES 07

Virtual Machine - Examining CPUs in a Virtual Machine - Examining Memory in a Virtual Machine - Examining Network Resources in a Virtual Machine - Examining Storage in a Virtual Machine - Working with Virtual Machines - Virtual Machine Clones - Templates - Snapshots - Containers.

MODULE III VIRTUAL MACHINE CREATION 07

Performing P2V Conversions - Investigating the Physical-to-Virtual Process - Hot and Cold Cloning - Loading the Environment - VMware Workstation Player - Loading VirtualBox - Building a new Virtual Machine.

MODULE IV MANAGING CPU AND MEMORY FOR VIRTUAL MACHINE 07

CPU Virtualization - Configuring VM CPU Options - Tuning Practices for VM CPUs - Choosing Multiple CPUs - Hyper-Threading - Memory Virtualization - Configuring VM Memory Options - Tuning Practices for VM Memory - Calculating Memory Overhead - Memory Optimizations.

MODULE V MANAGING STORAGE AND NETWORKING FOR A VIRTUAL MACHINE 08

Storage Virtualization – Configuring VM Storage Options - Tuning Practices for VM Storage - Network Virtualization - Configuring VM Network Options - Tuning Practices for

Virtual Networks - Deploying Applications in a Virtual Environment

MODULE VI VIRTUALIZATION SECURITY 08

Fundamentals of Virtualization Security - Securing Hypervisors - Designing Virtual Networks for Security - Architecture Considerations.

L – 45;TOTAL HOURS-45

REFERENCES :

1. Matthew Portnoy, “Virtualization Essentials”, Wiley, Second edition, ISBN : 9788126564668, 2016
2. Daniel Kusnetzky, "Virtualization: A Manager's Guide", O'Reilly Media, Illustrated, 9781449306458 2012.
3. Tom White, “Hadoop: The Definitive Guide Storage and Analysis at Internet Scale” O'Reilly Media Press, ISBN : 9781449311520, 2012.
4. Dave Shackleford, “Virtualization security- Protecting Virtualized Environments”, Sybex Publishers, First Edition, ISBN : 978118288122, 2012.

OUTCOMES :

Students who complete this course will be able to

- Review virtualization concepts and their role in elastic computing.
- Articulate the main concepts, key technologies, strengths, and limitations of Virtualization.
- Analyze different types of virtualization with performance metrics.
- Describe the architecture and taxonomy of virtualization.
- Analyze the constraints and techniques in setting up virtualization through its enabling technologies.
- Design virtualization infrastructure solutions and give recommendations based on the need.

CYBER SECURITY ELECTIVES

CSCX 301 **AGILE SOFTWARE DEVELOPMENT** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To understand agile software development practices and how small teams can apply them to create high-quality software.
- To promote continuous iteration of development and testing throughout SDLC using agile methodology.
- To learn the basics about development cycles, IT Operations & faster innovation.
- To get knowledge on the advanced process of software engineering for faster problem resolution & team collaboration.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

MODULE I INTRODUCTION TO AGILE 7

Software Development Methodology – Waterfall model – V –model – History of Agile – Agile principles – Agile vs Waterfall – Agile Methodology Overview.

MODULE II AGILE FRAME WORK 7

Agile frameworks – Extreme programming - Rational Unified Process (RUP) - Test Driven Development (TDD) – Feature Drive Development (FDD) - Scrum - Kanban Methodology.

MODULE III AGILE SOFTWARE DEVELOPMENT 8

Software Development using Extreme Programming – Roles & Rules - Software Development using Scrum Framework – Scrum team – Sprints – Sprints planning – Metrics – Scrum tools - Case Studies.

MODULE IV AGILE PRACTICES 7

Pair Programmming – Refractoring – Code smells – Design patterns - Agile management tool.

MODULE V AGILITY AND REQUIREMENTS ENGINEERING 8

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

MODULE VI AGILITY AND QUALITY ASSURANCE 8

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Mark Merkow, “Secure, Resilient and Agile Software development”, ISBN 9781000041736, 1000041735, CRC Press, 2019.

REFERENCES:

1. Pedro M. Santos, Marco Consolaro, Alessandro Di Gioia ,”Agile Technical Practices distilled”, ISBN 9781838986629, 1838986626,Packt Publishing ,2019.
2. Matt LeMay ,”Agile for everybody”, ISBN 9781492033486, 1492033480, O'Reilly Media Publication, 2018.
3. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
4. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.
5. Craig Larman, ―Agile and Iterative Development: A Manager‗s Guide‖, Addison-Wesley,2004.
6. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

COURSE OUTCOMES:

- Explain the background and evolution of agile methodology.
- Describe how to unify processes and improve collaboration between development and operations.
- Implement agile software methodology for faster development of quality software.
- Compare the various agile frameworks and identify the suitable framework based on the problem.
- Apply the agile technical practices for the software development.
- Practice on agile project management tool.

CSCX 302	MALWARE ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of malware.
- To set up a protected static and dynamic malware analysis environment.
- To learn various malware behavior monitoring tools.
- To analyze the actionable detection signatures from malware indicators.
- To apply malware into exhibiting behaviors that only occurs under special conditions.
- To explore an effective measure for unknown android malware.

MODULE I INTRODUCTION **7**

Introduction to malware – OS security concepts – malware threats – evolution of malware – malware types viruses – worms – rootkits – Trojans – bots- spyware – adware – logic bombs – malware analysis – static malware analysis – dynamic malware analysis.

MODULE II STATIC ANALYSIS **8**

X86 Architecture – Main Memory – Instructions – Opcodes and Endianness – Operands – Registers – Simple Instructions – The Stack – Conditionals – Branching – Rep Instructions – C Main Method and Offsets – Antivirus Scanning – Fingerprint for Malware – Portable Executable File Format – The PE File Headers and Sections – The Structure of a Virtual Machine – Reverse Engineering – x86 Architecture – recognizing c code constructs in assembly – c++ analysis – Analyzing Windows programs – Anti-static analysis techniques obfuscation – packing – metamorphism – polymorphism.

MODULE III DYNAMIC ANALYSIS **8**

Live malware analysis – dead malware analysis – analyzing traces of malware – system calls – api-calls – registries – network activities. Anti-dynamic analysis techniques – runtime-evasion techniques – Malware Sandbox – Monitoring with Process Monitor – Packet Sniffing with Wireshark – Kernel vs. User – Mode Debugging – OllyDbg – Breakpoints – Tracing – Exception Handling – Patching.

MODULE IV MALWARE FUNCTIONALITY **8**

Downloader – Backdoors – Credential Stealers – Persistence Mechanisms – Privilege Escalation – Covert malware launching – Launchers – Process Injection – Process Replacement – Hook Injection – Detours – APC injection.

MODULE V MALWARE DETECTION TECHNIQUES **7**

Signature-based techniques: malware signatures – packed malware signature – metamorphic and polymorphic malware – signature Non-signature based techniques – similarity-based techniques – machine-learning methods – invariant inferences.

MODULE VI ANDROID MALWARE **7**

Malware Characterization – Case Studies – Plankton, DroidKungFu, AnserverBot, Smartphone (Apps) Security.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Practical malware analysis The Hands-On Guide to Dissecting Malicious Software by Michael Sikorski and Andrew Honig ISBN-10: 159327-290-1, ISBN-13: 978-1-59327-290-6, 2012.

REFERENCES:

1. Computer viruses: from theory to applications by Filiol, Eric Springer Science & Business Media, 2006.
2. Android Malware by Xuxian Jiang and Yajin Zhou, Springer ISBN 978-1-4614-7393-0, 2005.
3. Hacking exposed™ malware & rootkits: malware & rootkits security secrets & Solutions by Michael Davis, Sean Bodmer, Aaron Lemasters, McGraw-Hill, ISBN: 978-0-07-159119-5, 2010.
4. Windows Malware Analysis Essentials by Victor Marak, Packt Publishing, 2015.

COURSE OUTCOMES:

- Understand the nature of malware, its capabilities, and how it is combated through detection and classification.
- Apply the tools and methodologies used to perform static and dynamic analysis on unknown executables.
- Learn the executable formats, Windows internals and API, and analysis techniques.
- Implement techniques and concepts to unpack, extract, decrypt, or bypass new anti-analysis techniques in future malware analysis.
- Analyze the underlying scientific and logical limitations on society's ability to combat malware.
- Explore the social, economic, and historical context in which malware occur.

CSCX 303 SECURE SOFTWARE DEVELOPMENT LIFE CYCLE L T P C
3 0 0 3

COURSE OBJECTIVES:

- To study the characteristics of secure software life cycle.
- To understand the secure software determining needs.
- To gain the knowledge of software development architecture.
- To learn about the best practices and application security.
- To study the advanced programming practices.
- To experience the software applications and security testing.

MODULE I Characteristics and Security of Software Life Cycle 7

Characteristics – Capacity – Efficiency – Interoperability – Manageability – Performance – Privacy – Reliability – Scalability – Security – Security begins – Requirement Gathering and Analysis – System Designs – Detailed Design – Design Reviews – Development phase – Testing – Deployment – Security Training.

MODULE II Secure Software Determining Needs 10

Assessing Business Requirements – Build vs Buy – RFP & RFI – Searching for solutions – Controlling costs and Realistic Budgeting – Analysis methods and Tools.

MODULE III Software Development Architecture 7

Creating requirements documents using analysis tools – Advantages and Disadvantages of DFD – Process Flow Diagrams – PFD Components – Data Dictionary – Process specifications – STD – ERD – Data – Modeling – Modeling Procedure – Normalization.

MODULE IV Best Practices & Designing Applications for Security 7

The security perimeter - Attack Surface - Application Security & Principles – Different category of practices – Design Phase – Nonfunctional Requirements – Design patterns – Architecting for the web & Design Review.

MODULE V Programming Practices 7

The evolution of software attacks – The OWASP Top 10 – OWASP enterprise Security API (ESAPI) – Cross-Site Scripting – Injection attacks – Authentication and Session management – Cross-site Request Forgery – Session management – Access control – Cryptography – Error Handling – Ajax and Flash – Practices for software Resilience.

MODULE VI Applications & Security Testing 7

Embedded Systems – Distributed Applications / Cloud Computing – Mobile Applications – Testing Phases – Unit Testing – Source code review – Code review process – Automated source code analysis – Open-Source analysis tools – Deployment strategy – Penetration Testing.

L - 45; Total Hours : 45

REFERENCES :

1. Mark S. Merkow Lakshmikanth Raghavan, “Secure and Resilient Software Development”, CRC Press Taylor & Francis Group, Auerbach Publications, 2010.
2. Arthur M. Langer, “Guide to Software Development Designing and Managing the Life Cycle”, Springer Second Edition, USA, 2016.
3. Mark S. Merkow, CISSP, CISM, CSSLP, “SECURE, RESILIENT, AND AGILE SOFTWARE DEVELOPMENT”, CRC Press Taylor & Francis Group, Auerbach Publications, 2020.

OUTCOMES :

Students to complete this course will be able to

- Narrate the fundamentals of secure software development life cycle.
- Identify the software designing requirement needs.
- Analyze the secure software development architecture.
- Analyze the different software best practices and security designing applications.
- Understand the advanced programming practices for secure software development.
- Apply the different types of testing techniques using open-source security testing tools.

CSCX 304 **MULTIMEDIA SECURITY** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To develop a basic understanding on the digital rights management systems
- To identify possible countermeasures against threats and vulnerabilities in a given security scenario.
- Learn the requirements and mechanisms for identification and authentication.
- Know the mechanisms for securing the information using biometrics.
- To compare and contrast the underlying security mechanisms needed to implement security countermeasures.
- Have a deeper knowledge on embedded concepts of multimedia security

MODULE I FUNDAMENTALS OF MULTIMEDIA SECURITY 7

Overview of Digital rights management systems - Digital rights management systems - multimedia encryption - multimedia authentication - key management for multimedia authentication and distribution.

MODULE II MULTIMEDIA ENCRYPTION 8

Fundamentals of Multimedia Encryption Techniques - Key Management for Multimedia Access and Distribution - Scalable Encryption and Multi-Access Control for Multimedia - Broadcast Encryption.

MODULE III EMBEDDED MULTIMEDIA SECURITY 7

Video coding embedded systems - reconfigurable architectures - encryption basics.

MODULE IV DIGITAL WATERMARKING 8

An overview of Digital watermarking - Biometrics in Digital Rights Management - Multidimensional Watermark for Still Image - Fragile Watermarking for Image Authentication

MODULE V MULTIMEDIA DATA HIDING 7

Lossless Data Hiding - Attacking Multimedia Protection Systems via Blind Pattern Matching - Digital Media Fingerprinting **-** Signature-Based Media Authentication.

MODULE VI MULTIMEDIA SECURITY APPLICATIONS 8

Steganalysis - Passive blind image forensics - Secure Media Streaming and Secure Transcoding security in digital cinema.

L – 45; TOTAL HOURS: 45

REFERENCES:

1. Wenjun Zeng, Heather Yu, Ching-Yung Lin, “Multimedia Security Technologies for Digital Rights Management”, Academic Press, 2nd edition, ISBN: 9780123894768, 2011.
2. Amit Pande, Joseph Zambreno,” Embedded Multimedia Security Systems: Algorithms and Architectures”, Springer Science & Business Media, 2nd edition, ISBN:1447144597, 2012.

OUTCOMES:

- Identify the various threats and vulnerabilities
- Get familiarized on the concept of multimedia security and its issues
- Describe the requirements and mechanisms for identification and authentication
- Determine appropriate mechanisms for protecting information
- Examine the issues related to video coding techniques.
- Have a deeper knowledge on embedded multimedia security.

SEMESTER VI

CSCX 214	**INFORMATION RETRIEVAL**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES :

- To recall the basics of information retrieval with pertinence to modeling, query operations and indexing.
- To introduce the IR principles to locate relevant information on large collections of data.
- To evaluate the performance of an information retrieval system.
- To acquire knowledge and experience of the XML programming language.
- To describe the various applications of information retrieval giving emphasis to multimedia IR, web search.
- To expose the document text mining techniques.

MODULE I INTRODUCTION 07

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics– The impact of the web on IR —IR Versus Web Search–Components of a Search engine.

MODULE II MODELING 07

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing.

MODULE III INDEXING 07

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching - Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency.

MODULE IV CLASSIFICATION AND CLUSTERING 09

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering – Matrix decompositions and latent semantic indexing – Fusion and Meta learning.

MODULE V SEARCHING THE WEB 08

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

MODULE VI DOCUMENT TEXT MINING 07

Information filtering - organization and relevance feedback – Text Mining -Text classification and clustering – Categorization algorithms: naive Bayes; decision trees; and nearest neighbor – Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).

L – 45;TOTAL HOURS-45

REFERENCES :

1. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, “Modern Information Retrieval: The concepts and Technology behind Search” (ACM Press Books), Second Edition, ISBN 10: 0321416910, 2011.
2. Stuart Russell-Peter Norvig, "Artificial Intelligence - A Modern Approach", 3rd Edition, Pearson Education, ISBN-10: 0-13-604259-7, 2009.
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, ISBN-10: 0136072240, 2009.

OUTCOMES :

Students who complete this course will be able to

- Apply the basic concepts and techniques of Information Retrieval in various related fields.
- Form the ontology for different domains and generate the equivalent representations.
- Use different information retrieval techniques in various application areas
- Implement retrieval systems for web search tasks.
- Develop skills in problem solving using systematic approaches.
- Apply document text mining techniques and analysis.

CSCX 215 SOFTWARE RISK MANAGEMENT L T P C
1 0 0 1

OBJECTIVES :

- To give an insight into the various risk levels in software development
- To provide a concise view on the risk plan
- To highlight the techniques in identifying risks.
- To realize the need for managing and tracing risks.
- To gain expertise in discovering risk and usage of risk assessment tools
- To highlight risk mitigation strategies.

MODULE I RISK MANAGEMENT PROCESS 07

Introduction to software risk management-objectives and goals-assessment-cost-developing a software risk management strategy-Risk management paradigm-cultural considerations

MODULE II RISK ASSESSMENT, MITIGATION AND MONITORING 08

Discovering risks-Methods-classification of risks-risk taxonomy-reviews-Risk assessment approaches-tools and techniques- risk planning-risk mitigation strategies- formulating and implementing risk management plans-risk database-managing and tracing risk.

L - 15; TOTAL HOURS - 15

REFERENCES :

1. John McManus, “Risk Management in Software Development Projects”, Route Ledge, ISBN: 1136367918, 9781136367915 ,2012
2. Tom DeMarco, Tim Lister, Waltzing with Bears: Managing Risk on Software Projects, Addison-Wesley, ISBN 0133492230, 9780133492231, 2013.
3. Hall, Elaine M.” Managing Risk: Methods for Software Systems Development”, Addison Wesley, ISBN 0201255928, 2001.

OUTCOMES :

Students who complete this course will be able to

- Identify risks associated with a project.
- Categorize risks and Develop basic risk management skills.
- Develop a comprehensive risk management plan for a project.
- Qualitatively and quantitatively analyze risks and assess risks.
- Apply risk mitigation strategies.
- Evaluate risk management tools and explore them.

CSCX 218 SOFTWARE DESIGN AND ARCHITECTURE

L	T	P	C
1	0	0	1

OBJECTIVES :

- To provide a concise overview of the basics and characteristics of software architecture.
- To provide an understanding of software development with an emphasis on architecture and design.
- To highlight the architectural patterns and models.
- To understand the principles of software quality concepts and quality attributes.
- To outline the various architectural styles and design strategies.
- To acquire knowledge on documentation of software architecture

MODULE I SOFTWARE ARCHITECTURE AND QUALITY ATTRIBUTES 07

Software Architecture- Importance – Contexts of software architecture – Quality attributes – Availability – Interoperability – Modifiability – Performance – Usability – other Quality attributes

MODULE II DESIGN AND MODELLING 08

Architectural tactics and patterns – Frameworks - Quality attribute modeling and analysis – Architecture in Agile Projects, Architectural Styles – Designing an Architecture – Design Strategy – Attribute Driven Design Methods – Documenting Software Architecture.

L - 15; TOTAL HOURS - 15

REFERENCES :

1. Len Bass, Paul Clements, Rick Kazman,"Software Architecture in Practice", Addison-Wesley, 3rd Edition, ISBN – 97801321815736, 2015.
2. Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Robert Nord, Judith Stafford "Documenting Software Architectures: Views and Beyond ", 2nd edition, Pearson Education, ISBN: 0132488590, 9780132488594, 2011.
3. Taylor, R., Medvidovic, N., Dashofy, E., "Software Architecture: Foundations, Theory, and Practice", Wiley. ISBN: 9780470167748, 2010.

OUTCOMES :

Students who complete this course will be able to

- Identify and assess the quality attributes of a system at the architectural level.
- Select patterns and architectures for applications of various domains.
- Develop software that meets specific quality constraints by understanding the

impact of architecture, design and implementation.

- Recognize major software architectural styles, design patterns, and frameworks.
- Apply the knowledge of various architectural tactics and styles in given scenario.
- Illustrate the skills to document software architectures.

CSCX 220 HUMAN COMPUTER INTERACTION

L	T	P	C
3	0	0	3

OBJECTIVES :

- To describes guidelines for effective interface designs.
- To understand the basics of foundation for User Interface.
- To equip with the human factor methodologies
- To provide the design technology for individuals and persons with disabilities
- To provide guideline for testing and modeling for interactive design
- To identify the various models that can be used for designing systems

MODULE I INTRODUCTION **7**

Usability of Interactive Systems - Universal Usability - Guidelines, Principles, and Theories.

MODULE II DESIGN **7**

Design - Evaluation and the User Experience – 8 golden rules of Interface design- Design case studies.

MODULE III DESIGN PROCESS **7**

Managing Design processes – Evaluating Interface Designs – Software Tools.

MODULE IV INTERACTION STYLES 8

Direct Manipulation and Immersive Environments - Fluid Navigation - Expressive Human and Command Languages – Devices - Communication and Collaboration – Voice – Finger Print.

MODULE V DESIGNING ISSUES **8**

Advancing the User Experience - The Timely User Experience - Documentation and User Support - Information Search - Data Visualization.

MODULE VI APPLICATIONS **8**

Introducing Emotional Interfaces to Healthcare Systems – Electronic Health Records – Development of Smartphone Self-reporting applications in Health Care.

L – 45;TOTAL HOURS : 45

REFERENCES :

1. Ben Shneiderman, Catherine, Maxine Cohen, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, 6th Edition, ISBN-9780134380711, 2017.
2. I. Scott Mackenzie, “Human-Computer Interface: An Empirical Research perspective”, Elsevier, ISBN: 978012405865, 2013.

OUTCOMES :

Students to complete this course will be able to

- To Explore and analyze the basic concepts, terms in user interface.
- Develop an interactive user interface.
- Recognize the importance of human factors.
- Design the effective HCI for individuals and persons with disabilities.
- Apply the Interaction design basics.
- Explain the guidelines for effective interface designs.

CSCX 221 **GREEN COMPUTING** **L T P C**
3 0 0 3

OBJECTIVES :

- To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
- To create awareness of energy efficient computing.
- To examine the power management in computing devices.
- To emphasize skill in energy saving practices in their use of hardware.
- To explore the technology tools that can reduce paper waste and carbon footprint.
- To understand how to minimize equipment disposal requirements.

MODULE I INTRODUCTION 08

Reputation as Motivation-Avoiding Green wash-Green Recruiting and Retention-Money saving efforts-Implementing Energy Efficiency-Current Devices –Digitizing NON-IT Functions.

MODULE II GREEN COMPUTING ENVIRONMENT 08

Environmental Drivers-Green Agenda-Roots of Environmentalism-Environmentalism and IT-Imperative of Climate Change-Go Green-A New vision of computing-Efficiency and cloud computing-Green ability-responsibility-usability-the zen of green computing

MODULE III GREEN DEVICES 08

Device purchases-Dimension of Device pyramid greeness-Green computing-Embodied Energy-Device Green-Supplier Green-Buying principles-Desktop computers-Laptops.

MODULE IV GREEN DATACENTERS 07

Green Data Centers-Model-Power supply considerations-servers-storage-networking-datacenter suppliers-saving energy-Cost savings-Risk Reduction-Carbon Footprint Reduction-Focusing on solar power.

MODULE V GREEN HOUSE GAS AND RESOURCE 07

Sources and sinks of green house gases and warming-doubters-deniers-Reducing Emissions-Resource use check list-Apple-EPEAT-Case Study-Computer Hardware and RSI

MODULE VI DEEP GREEN COMPUTING 07

Megatrends for Green computing-Telepresence-Telecommuting-Platforms for Deep Green computing-Selling Deep Green Computing

L – 45;TOTAL HOURS-45

REFERENCES :

1. Bud E. Smith,"Green Computing: Tools and Techniques for Saving Energy, Money, and Resources",CRC Press,1st Edition,ISBN:9781466503410,2014
2. Wu Chun Fang, "Green computing Book", CRC Press,1st Edition,ISBN:9781439819876, 2014.

OUTCOMES :

Students who complete this course will be able to

- Describe the resources pertaining to green house gases and warming.
- Develop energy efficient computing applications.
- To analyze the consumption of power in data centers.
- Evaluate deep green computing use in relation to environmental perspectives.
- Discuss how the choice of hardware and software can facilitate a more sustainable operation.
- Apply the strategies of going Green.

CSCX 223	BUSINESS PROCESS MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES :

- Plan to become business or systems analysts that participate in BPM projects.
- To design the Process Modeling and Process Discovery.
- BPM technology helps organizations become more efficient by coordinating
- To Know about the Qualitative And Quantitative Process Analysis
- To analyze organizational performance from a process perspective, redesign processes using value-focused techniques.
- To design Process Automation and Process Intelligence in BPM systems.

MODULE I BUSINESS PROCESS ANALYSIS AND DESIGN 07

Introduction to Business process management- Functional Organization - BPM lifecycle, process modeling - Process Architecture – Introduction to BPM.

MODULE II PROCESS MODELLING AND PROCESS DISCOVERY 08

Branching and Merging - Information Artifacts - Processes Decomposition - More on rework and repetition - Handling Events and Exceptions - Discovery method - Process modeling method.

MODULE III QUALTITATIVE AND QUANTITATIVE PROCESS ANALYSIS 07

Value -added analysis - Root cause Analysis - Performance Measures - Flow analysis - Queue and Simulation.

MODULE IV PROCESS REDESIGN 07

Essence of process redesign - Heuiristic process redesign - The case of heath care institution - Product base design.

MODULE V PROCESS AUTOMATION 08

Automation business process - Advantages and challenges of introducing a BPMS - Turning process models Executable

MODULE VI PROCESS INTELLIGENCE 08

Process Execution and event logs - Automatic process discovery - Performance Analysis - Conformance Checking

L – 45; TOTAL HOURS - 45

REFERENCES :

1. Dumas, M., La Rosa, M., Mendling, J., Reijers, H,"Fundamentals of Business Process Management" , Springer ,ISBN 978-3-642-33143-8 ,2013.
2. Alexander Grosskopf, Gero Decker, Mathias Weske ,"Business process modeling using BPMN" , Second Edition,Meghan-Kiffer Press,ISBN : 9780929652269, 2009

OUTCOMES :

Students who complete this course will be able to

- Analyze and improve Business Processes in organizations.
- Evaluate the Process Discovery and Modeling method.
- Implement the Root Cause Analysis and Flow Analysis of Qualitative Analysis.
- Develop the Process Redesign in BPM.
- To improve their ability in Process Automation and Process Intelligence.
- Evaluate BPMN Process Modules.

CSCX 228 INFORMATION VISUALIZATION

L	T	P	C
2	1	0	3

OBJECTIVES :

- To lay the foundation for visualization of data.
- To understand the features of visualization and impact of using colours.
- To appraise visual attention and categorize texture handling.
- To devise visualization techniques to represent static and dynamic patterns.
- To deduce visual objects space perception.
- To formulate the visualization strategies for information presentation.

MODULE I SCIENCE OF DATA VISUALIZATION 08

Visualization stages, semiotics based on perception, Model of perceptual processing, Types of data, Environment, Optics, Resolution, and Display.

MODULE II LIGHTNESS, BRIGHTNESS, CONTRAST, AND CONSTANCY 07

Neurons, Receptive Fields, and Brightness Illusions, Luminance, Brightness, Lightness, and Gamma, Color Measurement, CIE System of Color Standards, Opponent Process Theory, Color Appearance.

MODULE III VISUAL ATTENTION AND INFORMATION 08

Searching the Visual Field, Preattentive Processing, Rapid Area Judgments, Coding with Combinations of Features, Conjunctions with Spatial Dimensions, Gabor Model and Texture in Visualization, Texture Coding Information, Glyphs and Multivariate Discrete Data.

MODULE IV STATIC AND MOVING PATTERNS 07

Gestalt Laws, Contours, Perception of Transparency, Perceptual Syntax of Diagrams, Patterns in Motion.

MODULE V VISUAL OBJECTS SPACE PERCEPTION 07

Image-Based Object Recognition, Structure-Based Object Recognition, Perceiving the Surface Shapes of Objects, Depth Cue Theory, Task-Based Space Perception.

MODULE VI INTERACTING WITH VISUALIZATIONS AND THINKING WITH VISUALIZATION 08

Data Selection and Manipulation Loop, Exploration and Navigation Loop, Memory Systems, Eye Movements, Problem Solving with Visualizations, Implications for Interactive

Visualization Design, Interfaces to Knowledge Structures.

L – 30; T – 15;TOTAL HOURS-45

REFERENCES :

1. Colin Ware, “Information Visualization : Perception for Design”, Morgan Kaufmann, an imprint of Elsevier, Third edition, ISBN-13: 978-0123814647, 2012.
2. Robert Spence, “Information Visualization: Design for Interaction”, Pearson Publishers, Second Edition, ISBN-13: 978-0132065504, 2007.
3. Andreas Kerren, John Stasko, Jean-Daniel Fekete and Chris North, “Information Visualization: Human-Centered Issues and Perspectives (Lecture Notes in Computer Science)”, Springer edition, ISBN-13: 978-3540709558, 2008.

OUTCOMES :

Students who complete this course will be able to

- Acquire skills for visualization of data.
- Assess the features of visualization and handling of colours in visualization.
- Recognize various visual attention strategies and apply according to the given scenario,
- To analyze and propose appropriate visyualization techniques for static and dynamic patterns.
- To construct visual object space perception.
- To devise visualization strategies for presentation of real time scenarios

CSCX 233 SOFTWARE QUALITY ASSURANCE L T P C
3 0 0 3

OBJECTIVES :

- To provide an in depth understanding of software quality management process.
- To introduce concepts, metrics, and models in software quality assurance
- To describe the process and product quality attributes.
- To highlight the various activities of quality assurance, types of reviews and audits.
- To investigate the expectations of software quality in projects.
- To provide an overview of software quality standards.

MODULE I QUALITY ASSURANCE BASICS 07

Quality and Reliability – Evolution of the concepts of Quality – Quality gurus – Total Quality Management – Costs of Quality - Quality in organizations – Quality goals –Current scenario in software development organizations.

MODULE II SOFTWARE QUALITY DIMENSIONS 08

Four Dimensions of Software Quality – Specification – Conformance – Design – Development – Ensuring Quality -Software Product Quality – Measurement of software quality

MODULE III VERIFICATION AND VALIDATION 07

Verification – Walkthroughs – Inspections – Audits – Verification Process- Implementation of Verification activities in projects – Validation of Software Design – Specification – Product Validation

MODULE IV PRODUCT AND PROCESS QUALITY 08

Software Product Quality - Process Quality – Improvement and Stabilization – Process Models - Components of a Process - Metrics for Software Quality –Process and Product Metrics.

MODULE V NEW PARADIGMS OF SOFTWARE QUALITY 07

Current Certification Paradigms-Fallacy of Certifications – Maturity Models – New Paradigms for Software Quality Assurance.

MODULE VI SOFTWARE QUALITY STANDARDS 08

Quality management standards – ISO 9001 and 9000-3 – CMMI – SPICE- Tools for Quality improvement- Quality Control Tools.

L – 45; TOTAL HOURS-45

REFERENCES :

1. Murali Chemuturi, “Mastering Software Quality Assurance: Best Practices, Tools and Techniques “, J.Ross Publishing, ISBN-978-1-60427-032-7., 2011.
2. Daniel Galin, “Software Quality Assurance: From Theory to Implementation” - Addison-Wesley, ISBN 0201709457, 2004.
3. Ivan Mistrik , Richard M Soley ,Nour Ali , John Grundy , Bedir Tekinerdogan “Software Quality Assurance: In Large Scale and Complex Software-intensive Systems “,Morgan Kaufmann, ISBN – 0128023015,2015.
4. Abu Sayed Mahfuz, Software Quality Assurance: Integrating Testing, Security, and Audit, CRC Press, ISBN 149873555X, 9781498735551, 2016.
5. Schulmeyer, G. Gordon and McManus, James, Handbook of Software Quality Assurance, 3rd Ed. Prentice Hall, 2008.

OUTCOMES :

Students who complete this course will be able to

- Define software quality and describe the role of quality assurance in the software development process.
- Describe the quality of specifications, design, construction and conformance as applicable to software development organizations.
- Compare the various quality reviews and audits.
- Assess the quality and reliability of software products and compare software quality metrics.
- Explore the quality of the process from an implementation point of view and apply new paradigms for quality assurance.
- Demonstrate quality assurance tools and explore standards and techniques.

CSCX 234 CUSTOMER RELATIONSHIP MANAGEMENT L T P C
1 1 0 1

OBJECTIVES :

- To understand your role in achieving good customer relationship management with a customer and/or stakeholders.
- To be aware of the key skills needed to carry out successful customer relationship management, in order to build more productive & mutually rewarding relationships with customers and/or stakeholders.
- To be able to identify and respond to customers & stakeholders needs, expectations & issues that both meet their needs and protects the interests of your organization.
- To learn the skills to communicate with and influence customers & stakeholders
- To study simple CRM techniques
- To concentrate on customers to build long lasting relationships that allow to beat the competition.

MODULE I DEFINING CRM 06

New Spin on Customer Loyalty – CRM and customer Service – CRM in e-Business – Analytical CRM

MODULE II DELIVERING CRM 09

Defining and Preparing the CRM business plan – Choosing a CRM tool – CRM Implementation

L – 15;TOTAL HOURS-15

REFERENCES :

1. Kyle booth, “The Customer Relationship Management Handbook - Everything You Need to Know about Customer Relationship Management , History Ink Books, Illustrated Edition, ISBN: 9781489123251,2016.
2. Jill Dyche, “CRM Handbook, The: A Business Guide to Customer Relationship Management” ,Addison Wesley Publishers,1st Edition, ISBN: 9780201730623 ,2002.
3. Paul Green Berg, “CRM at the Speed of Light” , Tata McGrawHill,4th Edition, ISBN: 9780071590457,2010.
4. Scott Kostojohn, Mathew Johnson, Brian Paulen, “ CRM Fundamentals”,Apress Publishers, 1st Edition, ISBN: 9781430235903,2011.

OUTCOMES :

Students who complete this course will be able to

- Critically review and interpret the theoretical aspects of CRM across the main areas

of e-business.

- Provide an insight into the concepts and strategic implementation of CRM.
- In-depth understanding of the benefits of CRM and the competitive advantage this methodology provides.
- Insight on the challenges and constraints organizations face in attempting to incorporate CRM.
- Analyze how technology can be leveraged to enhance a CRM initiative.
- Assess the best practices in multiple vertical markets.

CSCX 236	GENETIC ALGORITHM	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To familiarize with Mathematical foundations for Genetic algorithm operators.
- To study the Applications of Genetic Algorithms.
- To understand filtering techniques and their broad applicability to a range of optimization problems.
- To emphasize the importance of optimization in engineering activities.
- To provide a broad introduction to the field of Genetic Algorithms and other fields of hierarchical genetic algorithm.
- To teach students how to apply these methods to solve problems in complex domains.

MODULE I INTRODUCTION 08

Chromosome Representation-Objective and Fitness Functions-Selection Methods-Genetic Operators-Intrinsic characteristics-Parallel Genetic algorithm-Multiple objective-Robustness-Multimodel-constraints

MODULE II FILTERING AND H-INFINITY CONTROL 08

Digital IIR Filter Design –Chromosome coding-The Lowest Filter Order Criterion -Time Delay Estimation-Active Noise Control-A Mixed Design Approach-The Distillation Column Design-Bench mark problem.

MODULE III HIERARCHICAL GENETIC ALGORITHM 07

Biological Inspiration-Hierarchical Chromosome Formulation-Genetic Operations-Multiple Objective approach-Neural Networks-Fuzzy Logic

MODULE IV SPEECH RECOGNITION SYSTEMS 08

Back ground of Speech Recognition systems-Dynamic Time Warping-Genetic Time Warping algorithm-Cross over-Mutation-Hidden Markov model-A Multiprocessor system for parallel Genetic Algorithms

MODULE V GENETIC ALGORITHMS IN PLANNING AND SCHEDULING PROBLEMS 07

ETPSPS scheme-Bottle neck analysis-selection key process-operational parameters for GA cycles-GA applications for ETPSP

MODULE VI GENETIC ALGORITHMS IN COMMUNICATION SYSTEMS 07

Virtual path design in ATM-Problem formulation-Combination approach-Design of mesh communication networks-Network optimization using GA-Wireless local area network design

L – 45;TOTAL HOURS-45

REFERENCES :

1. Kim-Fung Man, Kit Sang TANG, Sam Kwong,"Genetic Algorithms: Concepts and Designs", Springer,4th Edition,ISBN:9781852330729,2012.
2. Michael Mutingi, Charles Mbohwa ,"Grouping Genetic Algorithms: Advances and Applications",Springer,1st Edition ,ISBN:9783319443942,2017.

OUTCOMES :

Students who complete this course will be able to

- Appreciate the use of various GA operators In solving different types of GA problems.
- Understand and appreciate the basic concepts of Genetic algorithms in communication systems.
- Creating an understanding about the way the GA is used and the domain of application.
- Formulate a problem as a hierarchical approach by specifying representations, selection and variation operators.
- Write a program or use a package to implement the speech recognition systems.
- Apply genetic algorithms to planning and scheduling problems.

CSCX 237 ENTERPRISE RESOURCE PLANNING

L	T	P	C
2	1	0	3

OBJECTIVES :

- To gain knowledge on the challenges of ERP in Business.
- To introduce various ERP Products.
- To acquire knowledge on the various core process analysis activities.
- To learn the various issues relating to customization and testing
- To illustrate the accounting process in ERP systems
- To have an overview of the fundamentals of process modeling and ERP implementation

MODULE I INTRODUCTION 06

ERP as a Business Enabler– Evolution of ERP – ERP Life Cycle – ERP Products– Open-Source ERP- Project Initiation- Case Study

MODULE II CORE PROCESS ANALYSIS 07

Business Requirement Definition- Prerequisites- Activities- Deliverables– Decision Matrix – Conference Room Pilot– Business Flow Diagram- Install the CRP Instance.

MODULE III CUSTOMIZATION 08

Process Flow Diagram , Gap Analysis, Design , Interface and Conversion, Implementation Schedule— Interface Development– Interface Integration Testing – Validate Backlog Transaction Data.

MODULE IV SYSTEM INTEGRATION TESTING AND TRAINING 08

Implementation Schedule—System and Regression Testing- Prepare Testing Environment – Task List for Training- Develop Training/User Procedures Strategy - End User Documentation.

MODULE V ACCOUNTING IN ERP SYSTEMS 08

Operational Decision-Making Problem- Product Profitability Analysis- Management Reporting with ERP Systems- Human Resources Processes with ERP

MODULE VI ERP IN BUSINESS SCHOOL 08

Project Management Life Cycle – Risk Management – Problem Management – Problem Reporting and Escalation- Methodology – Case Study XIMB.- Process Modeling, Process

Improvement, and ERP Implementation

L – 30; T – 15;TOTAL HOURS-45

REFERENCES :

1. Ganesh, K., Mohapatra, S., Anbuudayasankar, S.P. and Sivakumar, P., “Enterprise Resource Planning-Fundamentals of Design and Implementation”, Springer International Publishing, 1st Edition, ISBN: 978-3-319-05927-3, 2014.
2. Ellen F. Monk and Bret J. Wagner, “ Concepts In Enterprise Resource Planning ”, Course Technology, Cengage Learning, 4th Edition, ISBN: 978-1-111-82039-8, 2013.
3. Lineke Sneller RC, “A Guide to ERP-benefits,implementation and trends”, Bookboon Publication, 1st Edition, ISBN: 9788740307290, 2014.

OUTCOMES :

Students who complete this course will be able to

- Define the terminology, features, and characteristics embodied in ERP
- Apply the principles behind ERP to design real time applications.
- Comprehend the analysis and activities of the business process chosen
- Acquire practical competence in the usage and application of tools to support ERP in B school
- Adopt different accounting process for designing a ERP system.
- Compare the functioning of various ERP Implementations.

CSCX 238	API DESIGN	L	T	P	C
		2	0	0	2

OBJECTIVES :

- To analyze the background and objectives of the API Specification.
- API fundamentals, including the business and technical cases for building and consuming web-based APIs.
- Recognize the Quality Management Principles.
- Understand the process approach for effective API design.
- Acquire the requirements and implementation steps of the API Specification.
- Learn the API Specification Certification process.

MODULE I CREATE AN API 10

Distributed Development -Modularizing Applications -Nonlinear Versioning - Communication -Empirical Programming- Method and Field Signatures-Files and Their Content-Environment Variables and Command-Line Options-Text Messages As APIs-Protocols-Behavior - Comprehensibility –Consistency-Discoverability - Life Cycle of an API

MODULE II API DESIGN 10

A Method -A Factory Is Better Than a Constructor-Allow Access Only from Friend Code Removing a Method or a Field -Removing or Adding a Class or an Interface-Inserting an Interface or a Class into an Existing Hierarchy-Adding a Method or a Field - Types of Modular Design-Intercomponent Lookup and Communication.

MODULE III API SECURITY AND USER MANAGEMENT 10

User Management-Identification-Authentication-Usernames and Passwords-Session-Based Authentication-Other Authentication Methods-Fortify Authentication with SSL-Encryption-Threat Detection and Prevention-SQL Injection-XML and JSON Attacks-Data Masking-General Recommendations-API Data Protection Recommendations-API Security Recommendations

L – 30;TOTAL HOURS-30

REFERENCES :

1. Jaroslav Tulach," Practical API Design: Confessions of a Java Framework Architect" ISBN=1430243171, 2012

2. Daniel Jacobson, Greg Brail, Dan Woods," APIs: A Strategy Guide", ISBN=1449308929, 2011
3. Jason Paul Michel "Web Service APIs and Libraries", ISBN= 978-0838911822,2013

OUTCOMES :

Students who complete this course will be able to

- Translate design requirements into API resources and methods.
- Use API Design process to create API definitions.
- Use RAML to define API resources, methods, parameters, and responses.
- Create document for API processing and test APIs.
- Minimize repetition in API definitions using resource types and traits.
- Model data in APIs using data types.

CSCX 216 SOCIAL MEDIA SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES :

- To give overview of social media fundamentals.
- To provide various opportunities of social media.
- To presents the risks present in social media and how to mitigate them.
- To focus on security issues with commonly used social networks.
- To provide policy and privacy frame work that addresses the social media risk.
- To show best practices for mitigating risk in the use of social media.

PREREQUISITES :

- Social Network

MODULE I INTRODUCTION TO SOCIAL MEDIA 7

Social media – Types and classification – Value of social media - Social media concepts and theories – Social network sites.

MODULE II OPPORTUNITIES OF SOCIAL MEDIA 7

Marketing – Sharing information – Blogs – Video calls - Employment – Limiting personal information in Linkedin - Uses of social media in public sector.

MODULE III RISKS OF SOCIAL MEDIA 8

Create social media applications - Risks of Social media – Public embarrassment – False information – Information leakage – Backing up social media – Loss of data/equipment – Cybercrime – Social Engineering – Hacked accounts.

MODULE IV RISK MANAGEMENT 7

Risk management – Laws and Regulation – Insurance – Forensics – Police use of social media – Malware, Viruses and exploit distribution – Risk management model.

MODULE V POLICIES AND PRIVACY 8

Policies – Privacy – Blocking users on Facebook, Twitter, Youtube, Whatsapp – Controlling app privacy in Facebook – Location awareness in Facebook and Twitter – Case studies.

MODULE VI SECURITY AND TOOLS 8

Security – Fake accounts – Passwords – Privacy and information sharing – Content security – Monitor social media – Best practices – Security tools.

L – 45; TOTAL HOURS : 45

REFERENCES :

1. Dac-Nhuong Le, Chintan Bhatt, Mani Madhukar," Security Designs for the Cloud, IoT, and Social Networking", ISBN 1119593204, 9781119593201,John Wiley & Sons, 2019.
2. Jeremy Harris Lipschultz," Social Media Communication: Concepts, Practices, Data, Law and Ethics",2nd Edition, ISBN 131538812X, 9781315388120,Routledge Publication , 2017
3. Michael Cross," Social Media Security: Leveraging Social Networking While Mitigating Risk", ISBN 1597499870, 9781597499873, Newnes Publication, 2013
4. Deborah Gonzalez," Managing Online Risk: Apps, Mobile, and Social Media Security", ISBN 0124200605, 9780124200609 Butterworth-Heinemann, 2014
5. Alan Oxley," Security Risks in Social Media Technologies: Safe Practices in Public Service Applications", ISBN 1780633807, 9781780633800, Elsevier, 2013

OUTCOMES :

Students to complete this course will be able to

- Describe functions of various social media networking sites.
- Create and identify the uses of social media applications in the public sector.
- Acquire knowledge on risk of social media and mitigate the risk.
- Analyze dark side of social media and to take preventive measures.
- Explore the policies and privacy framework of various social networks.
- Explain the security threats associated with social media and best practices.

CSCX 231 BIOMETRIC SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES :

- To provide students with understanding of biometrics, biometric equipment and standards applied to security.
- To learn the fundamental issues and technologies for Biometric security.
- To Recognize physical and behavior biometric characteristics.
- To illustrate the key issues and importance of biometric systems for security concerns.
- To discuss the biometric computing knowledge and methods.
- To learn some basic biometrics systems with real case studies.

MODULE I INTRODUCTION TO BIOMETRICS 08

Cancelable Biometrics and Data Separation Schemes-Minutiae based Finger print representations-reviews-privacy-security and cryptography realization-palmprint template protection technologies.

MODULE II BIOMETRIC KEY AND ENCRYPTION 08

Biometric Discretization for Template Protection and Cryptographic key generation-De Identifying Biometrics Images –Decomposition-Mixing

MODULE III BIOMETRIC SYSTEM ANALYSIS 08

BioPACE:Biometric Protected Authentication Connection Establishment-Privacy and security assessment of biometric systems-A generalized framework for privacy and security assessment of biometric Template Protection.

MODULE IV PRIVACY ENHANCED BIOMETRIC SYSTEMS 07

Secure and Efficient Iris Fingerprint Identification-Security over Outsourced Biometric Data.

MODULE V BIOMETRIC IDENTIFICATION AND AUTHENTICATION 07

A Collaborative Framework Design for Distributed Biometrics based Authentication in cloud-Secure Two party Computation and Biometric Identification.

MODULE VI BIOMETRIC SECURITY TECHNOLOGIES 07

Other Biometric security Technologies-Watermarked Biometrics-3D Fingerprints – case studies

L – 45;TOTAL HOURS-45

REFERENCES :

1. David Chek Ling Ngo, Andrew Beng Jin Teoh, Jiankun Hu, “Biometric Security”Cambridge scholars publishing,1st Edition,2015.
2. Richard Jiang, Somaya Al-Madeed, Ahmed Bouridane, Danny Crookes, Azeddine Beghdadi,” Biometric Security and Privacy:”,Springer,1st Edition,2017.

OUTCOMES :

Students who complete this course will be able to

- Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems.
- Understand and analyze biometric systems at the component level.
- Analyze and design basic biometric system applications.
- Be able to work effectively in teams and express their work and ideas orally and in writing.
- Identify the sociological and acceptance issues associated with the design and implementation of biometric systems.
- Understand various Biometric security issues.

CSCX 232 DATABASE SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES :

- To expose the need for Database security in real time systems.
- To compare the architecture model of several Database Management systems.
- To describe database security architecture and password policies.
- To infer the impact of SQL injection in database systems.
- To focus on various auditing and security procedures for Database systems.
- To overview fundamental concepts of multilevel relational databases and its security models.

MODULE I INTRODUCTION 08

Security and Information technology - Database security – Security Architecture – Operating system Security fundamentals.

MODULE II DATABASE (DB) REVIEW 08

DB Definition –DB Structure components –DB Models – DB Relationships – DB types – DB Management systems – DB similarities – Oracle Architecture – MySQL Architecture – Microsoft SQL Server Architecture

MODULE III PASSWORD, PROFILES, PRIVILEGES AND ROLES 08

Defining and Using Profiles – Designing and Implementing Password Policies - Granting and Revoking User privileges – Creating, Assigning and Revoking User Roles.

MODULE IV SQL INJECTION 08

Identification – Understanding SQL Injection – Identifying vulnerabilities – Exploitation and Defense – Exploitation and Information gathering – Extracting the Red Data – Exploitation of Privileges and passwords – Defending against Exploitation.

MODULE V SECURITY AUDITING AND TESTING 07

Virtual private Databases - Database Auditing Models - Auditing Database Activities – Security Testing – Testing Methodology – Case study.

MODULE VI MULTILEVEL DATABASE SECURITY 06

Introduction - Multilevel Database Relations - Polyinstantiation - Multilevel Database Security Models – Concurrency control - Performance Study .

L – 45;TOTAL HOURS-45

REFERENCES :

1. Alfred Basta , Melissa Zgola, “Database Security”, Delmar Cengage Learning,1st Edition, ISBN : 9781435453906, 2011.
2. Hassan A. Afyouni, “Database Security and Auditing: Protecting Data Integrity and Accessibility”, Cengage India; 1 edition, ISBN-13: 978-8131519059, 2013.
3. Osama S. Faragallah, El-Sayed M. El-Rabaie, Fathi E. Abd El-Samie, Ahmed I. Sallam, Hala S. El-Sayed,” Multilevel Security for Relational Databases”, Auerbach Publications, ISBN 9781482205398, 2014.

OUTCOMES :

Students who complete this course will be able to

- Define the basics of Database management systems.
- Compare and contrast different Database security architecture.
- Analyze the impact of SQL injection attacks and its remedies
- Design secured Database User profiles and provides solutions to overcome password and privilege exploitation.
- Apply different security testing methodology and audit the Database activities in real time environment.
- Relate different multilevel database security models and design in real time environment.

CYBER SECURITY ELECTIVES

CSCX 411	**CYBER CRIME INVESTIGATION AND DIGITAL FORENSICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES :

- Understand the computer hacking and malicious software
- Differentiate the digital piracy, intellectual theft and economic crime
- Be aware of online fraud , pornography and online sex crime
- Comprehend the cyber-bullying , cyber-stalking, cyber-terrorism and extremism
- Grasp the digital forensic investigation and its legal context around the world
- Realize the cybercrime policy and legislation across the globe

MODULE I INTRODUCTION 8

Technology and cybercrime – Technology as a landscape for crime – A typology for cybercrime – Law enforcement, privacy and security in dealing with cybercrime - Local policies – State agencies – Federal Law enforcement – Civil investigation and application of digital evidence – Extralegal agencies and non-governmental organizations – International enforcement challenges – Tension between privacy and security - Defining computer hacking – Victims of hacking – Human aspects of the hacker subculture – Legal frameworks to prosecute hacking – Enforcing and investigating hacker activity

MODULE II AUTOMATED COMPUTER ATTACKS AND INTELLECTUAL PROPERTY 8

Basics of malware, Viruses, Trojans and worms –Global impact of malware – hackers and malware writers – The market of malicious software – Legal challenges in dealing with malware – coordination and management in addressing malware - Intellectual property – The evolution of piracy over time – Subculture of piracy – The evolution of legislation to deal with piracy – Law enforcement and industry's response

MODULE III ONLINE FRAUD AND PORNOGRAPHY 8

Fraud and computer mediated communications – Identity theft – Email-based scams – Romance scams – Problem of carding and stolen data markets – Identify theft and fraud laws – Child pornography - Pornography in the digital age – Dealing with obscenity and pornography online – self-regulation by the pornography industry – Defining and differentiating child born from obscene content – Cyberbullying – online harassment – cyberstalking – Online Extremism – cyber terror – cyberwarfare

MODULE IV DIGITAL FORENSICS 9

Introduction – Computer forensics to digital forensics –stages of digital forensics – role of digital evidence – Types of hardware, peripherals and electronic evidence – evidence integrity – Acquisition and examination of forensic evidence – Data preservation – Digital forensic imaging tools – uncovering digital evidence –data analysis – Data reduction and

filtering

MODULE V LEGAL CHALLENGES IN DIGITAL FORENSICS 9

Constitutional issues in digital investigations – Federal rules of Evidence – The future of cybercrime terror and policy - Social movements, technology, and social change – Future of forensics – Challenge to policy makers globally

MODULE VI CASE STUDY 9

Case Study – Cybercrime Investigation case studies - An Excerpt from placing the suspect behind the keyboard - Digital Forensics - Important Cyber Law Case Studies – Digital Evidence in corporate investigations.

L-45; TOTAL HOURS-45

REFERENCES :

1. Holt, Thomas J., Bossler, Adam M., Seigfried-Spellar, Kathryn C , “Cybercrime and Digital Forensics: An introduction”, Routledge Taylor and Francis Group, 2nd Edition, ISBN:978-1-138-238725-2, 2018.
2. Brett Shavers, “CyberCrime Investigation case studies - An Excerpt from placing the suspect behind the keyboard”, Elseiver, Syngress, 2013.

OUTCOMES:

Students who complete this course will be able to

- Evaluate standards and good practices for digital evidence and digital forensics
- Recognize the Digital Forensics in Law Enforcement
- Apply forensics techniques for analyzing computer systems and networks
- Gain specialist skills and knowledge in a relevant and increasingly essential area of criminology
- Describe the legalities, penalties, and punishment associated with cyber.
- Identify the different online frauds and computer mediated communications

CSCX 412	INFORMATION SECURITY INTELLIGENCE AND COMPLIANCE ANALYTICS USING BIG DATA	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the basic concepts of security systems and trusted baselines, which are widely used in the design of cloud security.
- To identify the suitable architecture for securing the cloud infrastructure.
- To detect the known threats and risks associated with secure cloud architecture.
- To provide knowledge on the time series analysis and text analysis.
- To understand the need and application of Big Data.
- To learn the security attacks in cloud computing

MODULE I INTRODUCTION TO INFORMATION SECURITY 7

Need for Security - Basic concepts - Assets, Threats, Vulnerabilities, Risks, and Controls - Security Professionals and Organizations – Security Management System - Implementing Information Security Strategy into Current Practices, Regulations, and Plans.

MODULE II INFORMATION SECURITY PLANNING PROCESS 7

Approaches to Implementing Information Security - Organizational Structure for Managing Information Security - Asset Management - Information Security Risk Management & Security Policies - Human Resource Security - Certification, Accreditation, and Assurance.

MODULE III BIG DATA ECO SYSTEM-1 8

Big Data Overview - Data Structures - Analyst Perspective on Data Repositories - State of the Practice in Analytics - BI Versus Data Science - Current Analytical Architecture

MODULE IV BIG DATA ECO SYSTEM-2 7

-Drivers of Big Data - Emerging Big Data Ecosystem and a New Approach to Analytics - Key Roles for the New Big Data Ecosystem - Examples of Big Data.

MODULE V BIG DATA ANALYTICS 8

Introduction – Difference between Traditional analytics and Big data Analytics –Need for Big Data Analytics in Cyber security – Applying Big Data Analytics in Cyber security – Challenges to Big Data analytics for Cyber security.

MODULE V BIG DATA IN EMERGING CYBERSECURITY DOMAINS 8

Data Visualization for Cyber Security – Big Data Analytics for Mobile App Security- Security, Privacy, and Trust in Cloud Computing – Cyber Security in Internet of Things(IoT).

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Mohammad Hammoudeh, Octavio Loyola-González, Reza M. Parizi, Zheng Xu," Cyber Security Intelligence and Analytics",Springer International Publishing, ISBN: 9783030433062, 3030433064, 2020.

REFERENCES:

1. Julia Deng, Onur Savas," Big Data Analytics in Cyber security", CRC Press, 9781498772167, 1498772161, 2017.
2. Corey Schou, Steven Hernandez, "Information Assurance Handbook: Effective Computer Security and Risk Management Strategies", McGraw Hill Education, First edition, ISBN: 9789339222376, 2015.
3. John Rittinghouse, James Ransome," Cloud Computing",CRC Press,1st Edition,ISBN:9781439806814,2016.

COURSE OUTCOMES:

- Compare modern security concepts as they are applied to cloud computing.
- Assess the security attacks of cloud computing system.
- Solve the problems associated with big data characteristics.
- Choose the appropriate data analysis technique for extracting the pattern.
- Describe the security of cloud computing environment with cloud datacenters.
- Identify similarities using appropriate measures.

CSCX 413 PENETRATION TESTING AND VULNERABILITY ASSESSMENT

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the penetration testing and methodology.
- To understand the client requirement for penetration testing.
- To gain the knowledge on vulnerability and social engineering process.
- To learn about the privilege escalation techniques.
- To study the advanced WLAN attacks & testing methodology.
- To experience the real-time supplementary tools.

MODULE I Fundamentals & Penetration Testing Methodology 7

Overview of penetration testing – types of testing – Advantages of testing – Level of Security – Vulnerability assessment – Security testing methodologies.

MODULE II Penetration Testers Aromory 8

Target Scoping – Client requirements – Preparing the test plan – Test boundaries – Information gathering – Document gathering – DNS information – Route information – Utilizing search engines – Target Discovery – Identifying the target machine – OS fingerprinting – Enumerating Target – Service Enumeration – VPN Enumeration.

MODULE III Vulnerability and Social Engineering 8

Types of vulnerabilities – Vulnerability taxonomy – Open Vulnerability Assessment System – Cisco analysis -Fuzzy analysis – SMB analysis – SNMP analysis – Web application analysis – Social engineering – Attack Process – Attack Methods – Social Engineering Toolkit (SET).

MODULE IV Privilege Escalation and Maintenance Access 8

Attacking the password – Network sniffers – Network spoofing tools – Protocol tunneling – Proxy – End to end connection – Documentation and reporting – Results verification – Types of reports – Presentation.

MODULE V Advanced WLAN attacks & Penetration Testing Methodology 7

Man-in-the-Middle attack (MITM) – Session Hijacking – Time for action – Security – Wireless penetration testing – Time for action – discovering wireless devices.

MODULE VI Supplementary Tools 7

Vulnerability scanner – Web application fingerprint – Network Ballista – Netcat – Setting up virtual test lab environment – Case study.

L- 45; Total Hours - 45

REFERENCES :

1. Shakeel Ali and Tedi Heriyanto, “Assuring Security by Penetration Testing”, Packt Publishing, UK, 2011.
2. Vivek Ramachandran “BackTrack 5 Wireless Penetration Testing”, Packt Publishing, India, 2011.
3. Thomas Wilhelm and Jason Andress, “Ninja Hacking Unconditional Penetration Testing Tactics and Techniques”, Syngress Elsevier Publisher, USA,2011.
4. Lee Allen, “Advanced Penetration Testing for Highly-Secured Environments”, Packt Publishing, India, 2012.

OUTCOMES :

Students to complete this course will be able to

- Narrate the fundamentals of penetration testing principles and security levels.
- Identify the routing protocols and enumeration strategies.
- Analyze the vulnerability taxonomy and social engineering toolkit.
- Analyze the network spoofing tools and report preparation techniques.
- Understand the advanced wireless local area network and penetration testing methodologies.
- Apply the various case studies on open-source software and open standards.

CSC X 414	LEGAL ISSUES IN INFORMATION ASSURANCE	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To know the key provisions of information security and privacy laws
- To investigate different types of intellectual property laws
- To explore the principles and applications of enterprise information security risk assessments, analyze relevant risks, conduct risk analysis, and apply risk management and enterprise risk governance practices
- To investigate the electronic data collection, digital evidence rules and procedures for e-Discovery and compliance
- To develop an applied understanding of the privacy protection concepts in information systems
- To build an applied understanding of enterprise information security incidence response, business continuity, disaster recovery planning from an organization, regulatory and legal perspective

MODULE I FUNDAMENTAL CONCEPTS 7

Why Is Information Security an Issue? - Basic Information Security Concepts – What Are Common Information Security Concerns? - What Are the Mechanisms That Ensure Information Security? - U.S. National Security Information.

MODULE II PRIVACY & SECURITY 8

Sources of Privacy Law – The Threats to Personal Data Privacy in the Information Age - Workplace Privacy - General Principles for Privacy Protection in Information Systems - Business Challenges Facing Financial Institutions - The Different Types of Financial Institutions - Consumer Financial Information - Who Regulates Financial Institutions? - The Gramm-Leach-Bliley Act - Federal Trade Commission Red Flags Rule - Payment Card Industry Standards - Case Studies and Examples.

MODULE III SECURITY AND PRIVACY OF INFORMATION BELONGING TO CHILDREN 9

Challenges in Protecting Children on the Internet - Children's Online Privacy Protection Act - Children's Internet Protection Act - Family Educational Rights and Privacy Act (FERPA) - Case Studies and Examples

MODULE IV SECURITY AND PRIVACY OF HEALTH INFORMATION 7

Business Challenges Facing the Healthcare Industry - Why Is Healthcare Information So Sensitive? - The Health Insurance Portability and Accountability Act - The Role of State

Laws Protecting Medical Records - Case Studies and Examples - Corporate Information Security and Privacy Regulation - The Sarbanes-Oxley Act of 2002 - Compliance and Security Controls - SOX Influence in Other Types of Companies - Corporate Privacy Issues - Case Studies and Examples

MODULE V FEDERAL GOVERNMENT INFORMATION SECURITY AND PRIVACY REGULATIONS 7

Information Security Challenges Facing the Federal Government - The Federal Information Security Modernization Act - Protecting Privacy in Federal Information Systems - Case Studies and Examples - State Laws Protecting Citizen Information and Breach Notification Laws - Breach Notification Regulations - Data-Specific Security and Privacy Regulations - Encryption Regulations - Data Disposal Regulations - Case Studies and Examples

MODULE VI PROTECTING CITIZEN INFORMATION AND BREACH 7

State Laws Protecting Citizen Information and Breach Notification Laws - Breach Notification Regulations - Data-Specific Security and Privacy Regulations - Encryption Regulations - Data Disposal Regulations - Case Studies and Examples

L – 45; TOTAL HOURS – 45

REFERENCES :

1. Legal Issues in Information Security, 2nd Edition by Joanna Lyn Grama, 2015, ISBN-13: 978-1-284-05474-3
2. Information Security and Privacy in Network Environments. United States: Office of Technology Assessment, Congress of the U.S., 1994. ISBN:9780160451881, 0160451884
3. Braman, James., Dudley, Alfreda., Vincenti, Giovanni. Investigating Cyber Law and Cyber Ethics: Issues, Impacts and Practices. Ukraine: Information Science Reference, 2012. ISBN:9781613501337, 1613501331

OUTCOMES :

Students who complete this course will be able to

- Describe the fundamentals concepts of Information security
- Identify the privacy and security issues of consumers
- Comprehend security and privacy of information belonging to children
- Analyze the security and privacy of health information
- Recognize federal government information security and privacy regulations
- Comprehend the protecting citizen information and breach.

CSCX 415 **SECURE ELECTRONIC COMMERCE** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To learn fundamentals of e-commerce, types and applications.
- To gain knowledge types of information systems in a business environment and their relationship to each other.
- To assess the impact of the Internet and Internet technology on business electronic commerce and electronic business.
- To Identify the major management challenges for building and using information systems.
- To explore learn strategies for e-commerce, Mobile Commerce, Wireless Application Protocol, WAP technology and Mobile Information devices.
- To build an own E-Commerce using Open Source Frameworks

MODULE I INTRODUCTION **7**

Definition of Electronic Commerce - E-Commerce: Technology and prospects - incentives for engaging in electronic commerce - Needs of E-Commerce - advantages and disadvantages – framework - Impact of E-commerce on business - E-Commerce Models.

MODULE II NETWORK INFRASTRUCTURE FOR E- COMMERCE **7**

Internet and Intranet based E-commerce- Issues, problems and prospects - Network Infrastructure - Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY) - Mobile Commerce: Introduction - Wireless Application Protocol - WAP technology - Mobile Information device.

MODULE III WEB SECURITY **7**

Security Issues on web - Importance of Firewall - components of Firewall - Transaction security - Emerging client server - Security Threats - Network Security - Factors to consider in Firewall design - Limitation of Firewalls.

MODULE IV ENCRYPTION **7**

Encryption techniques - Symmetric Encryption: Keys and data encryption standard - Triple encryption - Secret key encryption - Asymmetric encryption: public and private pair key encryption - Digital Signatures - Virtual Private Network.

MODULE V ELECTRONIC PAYMENTS **7**

Overview - The SET protocol - Payment Gateway – certificate - digital Tokens - Smart card - credit card- magnetic strip card - E-Checks- Credit/Debit card based EPS - online Banking - EDI Application in business - E- Commerce Law - Forms of Agreement - Govt. policies and Agenda.

MODULE VI CASE STUDY

Case Study: Identify Key components - strategy - B2B, B2C Models of

E-commerce - Business model of any e-commerce website - Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencart.

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Kenneth C.Laudon, Carol Guercio Traver —E-Commerce‖, Pearson, 10th Edition, ISBN 9780134839516, 2016.
2. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison Wesley, Dorling Kindersley Pvt Ltd, ISBN: 9788177583922, 8177583921, 2002.

REFERENCES:

1. Robbert Ravensbergen, —Building E-Commerce Solutions with WooCommerce‖, PACKT, 2nd Edition

COURSE OUTCOMES:

- Acquire knowledge on fundamentals of e-commerce, types and applications.
- Ability to processes of developing and implementing information Systems in a business environment.
- Aware of the ethical, social, and security issues of information systems.
- Develop an understanding of how various information systems work together to accomplish the information objectives of an organization
- Elaborate about the importance of managing organizational change associated with information systems implementation
- Design an own E-Commerce using Open Source Frameworks

CSC 416	CLOUD SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To appraise the students with basic knowledge on security issues from the cloud providers and users perspective.
- To teach a student how to secure private and public cloud
- To explain students how to develop a prototype for cloud security
- To Identify the threats, risks, vulnerabilities, side-channel attacks, and privacy issues associated with cloud-based IT services
- To study the security architectures that assure secure isolation of physical and logical infrastructures
- To detect the known threats, risks, vulnerabilities and privacy issues associated with Cloud based IT services.

MODULE I INTRODUCTION TO CLOUD COMPUTING AND SECURITY **7**

Understanding Cloud Computing- The IT Foundation for Cloud-Cloud Computing Architecture-Cloud Reference Architecture-Control over Security in the Cloud Model-Making Sense of Cloud Deployment-Making Sense of Services Models-How Clouds Are Formed and Key Examples-Real-world Cloud Usage Scenarios.

MODULE II SECURITY RISK ISSUES **7**

Cloud Computing: Security Concerns-Assessing Your Risk Tolerance in Cloud Computing-Legal and Regulatory Issues-

MODULE III SECURITY ARCHITECTURE **8**

Security Requirements for the Architecture-Security Patterns and Architectural Elements-Cloud Security Architecture-Planning Key Strategies for Secure Operation.

MODULE IV SECURING THE CLOUD: DATA SECURITY **8**

Overview of Data Security in Cloud Computing- Data Encryption: Applications and Limits-Cloud Data Security: Sensitive Data Categorization- Cloud Data Storage- Cloud Lock-in-Securing the Cloud: Key Strategies and Best Practices- Overview of Security Controls-The Limits of Security Controls- Security Monitoring.

MODULE V SECURITY CRITERIA: BUILDING AN INTERNAL CLOUD **7**

Private Clouds: Motivation and Overview- Security Criteria for Ensuring a Private Cloud-Security Criteria: Selecting an External Cloud Provider- Selecting a CSP: Overview of Assurance- Overview of Risks- Security Criteria.

MODULE VI EVALUATING CLOUD SECURITY: AN INFORMATION SECURITY FRAMEWORK **8**

Evaluating Cloud Security- Checklists for Evaluating Cloud Security- Metrics for the Checklists- Operating a Cloud- From Architecture to Efficient and Secure Operations- Security Operations Activities.

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Winkler, Vic JR. Securing the Cloud: Cloud computer Security techniques and tactics. Netherlands, First edition, 2011.
2. Cope, Robert, et al. Cloud Computing Design Patterns. United Kingdom, Pearson Education, Netherlands,Second edition, 2015.

REFERENCES:

1. Mather, Tim, Subra Kumaraswamy, and Shahed Latif. Cloud security and privacy: an enterprise perspective on risks and compliance "O'Reilly Media, Inc.", California**,** First edition, 2009.
2. Krutz, Ronald L., and Russell Dean Vines. Cloud security: A comprehensive guide to secure cloud computing. Wiley Publishing, New Jersey, First edition, 2010.

COURSE OUTCOMES:

- Comprehend the basics of cloud platforms and risk issues in cloud computing.
- Describe cloud security architecture, challenges and requirements
- Implement various core security controls for cloud computing
- Identifying best practices and strategies for a secure cloud environment
- Illustrate how to perform security analytics in cloud platform
- Design security architectures that assure secure isolation of physical and logical infrastructures including compute, network and storage, comprehensive data protection at all layers

SEMESTER VII

CSCX 143	**DEEP LEARNING**	**L**	**T**	**P**	**C**
		2	**0**	**2**	**3**

OBJECTIVES :

- To learn the machine learning basics
- To estimate the deep learning networks
- To describe the deep networks.
- To expose the students to sequence modeling
- To appraise the recent advances in deep learning.
- To summarize the practical methodology and applications of deep learning.

MODULE I MACHINE LEARNING BASICS FOR DEEP LEARNING 08

Learning Algorithms - Capacity, Overfitting and Underfitting -Hyper parameters and Validation Sets - Estimators, Bias and Variance - Maximum Likelihood Estimation - Bayesian Statistics - Stochastic Gradient Descent - Building a Machine Learning Algorithm - Challenges Motivating Deep Learning.

MODULE II DEEP LEARNING NETWORKS 07

Introduction – Historical context of Deep Learning – Classes of Deep Learning Network – Deep Networks for Unsupervised learning – Deep Networks for Supervised learning – Hybrid Deep Networks.

MODULE III DEEP NETWORKS: MODERN PRACTICES 08

Deep Feedforward Networks - Architecture Design - Back-Propagation and Other Differentiation Algorithms - Regularization for Deep Learning - Regularization and Under-Constrained Problems - Optimization for Training Deep Models - Optimization Strategies and Meta-Algorithms – Convolutional Network.

MODULE IV SEQUENCE MODELING: RECURRENT AND RECURSIVE NETS 08

Unfolding Computational Graphs - Recurrent Neural Networks - Deep Recurrent Networks - The Challenge of Long-Term Dependencies - Echo State Networks - The Long Short-Term Memory and Other Gated RNNs - Optimization for Long-Term Dependencies.

MODULE V PRACTICAL METHODOLOGY AND APPLICATION 07

Performance Metrics - Default Baseline Models - Selecting Hyperparameters - Debugging Strategies - Example: Multi-Digit Number Recognition – Applications - Computer Vision,

Speech Recognition and Natural Language Processing – Other Applications.

MODULE VI RESNET 07

Review of Deep Learning-Problems in Deep Learning- Deep Learning Architecture - Deep Rezidual Learning-Application of ResNet-Case Study.

L – 30; P – 30;TOTAL HOURS - 60

REFERENCES :

1. Li Deng and Dong Yu, “Deep Learning Methods and Applications”, Now Publisher, 1st Edition, ISBN: 1932-8346, 2014.
2. Josh Patterson, Adam Gibson, “Deep Learning”, O'Reilly Media, 1st Edition, ISBN: 978-1491914250, 2017.
3. Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning (Adaptive Computation and Machine Learning Series)”, MIT Press, 1st Edition, ISBN: 978-0262035613, 2017.
4. Tom M. Mitchell, Machine Learning, McGraw Hill Education, 1stEdition, ISBN: 978-1259096952, 2013.
5. LaureneFausett, “Fundamentals of Neural Networks: Architectures, Algorithms and Applications”, Pearson, 1st Edition, ISBN- 978-8131700532, 2004.

OUTCOMES :

Students who complete this course will be able to

- Illustrate the machine language applications in deep learning
- Identify the various deep learning algorithms and its application
- Evaluate the role of sequence modeling
- Compare the various deep learning network algorithms
- Apply the deep learning algorithms to solve real time problems.
- Acquire skills in handling situations involving application of deep learning

CSCX 147 WRITING SKILLS FOR ENGINEERING LEADERS

L	T	P	C
1	0	0	1

OBJECTIVES :

- To addresses the specific combination of thinking and writing skills needed to succeed in modern engineering.
- To describe how to avoid logical fallacies and use physical reasoning to catch mistakes in claims.
- To covers the essentials of technical grammar and style as well as the elements of mathematical exposition.
- To emphasizes the centrality of the target audience, and thus the need for clear and concise prose.
- To check for spelling, word choice, sentence structure, punctuation, paragraph and essay writing
- To learn the basics of English writing with its clear, concise concept explanations and useful, relevant corresponding exercise.

MODULE I WRITING BY DESIGN 07

Clearly understand the goal – Mindset for Technical writing – Avoid the worst thinking traps- Grammar and style.

MODULE II WRITING SKILLS 08

Basic Structure – The Paragraph – The Essay – Writing skills – Organizing ideas- Choosing quotations- Writing arguments and summaries – Revising and presenting work.

L – 15;TOTAL HOURS-15

REFERENCES :

1. Len Bass Edward J. Rothwell, Michael J. Cloud," Engineering Writing by Design: Creating Formal Documents of Lasting Value", CRC Press, ISBN: 9781482234329,2016.
2. Paige Wilson, Teresa Ferster Glazier," The Least You Should Know About English: Writing Skills, Form C", Cengage Learning, ISBN: 9781111830922,2013.

OUTCOMES :

Students who complete this course will be able to

- Demonstrates how effective writing can be achieved through engineering-based thinking.
- Locate the basic errors and mistakes for designing a document.

- Become expert in technical writing.
- Describe the writing skills formally.
- Become effective writers.
- Inbuilt confident on writing any technical document.

CSCX 148 SOFTWARE RELIABILITY

L	T	P	C
2	0	0	2

OBJECTIVES :

- To understand how to apply the principles of software reliability in a variety of context.
- To learn the techniques to find the reliability of software.
- To know the different models of software reliability.
- To study the various metrics used to measure the quality factors of software reliability
- To identify the responsibility of organization and staffing in achieving software reliability, and computer architecture and program correctness
- To explain the fault detection and correction approaches used in developing a quality software
- To illustrate the design principles for achieving higher reliable software system.

MODULE I SOFTWARE RELIABILITY CONCEPTS 10

Defining failure for the product, common measure for all associated systems, setting system failure intensity objectives, determining develop software failure intensity objectives, software reliability strategies, failures, faults and errors, availability, system and component reliabilities and failure intensities, predicting basic failure intensity.

MODULE II SOFTWAR RELIABILITY MODELING SURVEY 10

Introduction, Historical Perspective and Implementation, Exponential Failure Time Class of Models, Weibull and Gamma Failure Time Class of Models, Infinite Failure Category Models,Bayesian Models, Model Relationship, Software Reliability Prediction in Early Phases of the Life Cycle, software reliability growth modeling.

MODULE III SOFTWARE METRICS FOR RELIABILITY ASSESSMENT 10

Introduction, Static Program Complexity, Dynamic Program Complexity, Software Complexity and Software Quality, Software Reliability Modeling

L – 30; TOTAL HOURS - 30

REFERENCES :

1. Betsy Beyer, Chris Jones,“Site Reliability Engineering”, O’Reily Publishers,1st Edition,ISBN: 9781491929124,2016.
2. Shigeru Yamada “Software Reliability Modeling: Fundamentals and Applications”,

Springer publishers, ISBN: 9784431545644, 2014.

3. Michael R.Lyu, " Handbook of Software Reliability Engineering", Tata McGrawHill Publications, ISBN:9780070394001,2005.

OUTCOMES :

Students who complete this course will be able to

- Know the process and basic activities of software reliability engineering
- Apply methods for ensuring, evaluation and enhancing of software reliability
- Work better with other professionals at an organization to make decisions about the reliability of software.
- Implement different software reliability models and to evaluate the reliability of developed tool using different methods and tools.
- Apply the knowledge and select an appropriate software reliability model
- Perform an evaluation of software reliability and in case of necessity to enhance reliability.

CSCX 150 ADVANCED SAS: MACROS AND SQL

L	T	P	C
2	0	0	2

OBJECTIVES :

- To impart about basics of statistical analysis.
- To render the students to apply data analysis concepts.
- To expose the students to use macros and automate a process.
- To apply the SAS concepts in data management, applications development and data warehousing.
- To create macro programs to reduce the complexity of SAS
- To use SQL and SAS in effective database management.

MODULE I DATA MANIPULATION AND THE SAS PROGRAMMING LANGUAGE **10**

Introduction to SAS- Reading Raw Data from External Files - Displaying Your Data- Using Advanced INPUT Techniques.

MODULE II SAS MACRO LANGUAGE **10**

Introduction- Macro Variables-Built-In Macro Variables - LET Statement - Demonstrating a Simple Macro- Tokens -a Macro Variable as a Prefix –transfer of value between DATA Steps.

MODULE III SAS STRUCTURED QUERY LANGUAGE **10**

Basics-Joining Two Tables (Merge) -Left, Right, and Full Joins-Concatenating Data Sets -Summary Functions -an ORDER Clause -Fuzzy Matching.

L – 30;TOTAL HOURS-30

REFERENCES :

1. Alan C. Elliott, Wayne A. Woodward ”SAS Essentials: Mastering SAS for Data Analytics, 2nd Edition,ISBN: 978-1-119-04216-7,2015
2. Ron Cody, “Learning SAS® by Example: A Programmer's Guide”, Sas Inst Edition ISBN: 9781599941653, 1599941651,2010

OUTCOMES :

Students who complete this course will be able to

- Develop new macro code to write more efficient SAS programs .
- Utilize the SQL procedure as an easy, flexible way to query and combine your data.
- Apply advanced SAS programming techniques such as creating samples and indexes, using lookup tables to match data, and modifying and tracking data set changes.
- Transcribe SAS programs to maximize efficiency.
- Create SAS variables and recode data values.
- Using advanced DATA step programming statements to improve efficiency.

CSCX 157 SOFTWARE PROCESS AND PRODUCT QUALITY

L	T	P	C
1	0	0	1

OBJECTIVES :

- To explain the basic concepts of the software process and modeling.
- To discuss the detailed concepts of descriptive process modeling.
- To describe the software process engineering metamodel and tools.
- To collect data to measure product factors and aggregate the results up to quality aspects.
- To analyze the product quality based on the quality evaluation and measures.
- To focus on the individual development of business information systems.

MODULE I THE SOFTWARE PROCESS 07

Motivation - Software Process Modeling and improvement – Process modeling goals and Benefits – Prescriptive process models – classes – Process standards – Goals of descriptive process models - creation - descriptive process modeling alternatives – Managing risk in descriptive process modeling efforts - Process modeling notations and tools

MODULE II SOFTWARE QUALITY 08

Introduction - Software Quality-Terms and Definitions-Overview of SQuaRE series of standards- Quality Models set into context- Software measures- Quamoco quality models - Quality model maintenance - Model building and requirements-Quality control loop-Quality evaluation and measurements

L – 15;TOTAL HOURS-15

REFERENCES :

1. Jurgen Munch, Ove Armbrust, Martin Kowalczyk, Martín Soto, Software Process Definition and Management, Springer Science & Business Media, ISBN: 978-3-642-24291-5, 2012.
2 Wagner, Stefan, Software product quality control, Springer, ISBN:978-3-642-38570-4, 2013.

OUTCOMES :

Students who complete this course will be able to

- Explore the basic concepts of the software process.
- Illustrate the goals, creation and guidelines of the descriptive process models.

- Understand the process modeling and apply the models using tools.
- To summarize quality terms, definitions, standards and measures.
- Analyze the Product quality based on the quality evaluation and measures.
- Apply the quality control knowledge into real time case study.

CSCX 158 SYSTEM INTEGRATION

L	T	P	C
2	0	0	2

OBJECTIVES :

- Define the basics and other technical aspects associated in the integration of various applications.
- To analyze various process models and apply for better systems integration.
- To plan the system process for appropriate integrations.
- Identify information systems application and organization characteristics to carry out the concurrency.
- Discuss the characteristics of systems integration process in each project emphasizing various management issues.
- Explain the requirement analysis that help in systems integration by identifying the appropriate tools facilitate the creation of such services.

MODULE I INTRODUCTION 10

Introduction to integration-principles of integration-essence of integration-metrics-constraint –framework.

MODULE II PROCESS INTEGRATION 10

Interfaces-Functional Analysis-Organizational models-Issues-limits-Lifecycle stages-metrics-Problem domain analysis-Stakeholder Analysis-Process model.

MODULE III INTEGRATION MANAGEMENT 10

Granularity-Abstraction-process management-quality-Integration strategy-Integration model-patterns

L – 30;TOTAL HOURS-30

REFERENCES :

1. E Gary O. Langford “Engineering Systems Integration: Theory, Metrics, and Methods” by CRC Press, ISBN 9781138074125, 2017.
2. Andrea Prencipe, Andrew Davies, Mike Hobday “.The Business of Systems Integration” Oxford University Press, USA. ISBN-10: 9780199263233,2005
3. Fred A. Cummins ,”Enterprise Integration: An Architecture for Enterprise Application and Systems Integration” Wiley1st Edition. ISBN-10: 0471400106,2002

OUTCOMES :

Students who complete this course will be able to

- Identify the key challenges, basic concepts, and strategies related to systems integration projects.
- Solve organizational and managerial issues related to systems integration projects.
- Apply key systems integration architecture, methodologies, and technologies assessing the application.
- Define and analyze systems integration requirements based on the business process models.
- Design feasible solutions for an integration problem that utilizes proven design solutions described in integration patterns.
- Apply latest integration technologies to implement system integration solutions.

CSCX 161 **FULL STACK MOBILE APPLICATION DEVELOPMENT I (FRONT END)**

L	T	P	C
2	0	2	3

OBJECTIVES :

- Provide an overview of the web framework
- Show the steps in building a web page from scratch
- Introduce the notion of scripting and control functions in web pages
- Explain the Bootstrap CSS framework into web design
- Illustrate the facilities in the Angular JS Javasript App framework
- Show how the views can be redesigned with the ReactJS framework

MODULE I BASICS 07

HTML –Basics - Common elements – Formatting HTML text –Headings - Style – Tables – Forms – Element grouping – Graphics – Media – APIs – Examples –CSS – Syntax – Colors – Backgrounds – Margins – Text – Font – List – Tables – Examples.

MODULE II JAVASCRIPT 08

Javascript – Variables –Operators – Datatypes –Objects – Scope – Events - Functions – Control loops – Arrays –Forms – Forms API - DOM –Events – Strings - Numbers - Simple UI design – JSON.

MODULE III JQUERY 08

Basics –DOM- CSS – Chaining – Jquery function - Filters –custom filters – selector filters - Functions – Traversal –Traversal up the DOM – CSS expressions – Forms – Manipulation - Creating, operating, and adding HTML on the fly- HTML forms Events

MODULE IV BOOTSTRAP 07

User Input - Forms – Tables – Images – Media - Bootstrap Javascript components – Advanced programming - Case studies.

MODULE V DESIGN OF EXPERIMENTS 08

Angular JS - Directives – Filters – Data binding – Views – Controllers – Scope – Modules – Creating a container in a Module - Routes - Role of Routes– Factories - Services – Example Case study .

MODULE VI React JS 07

Statefull Vs Stateless Components – Container react application – Solving a problem using React- React lifecycle – Building complex React components – Using Flux in ReactJS – Case studies on using ReactJS.

L – 30; P – 30;TOTAL HOURS - 60

REFERENCES :

1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, “Mastering HTML, CSS & Javascript”, BPB Publications; First edition, ISBN-10: 8183335152, 2016
2. Chris Aquino, Todd Gandee, “Front-End Web Development: The Big Nerd Ranch Guide”, Oreilly Publishing, ISBN-10: 0134433947, 2016
3. Cody Lindley , “jQuery Cookbook", Oreilly Publishing, ISBN 10: 1449342841 , 2010.
4. Dan Wahlin,”AngularJS in 60 Minutes”, Wahlin Consulting – 2013, ISBN: 989948351620
5. Artemij Fedosejev, “React.JS Essentials”, PACKT Publishing, ISBN: 9781783551620, 2015.

OUTCOMES :

Students who complete this course will be able to

- Build a basic web page using HTML and CSS
- Control the web page design with the Javascript functions
- Expand the views and libraries using CSS and ReactJS
- Use the Bootstrap framework for developing responsive, mobile first projects on the web
- Use JQuery for DOM traversal, event handling and animation
- Implement the MVC pattern to separate presentation, data, and logic components using the AngularJS components
- Update the View for the user and control the application workflow using ReactJS

CSCX 169 SOFTWARE MAINTENANCE

L	T	P	C
2	0	0	2

OBJECTIVES :

- To describe the importance of software maintenance.
- To demonstrate the software maintenance processes and tools for maintenance.
- To explain the normal and special practices for software maintenance.
- To expose coherent and comprehensive coverage of software change concepts.
- To have a theoretical base for the skills required to effect, control and manage changes in software systems.
- To study the requirements reengineering and legacy information system in software maintenance.

MODULE I BASIC CONCEPTS 10

Evolution Versus Maintenance – Software Evolution Models and Processes – Reengineering: Concepts ,Process, Techniques – Legacy Systems – Impact Analysis – Categories of Maintenance Concepts – Maintenance of cost-based Systems

MODULE II MAINTENANCE MODELS 10

Reuse-Oriented Model – Staged Model: Closed Source Model, Open Source Software – Change Mini-Cycle Model – IEEE/EIA Maintenance Process – ISO/IEC 14764 Maintenance Process - Software Configuration Management – CR Workflow.

MODULE III REENGINEERING AND LEGACY INFORMATION SYSTEM 10

Reengineering: Concepts ,Process – Code reverse Engineering - Data reverse engineering – Wrapping – Migration : Planning, Methods.

L – 30;TOTAL HOURS-30

REFERENCES :

1. PriyadarshiTripathy ,KshirasagarNaik , “Software Maintenance and Evolution: A Practitioner's Approach” John Wiley & Sons, Hoboken, NJ , ISBN: 978-0-470-60341-3, 2014.
2. JorgRech , Christian Bunse,” Emerging Technologies for the Evolution and Maintenance of Software Models” ISBN: 9781613504383, 2011.
3. Penny Grubb, Armstrong A .Takang, “Software Maintenance Concepts and Practice”, 3rd Edition, World Scientific Publishing Company, ISBN: 978-9812384263, 2008.

4. Alain April, Alain Abrain, “Software Maintenance Management Evolution and Continuous Improvement”, IEEE computer Society Publication, ISBN: 8780470147078, 2008.
5. Paul Hopkin, “Fundamentals of Risk Management- Understanding, evaluating and implementing effective risk management”, 1st Edition, IRM Publishers, Kogan Page Limited, ISBN 978-0-7494-5943-7, 2010.

OUTCOMES :

Students who complete this course will be able to

- Formulate the maintenance procedures in routine maintenance.
- Relate process models and software maintenance tools in Software maintenance.
- Apply methods to solve software problems and analyze the case studies in Software maintenance.
- Identify and correct common faults in software applications.
- Utilize operating system components, diagnostic software and supplied documentation to detect and correct faults.
- Describe the maintenance and measurement of reengineering.

CSCX 174 5G WIRELESS COMMUNICATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES :

- To provide an overview of fifth-generation (5G) wireless communications systems.
- To impart knowledge about the 5G enabler mmWave Spectrum
- Expose the students to the radio-access technologies.
- To acquaint students with various types of relaying and coding techniques.
- To improve students' understanding of 5G spectrum and Channel model.
- To impart knowledge on the cutting-edge technologies that are main topic for industrial research departments and standardization groups in industry (as well as many academic research groups).

MODULE I HISTORICAL BACKGROUND 08

Introduction - Historical background - From ICT to the whole economy - Rationale of 5G - Global initiatives - Standardization activities - 5G use cases and system concept - Use cases and requirements -Requirements and key performance indicators - 5G system concept - Concept overview - Extreme mobile broadband- Massive machine-type communication - Ultra-reliable machine-type communication - Dynamic radio access network - Lean system control plane - Localized contents and traffic flows - Spectrum toolbox

MODULE II 5G ARCHITECTURE 08

Introduction - High-level requirements for the 5G architecture - Functional architecture and 5G flexibility - Physical architecture and 5G deployment - Machine-type communications - Fundamental techniques for MTC - Massive MTC - Ultra-reliable low-latency MTC - Device-to-device (D2D) communications - D2D: from 4G to 5G - Radio resource management for mobile broadband D2D - Multi-hop D2D communications for proximity and emergency services - Multi-operator D2D communication - Millimeter wave communications - Spectrum and regulations - Channel propagation - Hardware technologies for mmW systems - Deployment scenarios - Architecture and mobility - Beam forming - Physical layer techniques.

MODULE III RADIO ACCESS TECHNOLOGIES 08

The 5G radio-access technologies - Access design principles for multi-user communications - Multi-carrier with filtering: a new waveform - Non-orthogonal schemes for efficient multiple access - Radio access for V2X communication - Radio access for massive machine-type communication - Massive multiple-input multiple-output (MIMO) systems - Theoretical background - Pilot design for massive MIMO - Resource allocation

and transceiver algorithms for massive MIMO - Fundamentals of baseband and RF implementations in massive MIMO - Channel models.

MODULE IV RELAYING AND WIRELESS NETWORK CODING 08

The role of relaying and network coding in 5G wireless networks - Multi-flow wireless backhauling - Highly flexible multi-flow relaying - Buffer-aided relaying - Interference management, mobility management, and dynamic reconfiguration - Network deployment types - Interference management in 5G - Mobility management in 5G - Dynamic network reconfiguration in 5G.

MODULE V 5G SPECTRUM 07

Spectrum challenges in 5G - 5G spectrum landscape and requirements - Spectrum access modes and sharing scenarios - 5G spectrum technologies - Value of spectrum for 5G: a techno-economic perspective - The 5G wireless propagation channel models - Modeling requirements and scenarios - The METIS channel models.

MODULE VI SECURITY FOR 5G COMMUNICATIONS 06

Overview of a Potential 5G Communications -System Architecture - Security Issues and Challenges in 5G – communicationsSystems - User Equipment - Access Networks - Mobile Operator's Core Network - External IP Networks.

L – 45; TOTAL HOURS-45

REFERENCES :

1. 1 MischaDohler, Jose F. Monserrat, AfifOsseiran, "5G Mobile and Wireless Communications Technology", Cambridge University Press, 1st Edition, ISBN: 9781316653166, June 2016.
2. Fundamentals of 5G Mobile Networks, Jonathan Rodriguez, John Wiley & Sons, Ltd., 2015, 1st Edition, ISBN: 9781118867525.

OUTCOMES :

Students who complete this course will be able to

- Describe the rationale of 5G.
- Understand the limitations of current networks as well as the requirements of the next generation, motivated by the vertical industries
- Illustrate the foreseen architecture for 5G, harnessing all the common views on the current technology trends and the emerging applications
- Evaluate the benefits and detriments of 5G wireless communication.
- Compose a report with recommendations for an use case
- Describe Key components like use of mm-wave spectrum, massive MIMO systems, heterogeneous networks, and device-to-device communications.

CSCX 145 SECURITY LAW AND COMPLIANCE

L	T	P	C
2	0	0	2

OBJECTIVES :

- To understand how to apply the principles of information security management in a variety of contexts.
- To equip students with the analytical skills and tools to address technology law issues.
- To learn the techniques and prove their compliance.
- To understand the main drivers forcing companies to look into Governance, Risk management, Compliance and Information Security solutions.
- To create a security awareness and manage the security laws
- To implement practical steps to cope with technology law risk.

MODULE I MANAGING SECURITY 10

Creating a Security program – Asset Management and Documentation – Policies – Standards and Procedures

MODULE II SECURITY LAW 10

Security – World of Securities Law – Business Context of Securities Law – How Securities are registered under the securities act

MODULE III MANAGEMENT ISSUES 10

IT Security Controls plans - Bottom of Form And procedures – Security Awareness, Training and Education – Security auditing – Legal and Ethical aspects

L – 30;TOTAL HOURS-30

REFERENCES :

1. Lee Brotherston, Amanda Berlin, “Defensive Security Handbook”, O’Reilly publishers, 1st Edition, ISBN: 978-1491960387, 2017.
2. Larry Soderquist &Theresa Gobaldon, “Security Law”, Foundation Press, 5th Edition, ISBN:9781609304690, 2014.
3. William Stallings & Lawrie Brown, “Computer Security Principles and Practice, Pearson Education, 3rd Edition, ISBN: 9780133773927, 2015.

OUTCOMES :

Students who complete this course will be able to

- Evaluate technologies, such as digital signatures, to comply with the law and serve as evidence.
- Appreciate current and imminent legislation pertinent to ICT governance, risk management and compliance.
- Make decisions about the law of data security and investigations.
- Identify the Interrelationship between the various elements of information security management and its role in protecting organizations.
- Demonstrate work in compliance with established standards and relevant legislation in the protection, security and investigation fields.
- Assign and evaluate delegated duties and responsibilities in compliance with organizational policies and procedures.

CSCX 168 SECURE INTERCONNECTING SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES :

- To define fundamentals and basic principles that are necessary for the network security protocols, such as the SSL/TLS protocols.
- To explain the perspective of the various technologies and protocols that can be used to provide basic security services at the transport layer of the TCP/IP protocol stack.
- To illustrate Traffic and security analysis of TLS and DTLS protocols
- To address the issues those are relevant for the understanding of the SSL/TLS protocols and their proper use.
- To estimate security measures of the system and using the techniques detect or protect the security related issues.
- To evaluate the security services based on the security standards.

MODULE I INTRODUCTION 06

OSI security Architecture – Security Definition – Cryptography Systems – Classes – Secure Cryptosystems – History – Legal Situation – Crypto systems – unkeyed – super key – public key

MODULE II TRANSPORT LAYER SECURITY 07

Introduction – protocol evolution – SSL Protocol – Record protocols - Handshake protocol – Change cipher spec protocol – Alert protocol – Application Data Protocol – Traffic analysis of a SSL session - Security analysis

MODULE III TLS PROTOCOL 09

Introduction – TLS1.0 –TLS 1.1 – TLS 1.2 – Traffic analysis of a TLS session – Security analysis – DTLS Protocol – DTLS1.0 – DTLS 1.2 – Security analysis

MODULE IV FIREWALL AND PUBLIC KEY CONCEPT 08

Firewall traversal – SSL/TLS tunneling – SSL/TLS Proxying – Public key Certificates – PGP certificates – X.509 Certificates: Wild card Certificates, International step up and SGC Certificates, Extended validation Certificates – Client Certificates

MODULE V INTERNET SECURITY 08

System Intrusion detection and prevention – Computer forensics – Network forensics – Forensics tools – Scanning, filtering and blocking – Virus filtering – Content filtering.

MODULE VI STANDARDIZATION AND SECURITY CRITERIA 07

Product standardization – security evaluations – Major security evaluation criteria – Conquering the last frontier in the digital invasion

L – 45;TOTAL HOURS - 45

REFERENCES :

1. Oppliger, Rolf. SSL and TLS: Theory and Practice, Second edition, Artech House, ISBN- 978-1-59693-447-4, 2016.
2 Joseph Migga Kizza, Guide to Computer Network Security Computer Communications and Networks, 3rd edition, Springer, ISBN: 9781447166542, 2015.
3 Singh, Brijendra. Network Security and Management, PHI Learning Pvt. Ltd., ISBN: 978-8-12034-497-6, 2011.

OUTCOMES :

Students who complete this course will be able to

- Describe the basic principles of cryptography relevant for the SSL/TLS protocols.
- Summarize the overall activities of SSL protocol.
- Compare and contrast the concepts of TLS, SSL protocols and DTLS protocol.
- Analyze how transport layer protocols securely traverse a firewall and certificates.
- Apply the security related techniques to simple scenarios and discuss the techniques.
- To appraise the security services based on the security standards.

CYBER SECURITY ELECTIVES

CSCX 328 BLOCKCHAIN & CRYPTO CURRENCY TECHNOLOGY L T P C

3 0 0 3

COURSE OBJECTIVES :

- To overview the transformation of physical money to digital money
- To outline the evolution of cryptocurrencies like bitcoins and Ethereum.
- To understand the purpose of Blockchain for secure transaction of cryptocurrencies.
- To explore the process of mining and its applications in real domain
- To gain knowledge on Initial Coin Offerings and its funding policies.
- To learn about the future uses of the blockchain in various industries.

MODULE I PHYSICAL AND DIGITAL MONEY 8

Money – Physical Money - Digital Money - Interbank payment – Bank Accounts – International Payment – Cryptography – Encryption and Decryption – Hashes – Digital Signatures

MODULE II CRYPTOCURRENCIES 7

Bitcoin – Practice – predecessors – Early history – Price – Storing Bitcoins – OTC brokers – Ethereum – Ethereum Vs Bitcoin – Smart Contracts – Ethereum's History – Actors – Price – Forks – Bitcoin, Ethereum and other cryptocurrencies case study. – Digital Tokens and Transactions.

MODULE III BLOCKCHAIN TECHNOLOGY 8

Blockchain – Purpose – Types of blockchain–Distributed Ledgers, Distributed Ledger Technology, Public and Private Blockchain, Shared Ledger, Fully Private and Propriety blockchains, Tokenised & Tokenless Blockchains - Structure of a Block - Block Header - Block Identifiers - Block Header Hash and Block Height - The Genesis Block - Linking Blocks in the Blockchain- Merkle Trees - Merkle Trees and Simplified Payment Verification (SPV).

MODULE IV MINING CONSENSUS -1 8

Bitcoin Economics and Currency Creation-De-centralized Consensus - Independent Verification of Transactions - Mining Nodes - Aggregating Transactions into Blocks - Transaction Age, Fees, and Priority - Coinbase Reward and Fees - Structure of the Generation Transaction - Coinbase Data - Constructing the Block Header -

MODULE V MINING CONSENSUS -2 7

Mining the Block - Proof-of-Work Algorithm - Difficulty Representation - Difficulty Target and Re-Targeting - Successfully Mining the Block - Validating a New Block - Assembling and Selecting Chains of Blocks - Blockchain Forks- Mining and the Hashing Race - The Extra Nonce Solution - Mining Pools - Consensus Attack.

MODULE VI INITIAL COIN OFFERINGS 7

Initial Coin Offerings(ICO's) – ICO's work – Funding stages - Whitepapers – Token sale – Whitelisting – Exchange listing - Token Security – Investing – Pricing – Risks and Mitigation – Applications of Blockchain.

L – 45;TOTAL HOURS-45

TEXT BOOKS:

1. Antony Lewis, "The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them (Cryptography, Crypto Trading, Digital Assets, NFT)", Mango Media, ISBN-13 : 978-1633538009, 2018.
2. Andreas M. Antonopoulos, " Mastering Bitcoin – Unblocking Digital Crypto-Currencies", O'Reilly Media, ISBN: 9781491954386, 2017.

REFERENCES:

1. Bashir, Imran,"Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained", Packt Publishing Ltd, ISBN-13 978-1788839044, 2018.
2. Soze, Keizer. "Blockchain: Mastering Blockchain (Volume 2)." , Createspace Independent Publisher, ISBN-13 : 978-1974263301, (2017).
3. Ambadas Tulaja, Arshad Sarfraz, Sham M R , "Blockchain for Enterprise Application Developers", Wiley Publications, ISBN 978-81-265-9996-7, 2020.

OUTCOMES :

Students who complete this course will be able to

- Describe the growth of digital money and its uses.
- Examine the need of cryptocurrencies for digital transactions.
- Apply the process of Blockchain in secure cryto-currency business.
- Investigate various mining algorithms and implement in various industries..
- Analyze funding agencies for secure digital transactions in real time applications.
- Apply the concepts of innovation the development of Bitcoin and Digital Currencies.

CSCX 326	SECURITY IN INDUSTRY 4.0	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Understand the drivers and enablers of Industry 4.0
- To Appreciate the smartness in Smart Factories, Smart cities, smart products and smart services
- To Able to outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world
- To Appreciate the power of Cloud Computing in a networked economy
- To Understand the opportunities, challenges brought about by Industry 4.0 and how organisations and individuals should prepare to reap the benefits
- To Learn the applications and tools of Industry 4.0.
-

MODULE I Industry 4.0 -1 **7**

The Various Industrial Revolutions - Digitalisation and the Networked Economy - Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0 - The Journey so far: Developments in USA, Europe, China and other countries

MODULE II Industry 4.0 -2 8

Comparison of Industry 4.0 Factory and Today's Factory - Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation

MODULE III Road to Industry 4.0 **7**

Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services - Smart Manufacturing - Smart Devices and Products - Smart Logistics - Smart Cities - Predictive Analytics

MODULE IV Related Disciplines, System, Technologies for enabling Industry 4.0 **8**

Cyberphysical Systems - Robotic Automation and Collaborative Robots - Support System for Industry 4.0 -Mobile Computing - Related Disciplines - Cyber Security

MODULE V Role of data, information, knowledge and collaboration in future organizations **7**

Resource-based view of a firm - Data as a new resource for organizations - Harnessing and sharing knowledge in organizations - Cloud Computing Basics - Cloud Computing and Industry 4.0

MODULE IV Business issues in Industry 4.0 **8**

Opportunities and Challenges - Future of Works and Skills for Workers in the Industry 4.0 Era - Strategies for competing in an Industry 4.0 world

\L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Alasdair Gilchrist, “Industry 4.0: The Industrial Internet of Things”, Apress, 2016
2. Lan Gibson, David W. Rosen and Brent Stucker, “Additive Manufacturing Technologies Rapid Prototyping to Direct Digital Manufacturing”, Springer, 2010.
3. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat, “Industrial Internet of Things: Cyber manufacturing Systems” (Springer)
4. McEwen and H. Cassimally, Designing the Internet of Things, 1st edition, Wiley, 2013, ISBN-10: 111843062X
5. Bagha and V. Madisetti, Cloud Computing: A Hands-on Approach, 1st edition, Universities press, 2015, ISBN-10: 8173719233.
6. Evans, Beginning Arduino Programming – Writing Code for the Most Popular Microcontroller Board in the World, 1st edition, Apress, 2011, ISBN13: 9781430237778.
7. Chin and J. Weaver, Raspberry Pi with Java: Programming the Internet of Things (IoT), 1st edition, McGraw Hill Publisher, 2015, ISBN-10: 0071842012.

REFERENCES:

1. Andreas Gebhardt, “Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing”, Hanser Publisher, 2011.
2. J. Chanchaichujit, A.Tan, Meng, F., Eaimkhong, S. “Healthcare 4.0 Next Generation Processes with the Latest Technologies”, Palgrave Pivot, 2019.
3. F. Lamb, Industrial Automation: Hands on, 1st edition, McGraw-Hill Education, 2013, ISBN10:0071816453
4. M. Kuniavsky, Smart Things: Ubiquitous Computing User Experience Design, 1st edition, Morgan Kaufmann, 2010, ISBN-10: 0123748992
5. The Industrial Internet of Things Volume G1: Reference Architecture – IIC 7. Industrial Internet of Things Volume G4: Security Framework –IIC

OUTCOMES:

- Understand the drivers and enablers of Industry 4.0
- Appreciate the smartness in Smart Factories, Smart cities, smart products and smart services
- Outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world

- Understand the opportunities, challenges brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits
- Publish and distribute Android Application
- Identify the applications and Tools of Industry 4.0

CSCX 329 SECURITY GOVERNANCE, RISK AND COMPLIANCE

L	T	P	C
3	0	0	3

OBJECTIVES :

- To explain the key security requirements of information systems.
- To learn the importance of governance and risk management
- To represent the security design architectures
- To provide adequate knowledge on business continuity planning and disaster recovery planning
- To acquire in-depth knowledge on the physical security control, operations security
- To study intellectual property law

MODULE I INFORMATION SECURITY AND PRINCIPLES **7**

Introduction-Growing Importance of IT Security - Increase in Demand by Government - Importance of a Multidisciplinary Approach - Contextualizing Information Security - Information Security Principles of Success - Information Security Common Body of Knowledge

MODULE II GOVERNANCE AND RISK MANAGEMENT **8**

Introduction to Security Policies and its types - Developing and Managing Security Policies - Providing Policy Support Documents - Suggested Standards Taxonomy - Asset and Data Classification - Employment Hiring Practices - Risk Analysis and Management

MODULE III SECURITY ARCHITECTURE AND DESIGN **9**

Defining the Trusted Computing Base - Protection Mechanisms in TCB - System Security Assurance Concepts - Trusted Computer Security Evaluation Criteria - The Canadian Trusted Computer Product Evaluation Criteria - The Federal Criteria for Information Technology Security - The Common Criteria

MODULE IV EVALUATION MODELS AND ETHICS **7**

The Common Evaluation Methodology - Confidentiality and Integrity Models - Advanced Models- Intellectual Property Law - Other Ethics Standards

MODULE V BUSINESS CONTINUITY PLANNING AND DISASTER RECOVERY PLANNING **7**

Overview of the Business Continuity Plan and Disaster Recovery Plan – Need of Business Continuity Plan – Creating Business impact analysis - Identifying and testing Recovery Strategies

MODULE VI **PHYSICAL SECURITY CONTROL, OPERATIONS SECURITY, ACCESS CONTROL SYSTEMS AND METHODOLOGY** **7**

Physical Security Domain - Operations Security Principles - Operations Security Process Controls and Actions - Terms and Concepts - Principles of Authentication – Biometrics - Single Sign On

L – 45; TOTAL HOURS – 45

REFERENCES :

1. Stamp, Mark. "Information Security: Principles and Practice" Hoboken, N.J.: Wiley, 2nd edition, 2011.
2. Whitman, M. E., &Mattord, H. J., Principles of Information Security. Cengage Learning, 4th Edition, 2014.
3. Iannarelli, J. G., & O'Shaughnessy, M. O, "Information governance and security: Protecting and managing your company's proprietary information", Waltham, MA: Butterworth Heinemann, Elsevier. 2015

OUTCOMES :

Students who complete this course will be able to

- Demonstrate the principles of information security
- Comprehend the governance and risk management
- Identify the security architecture aspects
- Design business continuity planning and disaster recovery planning activities
- Apply the physical security control and operations security principles.
- Modify and improve the security and risk management

CSCX 330 OPERATING SYSTEM SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES :

- To know the different popular operating systems and file systems
- To recognize the fundamentals of operating system security
- To manage the balance between function and security
- To learn how to secure the commercial operating systems
- To recognize the challenges in Secure Capability Systems
- To study the Linux security model

MODULE I INTRODUCTION **8**

Introduction to Operating Systems - DOS/OS/NOS-Review Number System & Logic Gates-VMware & Others – Operating system Fundamentals – popular operating system – File System – Installing and updating operating system - Virtualization and Cloud Computing Fundamentals

MODULE II OPERATING SYSTEM SECURITY **8**

Secure operating system – Security Goals – Trust Model – Threat Model – Access Control Fundamentals – Protection System – Reference Monitor – Secure Operating System Definition – Assessment Criteria – Multics system – Multics Security – Multics Vulnerability Analysis

MODULE III SECURITY IN ORDINARY OPERATING SYSTEMS **8**

System Histories – UNIX Security – Windows Security –Verifiable security goals – Information – Information Flow Security Model – Information Flow Integrity Model – Covert Channels

MODULE IV SECURITY KERNEL AND SECURING COMMERCIAL OPERATING SYSTEMS **9**

Security Kernel – Secure Communication Processor – Gemini Secure Operating System – Retrofitting Security into Commercial OS – History of retrofitting Commercial OS's – Commercial Era – Microkernel Era – UNIX Era

MODULE V SECURE CAPABILITY AND VIRTUAL MACHINE SYSTEM **9**

Capability System Fundamentals – Capability Security – Challenges in Secure Capability Systems – Building Secure Capability systems – Separation Kernels – VAX VMM Security Kernel - System Assurance

MODULE VI CASE STUDY **9**

Solaris Trusted Extensions – Trusted Extension Access Control – Trusted Extensions Mediation – Process Rights Management – RBAC – Trusted Extension Networking – Multilevel services – Administration – Linux Security Model – Security Enhanced Linux

L-45 ;TOTAL HOURS-45

REFERENCES :

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, John Wiley & Sons ,Inc., 9th Edition, 2013.
2. Trent Jaeger, “Operating System Security “,Morgan publishers & Claypool Publishers,2008.
3. Michael J.Palmer, “Guide to Operating Systems Security”, Thomson/Course Technology, 2004.
4. William Stallings, “Operating System: Internals and Design Principles”, Prentice Hall, 7th Edition, 2012.
5. Tom Adelstein and Bill Lubanovic, “Linux System Administration”, O'Reilly Media, Inc., 1st Edition, 2007.

OUTCOMES:

Students who complete this course will be able to

- Install and update the different operating systems and file systems
- Identify and assess current and anticipated security risks and vulnerabilities
- Monitor, evaluate and test security conditions and environment
- Analyze and build secure capability system
- Secure the commercial operating system
- Demonstrate the ability to comply with local security policy and take appropriate action during an incident

CSCX 335 **SECURITY IN SMART DEVICES** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To familiarize with IoT models and security challenges
- To explore the security engineering and IOT lifecycle
- To recognize the cryptographic fundamentals of smart devices
- To elaborate on key management and privacy concerns
- To get insights the user authentication level
- To gain knowledge on IOT cloud security

MODULE I INTRODUCTION TO IOT 7

IOT – Applications – Enterprises – cybersecurity vs IOT security - Vulnerabilities – Attacks – Countermeasures – Threat modelling an IOT system

MODULE II SECURITY ENGINEERING AND IOT SECURITY LIFECYCLE 8

Security Engineering: Security in agile – safety and security design – Processes and agreements – Technology selection - IOT security lifecycle: Implementation and integration – Operations and maintenance - dispose

MODULE III CRYPTOGRAPHIC FUNDAMENTALS FOR IOT SECURITY ENGINEERING 7

Cryptography and its role in securing the IoT - Types and uses of cryptographic primitives - Encryption and decryption - Symmetric encryption - Asymmetric encryption – Hashes - Digital signatures - Symmetric (MACs) - Random number generation – Ciphersuites - Cryptographic module principles

MODULE IV KEY MANAGEMENT AND MITIGATING IOT PRIVACY CONCERNS 8

Key Management - Accounting and management – IOT Cryptographic – ZigBee - Bluetooth-LE - Symmetric keys – Certificates - X.509 - IEEE 1609.2 – Biometrics - Privacy challenges introduced by the IoT

MODULE V IOT USER LEVEL AUTHENTICATION 7

Edge Computing - Anonymous Mutual Authentication Protocol - Biometric-Based Robust Access - Gadget Free Authentication - Web-Based Framework

MODULE VI CLOUD SECURITY FOR THE IOT 8

Cloud services and the IoT - Examining IoT threats - Cloud IoT security controls – IOT enablers - Case study: Smart home - smart bus stop

L –45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. B. Rusell and D. Van Duren, “Practical Internet of Things Security,” Packt Publishing, Second Edition, Mumbai, 2016, ISBN: 978-1785880292.
2. Madhusanka Liyanage et al., “IoT Security: Advances in Authentication”, Wiley Publisher, First Edition, USA, 2019, ISBN: 978-1119527923
3. Johnsonn Jr, C. Richard, William A. Sethares, and Andrew G. Klein, “Software receiver design: build your own digital communication system in five easy steps,” Cambridge University Press, First Edition, United Kingdom, 2011, ISBN-13 : 978-0521189446.

REFERENCES:

1. Sajay Rai, Philip Chukwuma, Richard Cozart, “Security and Auditing of Smart Devices: Managing Proliferation of Confidential Data on Corporate and BYOD Devices (Internal Audit and IT Audit)”, Auerbach Publications, First Edition, USA, 2016, ISBN-13 : 978-1498738835
2. Mohuiddin Ahmed, Abu S.S.M Barkat Ullah, Al-Sakib Khan Pathan, “Security Analytics for the Internet of Everything”, CRC Press, Second Edition,USA, 2020, ISBN-13 : 9780367440923
3. https://internetofthingsagenda.techtarget.com/definition/IoT-security-Internet-of-Things-security
4. https://home.howstuffworks.com/smart-home.htm

OUTCOMES :

Students to complete this course will be able to

- Analyze and understand the IOT applications and threats
- Examine and apply the IOT security in smart devices
- Ensure the fundamental security of smart devices
- Modify and improve the privacy concerns associated with IOT
- Recognize the importance of user authentication level
- Design smart devices with cloud security

CSCX 336 COGNITIVE PSYCHOLOGY IN CYBER SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES :

- To give overview of cognitive psychology.
- To provide the core concepts of reasoning and decision making.
- To relate the behavior of human in cyber space.
- To identify the role of brain in cyber psychology.
- To get familiar with the computing environment from cyber-attacks.
- To analyze the psychology with cyber security case studies.

MODULE I INTRODUCTION TO COGNITIVE PSYCHOLOGY 5

Introduction to Cognitive psychology – Cognitive Neuro science – Structure of Nervous System – Measures in Cognitive Nervous System.

MODULE II REASONING AND DECISION MAKING 9

Perception – Attention – Pervasiveness of memory – Sensory memory – Short term and Long term memory – Working of memory system – Problem Solving – Deductive Reasoning – Inductive Reasoning – Making decisions.

MODULE III BEHAVIORAL CYBER SECURITY 8

Exploring the concept of Cyberspace – Human Information Processor – Population – Cyber security without human – Cyber security and Personality Psychology – Personality theory and assessment.

MODULE IV CYBER PSYCHOLOGY 9

Brain and Cyber psychology - Brain on the internet – Facebook and Socially networked brain – Media Multitasked brain – Cyber addictions- Cyber psychology of video games.

MODULE V COMPUTING ENVIRONMENT FROM CYBER ATTACKS 8

Profiling – Social Engineering – Sweeney Privacy – Understanding hackers – Game theory application to profiling – Behavioral economics – Fake news – Password meters.

MODULE VI CASE STUDIES 6

Addressing DDos Attacks – Ransomware – Facebook “This is your digital life” – Fake News concerning corona virus – Hacker case studies.

L - 45; Total Hours : 45

REFERENCES :

1. Dawn M. McBride, J. Cooper Cutting, Cognitive Psychology, ISBN 9781506383842,SAGE Publications ,2017
2. Wayne Patterson, Cynthia E. Winston-Proctor , “Behavioral Cybersecurity”, ISBN

9781000258257, CRC Press, 2020

3. Thomas D. Parsons, Cyberpsychology and the Brain,ISBN: 9781107094871, Cambridge University Press,2017
4. Lee Hadlington, “Cybercognition”, ISBN: 9781526414465, SAGE Publications,2017.

OUTCOMES :

Students to complete this course will be able to

- Define the importance of cognitive psychology.
- Illustrate the reasoning and decision making for solving the problems.
- Identify the personality behaviors in cyber-crimes.
- Analyze the behavior of brain in the cyber space.
- Describe the computing environment from cyber-attacks.
- Analyze the psychology aspects through cyber case studies.

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

MODULE I CONDUCTING AND SEMICONDUCTING MATERIALS 7

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

MODULE II DIELECTRIC MATERIALS 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 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, grapheme - nanocomposites – applications.

PRACTICALS

1. Determination of energy band gap of a semiconductor.
2. Determination of resistivity of metals by four point probe method.
3. Determination of dielectric constant of dielectric material.
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 periods, P: 30 periods, Total: 60 periods

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.
2. Pillai, S.O., Solid State Physics, New Age International, New Delhi, 2005.
3. Charles P.Poole and Frank J. Owens, ”Introduction to nanotechnology”, Wiley (India), 2009.
4. 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

- Differentiate between the properties of the nanomaterials compared to bulk materials.
- Comprehend the significance of properties of magnetic materials and derive these properties from synthesized materials.
- Apply the concepts of conducting and semiconducting materials for solid state devices.

- Complement the knowledge acquired in the theory class and correlate the results for applications.

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 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 – entropy and available energy – temperature – entropy diagram for Carnot’s cycle - Third Law of thermodynamics(qualitative).

L : 30 periods

PRACTICALS

1. Determination of mechanical equivalent of heat by Joule’s calorimeter.

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

P: 30 periods

Total: 60 periods

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.
- Understand and apply the ideas of laws of thermodynamics in thermodynamic systems.
- Perform heat based experiments and determine its various properties.

PHCX 03 INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY

L	T	P	C
2	0	2	3

OBJECTIVES:

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

MODULE I NANOMATERIALS AND APPLICATIONS 10

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, graphene- 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.

L : 30 periods

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.

P: 30 period

Total: 60 periods

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 6

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.

L : 30 periods

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.

P: 30 periods

Total: 60 periods

REFERENCES:

1. William T. Silfvast, “Laser Fundamentals”, Cambridge University Press, 2009.
2. Ghatak. A. & Thyagarajan. K. “Optical Electronics”, Cambridge University, 1994.
3. L aud.B.B., “Laser and Non-Linear Optics”, Second Edition, New Age International (p) Limited Publishers, 2011.
4. N ambiar. K.R., “Lasers Principle, Types and Applications”, New Age International (p) Ltd, 2004.
5. W ilson. J. & Hawkes. J.F.B., “Opto Electronics - An Introduction”, Prentice Hall, 1992.
6. W illiam 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 a basis for understanding properties and applications of dielectric materials.
- To impart knowledge on magnetic and optical materials and their properties & applications.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I CONDUCTING AND SEMICONDUCTING MATERIALS 8

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 7

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 8

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 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 periods, P: 30 periods

Total: 60 periods

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 the concepts and applications of Dielectric, Magnetic materials
- Familiarize Optical materials and their applications in Engineering and Medical fields.
- Complement the knowledge acquired in the theory class and correlate the results for applications.

PHCX 06 NON-DESTRUCTIVE TESTING

L	T	P	C
2	0	2	3

OBJECTIVES:

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

MODULE I ULTRASONIC INSPECTION METHOD 10

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.

L : 30 periods

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.

P: 30 periods

Total: 60 periods

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.

MODULUE 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.

L : 30 periods

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.

P: 30 periods

Total: 60 periods

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.
- Illustrate the fundamental concept of photo elasticity and its use for the stress analysis of the object.

PHCX 08	PROPERTIES OF MATTER AND NONDESTRUCTIVE TESTING	L	T	P	C
		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.**

L : 30 periods

PRACTICALS

1. Verification of Hooke's law by spring method.
2. Determination of Young's modulus of the beam by bending method.
3. Inspection of welds using solvent removable visible dye penetrant.
4. Inspection of welds using solvent removable fluorescence dye penetrant.
5. Inspection of welds by Magnetic Particle Testing.
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.

P: 30 periods

Total: 60 periods

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.
- Illustrate 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.

L : 30 periods

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.

P: 30 periods

Total: 60 periods

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: Thermogravimetric analysis – Differential thermal analysis – Differential scanning calorimetry

L: 30 periods

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.

P:30 periods

Total: 60 periods

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

To make the student conversant with

- 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 coatings

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.

L : 30 periods

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.

P:30 periods

Total: 60 periods

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

The 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

To make the student 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).

L:30 periods

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.

P:30 periods

Total: 60 periods

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

To make the student 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 8

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.

L:30 periods

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

P:30 periods

Total: 60 periods

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.

L:30 periods

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

P:30 periods

Total: 60 periods

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

To make the student 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.

L:30 periods

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. *Kinetics of first 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.

P:30 periods

Total: 60 periods

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.

L:30 periods

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).

P:30 periods

Total: 60 periods

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.

L: 30 periods

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.

P:30 periods

Total: 60 periods

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.

L: 30 periods

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.

P:30 periods

Total: 60 periods

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

1. introduce Logical and Mathematical ability to deal with abstraction.
2. familiarize the basic mathematical ideas and terminologies used in computer science.
3. 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:

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

REFERENCES:

- Ralph.P.Grimaldi, “Discrete and Combinatorial Mathematics: An Introduction”, 4th Edition, Pearson Education Asia, Delhi, 2007.
- Thomas Koshy, “Discrete Mathematics with Applications”, Elsevier Publications, 2006.
- 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:

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

REFERENCES:

- S.M.Ross, “Introduction to Probability and Statistics for Engineers and Scientists” Fifth Edition, Elesvier.
- S.C.Gupta and V.K.Kapoor, “Fundamentals of Mathematical Statistics” First edition, Sultan Chand and Sons.
- Arora and Arora, “Comphrensive Statistical Methods”, S. Chand, 2007

OUTCOMES:

On completion of the course, students will be able to

1. do basic problems on probability and descriptive statistics.
2. derive the probability mass / density function of a random variable.
3. calculate probabilities and derive the marginal and conditional distributions of bivariate random variables.
4. calculate point and interval estimates.
5. apply some large sample tests and small sample tests.
6. 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 DIFFERENTIAL EQUATIONS **7+3**

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

1. solve algebraic, transcendental and system of equations.
2. apply interpolation techniques.
3. carry out numerical differentiation and integration using different methods.
4. solve first order ODE using single and multi step methods.
5. solve second order ODE, initial and boundary value problems.
6. 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

1. formulate industrial problems as mathematical programming problems.
2. solve linear programming problems by different methods.
3. solve transportation problems by different methods.
4. 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

1. develop and test hypothesis for different statistical tests
2. design an experiment and case study the experiment with different data.
3. analyze the industrial data using quality control design tools statistically.
4. 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:

1. 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:

- M.K.Jain, S.R.K.Iyengar, R.K.Jain, "Numerical methods for Scientific and Engineering Computation", New Age International Publishers, New Delhi, 2003.
- 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
2 0 0 2

OBJECTIVES:

The aims of the course are to

1. provide basic idea of formation and use of Mathematical models for different purposes.
2. determine the extent to which models are able to replicate real-world phenomena under different conditions

MODULE I PRINCIPLES OF MATHEMATICAL MODELING 7

Mathematics as a modelling language - Classification of models - Building, studying, testing and using models - Black and white box models – Difference equations

MODULE II PHENOMENOLOGICAL MODELS 7

Linear, Multiple linear and nonlinear regression - Neural networks - Fuzzy model - Stability and higher dimensional systems

MODULE III MECHANISTIC MODELS –I 8

Setting up ODE models – Initial and Boundary value problems - Numerical solutions - Fitting ODE to data - Applications

MODULE IV MECHANISTIC MODELS –II 8

Linear and nonlinear equations - Elliptic, parabolic and hyperbolic equations - Closed form solutions - Finite difference and finite element methods

Total Hours –30

TEXT BOOKS:

- G . Ledder , “Calculus, modelling , probability and dynamic systems”, Springer 2013
- 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**
2 0 0 2

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)

SSCXO1	**FUNDAMENTALS OF ECONOMICS**	**L**	**T**	**P**	**C**
		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:

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

REFERENCES:

- Cleaver Tony (2004), "*Economics: The Basics*", Routledge, London.
- 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:

- Giddens A. 1989. “Sociology” Cambridge: Polity Press.
- Heald Haralambos, R.M(2014) . ‘‘Sociology Themes and Perspectives”, Oxford, New Delhi-92
- Bhushan Vidya and D.R. Sachdeva (2012). ‘‘Fundamental of Sociology”, Pearson, Delhi.

REFERENCES:

- Das Gupta, Samir and Paulomi Saha (2012), ‘‘An Introduction to Sociology”, Pearson, Delhi
- 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:

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

1. Students will gain an in-depth understanding of the social structure and social institutions that constitute society in India.
2. Students will be sensitized to the various categories ,Inequalities and their challenges
3. Students will be exposed to the social problems encountered in contemporary India.
4. Students will gain knowledge about the various forms and trends of the social change.
5. 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)

SSCXO4	ECONOMICS OF SUSTAINABLE DEVELOPMENT	L	T	P	C
		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:

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

OUTCOMES:

On successful completion of this course,

1. Students will have acclimatized with sociological perspectives for dealing with social relationships in production and service organizations.
2. Students will be familiar with structure of authority, roles and responsibility in organizational settings.
3. Students will imbibe leadership, communication and behavioral acumen to govern organization
4. Students will be sensitized to standards of desirable behavior to engage in industrial and corporate sector.

SSCXO6	LAW FOR ENGINEERS	L	T	P	C
		2	0	0	2

OBJECTIVES:

1. To understand the Constitution and Governance of our country.
2. To apprise the students of human rights - local and international and redressal mechanism.
3. To have an insight into the industrial, corporate and labour laws of our country.
4. 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,

1. Students will `be able to apply the basic concepts of Indian Constitution, Governance and power in their real life situation.
2. Students will have gained knowledge in human rights, cultural, social and political rights.
3. Students will have synthesized knowledge about industrial, corporate and labour laws of our country.
4. Students will have an overview of IPRs and laws related to Intellectual Property Rights.

General Elective Courses
Group I courses
(To be offered in V Semester)

		L	T	P	C
GECX101	**DISASTER MANAGEMENT**	**3**	**0**	**0**	**3**

OBJECTIVES:

- To introduce the concept of various environmental hazards and its management measures.
- To give exposure on the natural disasters causes and prevention strategies.
- To give exposure on various man-made disasters causes and prevention strategies.
- To make them understand the different segments of disaster management.
- To introduce the concept of different relief measures to be adopted in the time of disaster.
- To give exposure to various environmental policies & programs in India for disaster management

MODULE I ENVIRONMENTAL HAZARDS 7

Environmental hazards, Environmental Disasters and Environmental stress-Meaning and concepts. Vulnerability and disaster preparedness.

MODULE II NATURAL DISASTERS 7

Natural hazards and Disasters - Volcanic Eruption, Earthquakes, Tsunamis, Landslides, Cyclones, Lightning, Hailstorms, Floods, Droughts, Cold waves, Heat waves and Fire.

MODULE III MAN-MADE DISASTERS 7

Man induced hazards & Disasters - Soil Erosion, Chemical hazards, Population Explosion

MODULE IV DISASTER MANAGEMENT 8

Emerging approaches in Disaster Management- Preparing hazard zonation maps, Predictability / forecasting & warning, Preparing disaster preparedness plan, Land use zoning, Communication. Disaster resistant house construction,

Population reduction in vulnerable areas, Awareness - Rescue training for search & operation at national & regional level - Immediate relief, Assessment surveys, Political, Administrative, Social, Economic, Environmental Aspects.

MODULE V NATURAL DISASTER REDUCTION & MANAGEMENT **8**

Provision of Immediate relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards

MODULE VI ENVIRONMENTAL POLICIES & PROGRAMMES IN INDIA **8**

Regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India. Ecological planning for sustainability & sustainable development in India, Sustainable rural development: A Remedy to Disasters, Role of Panchayats in Disaster mitigations, Environmental policies & programmes in India- Institutions & National Centers for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & training.

Total Hours –45

REFERENCES:

1. Satender, “Disaster Management in Hills”, Concept Publishing Co., New Delhi, 2003.
2. Singh, R.B. (Ed.), “Environmental Geography”, Heritage Publishers, New Delhi,1990.
3. Savinder Singh, “Environmental Geography”, Prayag Pustak Bhawan,1997.
4. Kates, B.I. and White, G.F., “The Environment as Hazards”, Oxford University Press, New York, 1978.
5. Gupta, H.K., (Ed), “Disaster Management”, University Press, India, 2003.
6. Singh, R.B.,“Space Technology for Disaster Mitigation in India (INCED)”, University of Tokyo, 1994.
7. Bhandani, R.K., “An overview on Natural & Manmade Disaster & their Reduction”, IIPA Publication, CSIR, New Delhi, 1994.
8. Gupta, M.C., “Manuals on Natural Disaster management in India”, National Centre for Disaster Management, IIPA Publication, New Delhi, 2001.

OUTCOMES:

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

- Describe the origin, changes and management of environmental hazards.
- Develop the knowledge on natural disasters.
- Develop the knowledge on man-made disasters.
- Discuss the different segments of disaster management.
- Explain the concept of different disaster relief measures.
- Achieve sufficient knowledge on the National Policy on Disaster Management.

GECX102 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To understand the various principles, practices of TQM to achieve quality.
- To get acquainted with the various statistical tools and approaches for quality control and continuous improvement.
- To get aware of the importance of ISO and Quality Systems.

MODULE I INTRODUCTION 8

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs- Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

MODULE II TQM PRINCIPLES 7

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits.

MODULE III TQM IMPROVEMENT PROCESS 8

Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

MODULE IV STATISTICAL PROCESS CONTROL (SPC) 8

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

MODULE V TQM TOOLS 7

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality

Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

MODULE VI QUALITY SYSTEMS 7

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System– Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits

Total Hours –45

TEXT BOOKS:

1. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education, Inc. 2003.

REFERENCES:

1. James R.Evans & William M.Lidsay, “The Management and Control of Quality”, 5th Edition, South-Western (Thomson Learning), 2002.
2. Feigenbaum.A.V., “Total Quality Management”, McGraw-Hill, 1991.
3. Oakland.J.S., “Total Quality Management”, Butterworth Hcinemann Ltd.,Oxford, 1989.
4. Narayana V. and Sreenivasan. N.S., “Quality Management – Concepts and Tasks”, New Age International, 1996.
5. Zeiri, “Total Quality Management for Engineers”, Wood Head Publishers, 1991.

OUTCOMES:

The student should be able to

- Apply the various statistical tools and approaches for Quality control.
- Achieve continuous process improvement through TQM.

GECX103	ENERGY STUDIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the growing demand, supply of energy on global and national levels and the need for renewable energy promotion.
- To understand the basic need for energy conservation and waste heat recovery.
- To learn the important aspects of energy audit and management.
- To get acquainted with the global environmental issues and carbon credits.

MODULE I GLOBAL AND NATIONAL ENERGY SCENARIO 7

Role of energy in economic development, various energy resources - overall energy demand and availability- Energy consumption in various sectors and its changing pattern - Exponential increase in energy consumption and projected future demands. Need for renewable energy.

MODULE II SOLAR ENERGY 8

Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

MODULE III OTHER RENEWABLE ENERGY SOURCES 8

Power from wind – wind turbine working and types, solar thermal power plants – low medium and high power generation, power from wave , tidal, geothermal sources, OTEC system. MHD power plants – working, types, merits and demerits. Energy from biomass.

MODULE IV COGENERATION, WASTE HEAT RECOVERY AND COMBINED CYCLE PLANTS 8

Cogeneration principles- topping and bottoming cycles, role in process industries. Energy from wastes- waste heat recovery- heat recovery from industrial processes. Heat exchange systems – recuperative and regenerative heat exchangers – commercially available waste heat recovery devices. Combined cycle plants – concept, need and advantages, different combinations and practical scope.

MODULE V ENERGY CONSERVATION AND MANAGEMENT 7

Need for energy conservation – use of energy efficient equipment. Energy conservation opportunities - in educational institutions, residential, transport, municipal, industrial and commercial sectors – concept of green building. Energy audit in industries – need, principle and advantages. Case studies.

MODULE VI GLOBAL ENERGY ISSUES AND CARBON CREDITS 7

Energy crisis, fossil consumption and its impact on environmental climate change. Energy treaties – Montreal and Kyoto protocols - Transition from carbon rich and nuclear to carbon free technologies, carbon foot print – credits – clean development mechanism.

L – 45; Total Hours –45

TEXT BOOKS:

1. S.S. Rao and B.B. Parulekar, “Energy Technology”, 3rd Edition, Khanna Publishers, New Delhi, 2011.
2. O. Callaghn. P.W., “Design and Management for Energy Conservation”, Pergamon Press, Oxford, 1981.

REFERENCES:

1. G.D. Rai, “Non Conventional Energy Sources”, Khanna Publishers, New Delhi, 2011.
2. Archie, W Culp. “Principles of Energy Conservation”, McGraw Hill, 1991.
3. D Patrick and S W Fardo, “Energy Management and Conservation”, PHI,1990
4. P. O’Callaghan: “Energy Management”, McGraw - Hill Book Company, 1993.
5. Kenney, W. F., “Energy Conservation in Process Industries”, Academic Press, 1983.

OUTCOMES:

The student should be able to

- Realize the global and national energy status and need to switch over to renewable energy technology.
- Energy audit and suggest methodologies for energy savings.
- Utilize the available resources in an optimal way.
- Concern about the global environmental issues & promote carbon credits.

GECX104 ROBOTICS L T P C
3 0 0 3

OBJECTIVES:

- To learn about the robots, various components, of Robots, programming and their applications.

MODULE I **8**

Definition- Need - Application, Types of robots – Classifications – Configuration, work volume, control loops, controls and intelligence- basic parts - functions – specifications. of robot, degrees of freedoms, end effectors – types, selection

MODULE II ROBOT DRIVES AND CONTROL **8**

Controlling the Robot motion – Position and velocity sensing devices – Design of drive systems – Hydraulic and Pneumatic drives – Linear and rotary actuators and control valves – Electro hydraulic servo valves, electric drives – Motors – Designing of end effectors – Vacuum, magnetic and air operated grippers.

MODULE III ROBOT SENSORS **8**

Transducers and Sensors – Tactile sensor – Proximity and range sensors – Sensing joint forces – Robotic vision system – Image Representation - Image Grabbing –Image processing and analysis – Edge Enhancement – Contrast Stretching – Band Rationing - Image segmentation – Pattern recognition – Training of vision system.

MODULE IV ROBOT PROGRAMMING & AI TECHNIQUES **7**

Types of Programming – Teach pendant programming – Basic concepts in AI techniques – Concept of knowledge representations – Expert system and its components.

MODULE V ROBOTIC WORK CELLS AND APPLICATIONS OF ROBOTS **7**

Robotic cell layouts – Inter locks – Humanoid robots – Micro robots – Application of robots in surgery, Manufacturing industries, space and underwater.

MODULE VI ROBOT KINEMATICS AND DYNAMICS 7

Forward and inverse Kinematic equations, Denvit – Hartenbers representations Fundamental problems with D-H representation, differential motion and velocity of frames - Dynamic equations for sing, double and multiple DOF robots – static force analysis of robots.

L – 45; Total Hours –45

REFERENCES:

1. Yoram Koren," Robotics for Engineers", Mc Graw-Hill, 1987.
2. Kozyrey, Yu, "Industrial Robots", MIR Publishers Moscow, 1985.
3. Richard. D, Klafter, Thomas, A, Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Prentice-Hall of India Pvt. Ltd., 1984.
4. Deb, S.R. "Robotics Technology and Flexible Automation", Tata Mc Graw-Hill, 1994.
5. Mikell, P. Groover, Mitchell Weis, Roger, N. Nagel, Nicholas G. Odrey, "Industrial Robotics Technology, Programming and Applications", Mc Graw- Hill, Int. 1986.
6. Timothy Jordanides et al,"Expert Systems and Robotics", Springer – Verlag, New York, May 1991.

OUTCOMES:

Students would be able to

- Understand about the robots, its various components.
- Design Robots for industrial applications.
- Do programming for robots and apply them in real time applications.

GECX105 TRANSPORT MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To understand the transport fleet and their related activities for minimizing operational cost.
- To understand the need of maintenance and its importance.
- To understand the functions and applications of various types of transport system.

MODULE I INTRODUCTION 7

Personnel management; objectives and functions of personnel management, psychology, sociology and their relevance to organization, personality problems. Selection process: job description, employment tests, interviewing, introduction to training objectives, advantages, methods of training, training procedure, psychological tests.

MODULE II ORGANISATION AND MANAGEMENT 7

Forms of Ownership – principle of Transport Management – Staff administration – Recruitment and Training – welfare – health and safety. Basic principles of supervising. Organizing time and people. Driver and mechanic hiring - Driver checklist - Lists for driver and mechanic - Trip leasing - Vehicle operation and types of operations.

MODULE III TRANSPORT SYSTEMS 9

Introduction to various transport systems. Advantages of motor transport. Principal function of administrative, traffic, secretarial and engineering divisions. chain of responsibility, forms of ownership by state, municipality, public body and private undertakings.

MODULE IV SCHEDULING AND FARE STRUCTURE 8

Principal features of operating costs for transport vehicles with examples of estimating the costs. Fare structure and method of drawing up of a fare table. Various types of fare collecting methods. Basic factors of bus scheduling. Problems on bus scheduling.

MODULE V MOTOR VEHICLE ACT 7

Traffic signs, fitness certificate, registration requirements, permit insurance, constructional regulations, description of vehicle-tankers, tippers, delivery vans, recovery vans, Power wagons and fire fighting vehicles. Spread over, running time, test for competence to drive.

MODULE VI MAINTENANCE 7

Preventive maintenance system in transport industry, tyre maintenance procedures. Causes for uneven tyre wear; remedies, maintenance procedure for better fuel economy, Design of bus depot layout.

L – 45; Total Hours –45

TEXT BOOKS:

1. John Duke, "Fleet Management", McGraw-Hill Co, USA, 1984.
2. Kitchin.L.D., "Bus Operation", III edition, Illiffee and Sons Co., London, 1992

REFERENCES:

1. Government Motor Vehicle Act, Publication on latest act to be used as on date.

OUTCOMES:

Upon completion of the course, students will

- Know about different aspects related to transport system and management.
- Features of scheduling, fixing the fares
- Know about the motor vehicle act and maintenance aspects of transport.

GECX106	CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the system modeling and to derive their transfer function.
- To provide adequate knowledge of time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of Control systems.

MODULE I BASIC CONCEPTS AND SYSTEM REPRESENTATION 8

Control System - Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Block diagram reduction techniques – Signal flow graphs.

MODULE II TIME RESPONSE ANALYSIS AND DESIGN 8

Time response – Time domain specifications – Types of test input – First and Second order system - Type I and Type II System – Response - Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feedback control.

MODULE III FREQUENCY RESPONSE ANALYSIS AND DESIGN 7

Performance specifications - correlation to time domain specifications - bode plots and polar plots – gain and phase margin – constant M and N circles and Nichols chart – all pass and non-minimum phase systems.

MODULE IV STABILITY 8

Characteristics equation – Location of roots in s plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

MODULE V COMPENSATOR DESIGN 8

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots and root locus technique.

MODULE VI CONTROL SYSTEM COMPONENTS AND APPLICATION OF CONTROL SYSTEMS **6**

Synchros – AC servomotors - DC Servo motors - Stepper motors - AC Tacho generator - DC Tacho generator - Typical applications of control system in industry.

L – 45; Total Hours –45

REFERENCES:

1. K. Ogata, “Modern Control Engineering”, 4th Edition, Pearson Education, New Delhi, 2003.
2. I.J. Nagrath & M. Gopal, “Control Systems Engineering”, New Age International Publishers, 2003.
3. C.J.Chesmond, “Basic Control System Technology”, Viva student edition, 1998.
4. I.J.Nagarath and M.Gopal, “Control System Engineering”, Wiley Eastern Ltd., Reprint, 1995.
5. R.C.Dorf and R.H.Bishop, “Modern Control Systems”, Addison-Wesley (MATLAB Reference), 1995.

OUTCOMES:

At the end of the course, the student is expected to possess knowledge and achieve skills on the following:

- Proper understanding of basics of Control Systems.
- Ability and skill to carry-out time domain and frequency domain analysis.
- Capable of determining stability of the system using Routh Hurwitz criterion, Root locus and Nyquist criterion.
- Ability to design lag, lead and lag lead compensator networks.

GECX107 INTRODUCTION TO VLSI DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES:

- Basic concepts of HDL.
- Verilog language and its syntax constructs.
- Programmable Logic Devices and FPGAs
- MOS devices theory
- CMOS based combinational and sequential circuits

PREREQUISITES:

Fundamentals of Electronics

Basics knowledge in Digital Electronics.

MODULE I REVIEW OF BASIC DIGITAL SYSTEMS 7

Boolean algebra, Building blocks of combinational logic design-Adders, multiplexer, encoder, decoder, comparator, Latches & flip-flops, counters, shift registers.

MODULE II LOGIC DESIGN USING VERILOG HDL 8

Overview of Digital Design with Verilog HDL, Levels of Design Description, Concurrency, Hierarchical Modeling Concepts, Modules and Ports, Component instantiation Data flow and RTL, structural, gate level, switch level modeling and Behavioral Modeling.

MODULE III LANGUAGE CONSTRUCTS OF VERILOG HDL 7

Identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments, conditional statements Variable types, arrays and tables, Tasks and functions, Test bench.

MODULE IV BUILDING BLOCKS OF DIGITAL VLSI SYSTEMS 8

HDL Design -Data Path Operations-Addition/Subtraction, Parity Generators, Comparators, Zero/One Detectors, Binary Counters, ALUs, Multiplication, Shifters, Memory Elements. Programmable logic elements and AND-OR arrays, FPGAs programming methods.

MODULE V TRANSISTOR THEORY 7

Introduction to MOS Transistors-NMOS & PMOS Characteristics, Current Equations, Complementary CMOS Inverter-DC Characteristics, Static Load MOS Inverters.

MODULE VI BASICS OF DIGITAL CMOS DESIGN 8

NMOS & PMOS Logic Gate, CMOS Logic Gate, Basic layout design of simple gate-stick diagram, CMOS Logic Structures-full adder, multiplexers.

Total Hours –45

TEXT BOOKS:

1. M.Morris Mano "Digital Design", 3rd Edition, Prentice Hall of India Pvt. Ltd New Delhi, 2003

REFERENCES:

1. Michael D. Ciletti“Advanced Digital Design with the Verilog HDL" (2nd Edition) Hardcover – January 31, 2010
2. J.Bhasker: Verilog HDL primer, BS publication, 2001.
3. J. P. Uyemura, "Introduction to VLSI Circuits and System", Wiley, 2002
4. Neil Weste and K. Eshragian, “Principles of CMOS VLSI Design: A System Perspective,” 2nd edition, Pearson Education (Asia) Pvt.Ltd., 2000
5. Douglas A Pucknell& Kamran Eshragian , “Basic VLSI Design” PHI 3rd Edition (original edition – 1994)

OUTCOMES:

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

- Create basic Register Transfer Level (RTL) models for combinational circuits & Sequential circuits using Verilog HDL.
- Create basic behavioral models for combinational circuits & Sequential circuits using Verilog HDL.
- Describe the usage of Programmable Logic Devices and FPGAs.
- Describe MOS devices theory and inverter circuit DC characteristics
- Design the basic digital building blocks using MOS circuit.
- • Apply VLSI design concepts based on the requirements to conduct experiments or projects

GECX 108 PLANT ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provide in depth knowledge on Plant Engineering
- To introduce detail engineering and P&ID
- To learn about the support to Instrumentation from other disciplines
- To study about the Installation and commissioning

MODULE I INTRODUCTION OF PLANTS 7

General Project Cycle – Feed – Sales - Plant Description, Component / Areas of Plant, Plant Layout, Plant Interfaces, Plant Location

MODULE II ELEMENTS OF PLANT 8

Main Elements of a Plant, Process Flow Scheme (PFD – Process Flow Diagram) P&ID's, Plant Legend Finalization.

MODULE III DETAIL ENGINEERING 10

P& ID Development with PFD's, Major Discipline Involvement & Inter discipline Interaction, Major Instrumentation & Control Systems - Development Phase – Instrument List , I/O Count, Specification Sheets, Instrument Installation (Hook ups) , Control Philosophy – Detail Engineering.

MODULE IV SUPPORT FROM OTHER DISCIPLINE 8

Other Discipline Supports to Instrumentation – Plot Plan, Piping / Equipment Plan, Electrical Area Classification, Fire Hazardous Classification Telecommunication Systems - Control Network architecture.

MODULE V INSTALLATION AND COMMISSIONING 7

Plant Construction - Key Drawings for Construction Support Construction Activities, System Testing, Startup / Commissioning, Production.

MODULE VI CASE STUDIES 5

Case studies of Water Treatment Plant - Paper Industry – Power Plant etc

L – 45; Total Hours –45

REFERENCES:

1. Duncan C Richardson, Plant Equipment and Maintenance Engineering Handbook, McGraw-Hill Education: New York, Chicago, San Francisco, Athens, London, Madrid, Mexico City, Milan, New Delhi, Singapore, Sydney, Toronto,2014 McGraw-Hill Education
2. Gabriel Salvendy, Handbook of Industrial Engineering – Technology and operations Management, John Wiley & Sons, 2001.
3. Robert C Rosaler , Standard Handbook of Plant Engineering, Mc Graw Hill third Edition, 2004
4. R. Keith Mobley, Plant Engineer's Handbook, Technology and Engineering, 2001.

OUTCOMES:

At the end of the course, the student will be able to

- Review and correct P&IDs
- Do installation and commissioning of new plants
- Apply plant engineering in design and maintenance of water treatment plant / power plant etc

GECX109	NETWORK SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be able to

- Discuss the basic concepts of computer security, model and attacks
- Examine the major types of threats and the associated attacks
- Identify the encryption techniques in real time applications
- Understand the special requirements for wireless security and how authentication is implemented in wireless systems
- Understand the functions of Network Security Device Firewall and its types
- Interpret the various network intrusion such as computer viruses, network worms etc

MODULE I INTRODUCTION 6

Computer Security Concepts - The OSI Security Architecture - Security Attacks - Security Services - Security Mechanisms - A Model for Network Security - Standards – classical encryption techniques.

MODULE II SYMMETRIC ENCRYPTION AND MESSAGE CONFIDENTIALITY 7

Symmetric Encryption Principles - Symmetric Block Encryption Algorithms - Random and Pseudorandom Numbers - Stream Ciphers and RC4 - Cipher Block Modes of Operation

MODULE III PUBLIC KEY CRYPTOGRAPHY AND MESSAGE AUTHENTICATION 8

Approaches to Message Authentication - Secure Hash Functions - Message Authentication Codes - Public-Key Cryptography Principles - Public-Key Cryptography Algorithms - Digital Signatures

MODULE IV KEY DISTRIBUTION ,USER AUTHENTICATION AND TRANSPORT-LEVEL SECURITY 8

Symmetric Key Distribution Using Symmetric Encryption - Kerberos - Key Distribution Using Asymmetric Encryption - X.509 Certificates - Public-Key

Infrastructure -Federated Identity Management - Web Security Considerations - Secure Socket Layer and Transport Layer Security - Transport Layer Security

MODULE V WIRELESS NETWORK SECURITY, ELECTRONIC MAIL SECURITY AND IP SECURITY **8**

IEEE 802.11 Wireless LAN Overview -IEEE 802.11i Wireless LAN Security - Wireless Application Protocol Overview - Wireless Transport Layer Security - WAP End-to-End Security - Pretty Good Privacy - S/MIME – Domain Keys Identified Mail- IP Security Overview -IP Security Policy - Encapsulating Security Payload - Combining Security Associations - Internet Key Exchange - Cryptographic Suites

MODULE VI SYSTEM SECURITY **8**

Intruders -Intrusion Detection -Password Management - Types of Malicious Software - Viruses Virus Countermeasures – Worms - Distributed Denial of Service Attacks- The Need for Firewalls - Firewall Characteristics - Types of Firewalls - Firewall Basing - Firewall Location and Configurations

L – 45; Total Hours –45

REFERENCES:

1. William Stallings,"Network security Essentials:Applications and standards", Prentice Hall, Fifth Edition , ISBN-13: 978-0134527338, 2013
2. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson, ISBN-13:978-0-273-79335-9,2013
3. Behrouz Forouzan, Debdeep Mukhopadhyay,Cryptography and network security (sie) 2nd edition, ISBN-13: 978-0070702080, 2016
4. Wikipedia, "Network Security and Management" , https://en.wikipedia.org/wiki/Book:Network Security and Management, 2014.
5. Nitesh Dhanjani, Justin Clarke, "Network Security Tools", O'Reilly Media, ISBN-13: 9780596007942, 2005.

OUTCOMES:

Students who complete this course will be able to

- Recognize the computer security concepts, architecture attacks and model
- Distinguish the symmetric and asymmetric encryption techniques

- Apply the cryptographic algorithms in different applications
- Express the network security designs using available secure solutions such as PGP,SSL, IPSec, etc.
- Describe the firewalls principles and different types of firewalls applied in organization
- Identify abnormalities within the network caused by worms, viruses and Network related security treats**.**

GECX110	KNOWLEDGE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The course

- Focuses on positioning knowledge as a valuable commodity, embedded in products and in the tacit knowledge of highly mobile individual employees.
- Presents KM as a deliberate and systematic approach to cultivating and sharing an organization's knowledge base.
- Brings out the paradigm in terms of information technology and intellectual capital.

MODULE I KNOWLEDGE MANAGEMENT 6

KM Myths – KM Life Cycle – Understanding Knowledge – Knowledge, intelligence – Experience – Common Sense – Cognition and KM – Types of Knowledge – History of Knowledge Management - From Physical assets to Knowledge Assets – Expert knowledge – Human Thinking and Learning.

MODULE II KNOWLEDGE MANAGEMENT SYSTEMS AND MODELS 9

Challenges in Building KM Systems – Conventional Vs KM System Life Cycle (KMSLS) – Knowledge Creation and Knowledge Architecture – KM cycle - Different variants of KM cycle - KM models - Implications and practical implementations.

MODULE III CAPTURING KNOWLEDGE AND SHARING 9

Tacit knowledge capture - Explicit knowledge codification – Knowledge taxonomies - Knowledge sharing - Communities - Obstacles to knowledge capture and sharing.

MODULE IV KNOWLEDGE MANAGEMENT TOOLS 9

KM System tools – Neural Network – Association Rules – Classification Trees – Data Mining and Business Intelligence – Knowledge capture and creation tools - Content creation tools - Data mining and knowledge discovery – Content management tools - Knowledge sharing and dissemination tools – Group ware

and Collaboration tools - Intelligent filtering tools.

MODULE V KNOWLEDGE APPLICATION 6

KM at individual level - Knowledge workers - Task analysis and modeling - Knowledge application at group and organizational levels – Knowledge repositories - Knowledge reuse -Case study: e-learning.

MODULE VI VALUE OF KNOWLEDGE MANAGEMENT 6

KM return on investment and metrics - Benchmarking method – Balanced scorecard method - House of quality method - Results based assessment method - Measuring success - Future challenges for KM.

L – 45; Total Hours –45

TEXT BOOKS:

1. Elias M. Awad, Hassan M. Ghaziri, “Knowledge Management”, Prentice Hall, 2nd Edition, 2010.
2. Jay Liebowitz, “Handbooks on Knowledge Management”, 2nd Edition, 2012.
3. Irma Becerra-Fernandez, Rajiv Sabherwal, ”Knowledge Management: Systems and Processes”, 2010.

OUTCOMES:

Students who complete this course will be able to

- Describe the fundamental concepts in the study of knowledge and its creation, acquisition, representation, dissemination, use and re-use, and management.
- Explains the core concepts, methods, techniques, and tools for computer support of knowledge management.
- Critically evaluate current trends in knowledge management and apply it for e-learning

GECX111 CYBER SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the basics of Cyber Security Standards and Policies.
- To know the legal, ethical and professional issues in Cybersecurity.
- TounderstandCyberFraudsandAbuseanditsSecurityMeasures.
- To know the technological aspects of CyberSecurity.

MODULE I FUNDAMENTALS OF CYBER SECURITY 7

SecurityproblemincomputingвЂ“CryptographyBasicsвЂ“HistoryofEncryptionвЂ“ Modern Methods вЂ“ Legitimate versus Fraudulent Encryption methodsвЂ“ EncryptionusedinInternet.

MODULE II CYBERCRIME AND CYBEROFFENSES 8

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

MODULE III CYBERCRIME: MOBILE AND WIRELESS DEVICES 8

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

MODULE IV TOOLS AND METHODS USED IN CYBERCRIME 8

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

MODULE V SECURITY POLICIES 7

Introduction - Defining User Policies вЂ“ Passwords вЂ“ Internet Use вЂ“ Email Usage вЂ“ Installing/ Uninstalling Software вЂ“ Instant Messaging вЂ“ Defining System Administrative Policies вЂ“ Defining Access Control Developmental Policies Standards, Guidelines and Procedures вЂ“ 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.

L – 45; Total Hours –45

TEXT BOOKS:

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”,3rdEdition, Pearson Education,2003.
2. WilliamStallings,“CryptographyandNetworkSecurity–Principlesand Practices”, 3rd Edition, Pearson Education,2003.
3. AtulKahate,“CryptographyandNetworkSecurity”,TataMcGrawHill,2000.

OUTCOMES:

Uponcompletionofthiscourse, students will be able to

- Explain the general security issues.
- Discuss various cybercrimes and offenses.
- Outline the occurrence of 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.

GECX112 GENETIC ENGINEERING L T P C
4 0 0 4

OBJECTIVES:

- The course aims to provide an advanced understanding of the core principles and topics of Cell and Organism reproduction and the Principles of heredity and their experimental basis, and to enable students to be able to apply these principles in assessment of pedigrees to identify genotypes and predict the mating outcomes.

MODULE I GENETICS AND ORGANISM 10

Genetics and human affairs, Genetics and Biology, Genes and Environment, Techniques of genetic analysis, The chromosome theory of heredity, Sex chromosomes, Sex linkage, The parallel behaviour of autosomal genes and chromosomes.

MODULE II MENDELISM AND LINKAGE 12

Mendel's laws of inheritance, Interaction of genes, Variations on dominance, Multiple alleles, Lethal alleles, Several genes affecting the same character, Penetrance and expressivity, Linkage- Basic eukaryotic chromosome mapping, The discovery of linkage, Recombination linkage symbolism, Linkage of genes on X chromosomes, Linkage maps, Examples of linkage maps.

MODULE III FINE STRUCTURE OF GENES 10

The concept of promoter, Coding sequence, Terminator, Induction of gene for expression. The concept of extranuclear genome in higher plants and animals, Overview of mitochondrial genome, Chloroplast genome.

MODULE IV RECOMBINATION IN BACTERIA AND VIRUSES 10

Conjugation recombination and mapping the E.coli chromosomes, Transformation, Transduction, Chromosome mapping. Population genetics: Darwin's revolution, Variation and its modulation, The effect of sexual reproduction on variation, The sources of variation, Selection quantitative genetics

MODULE V PRINCIPLES OF PLANT BREEDING 9

Objectives, Selfing and crossing techniques, Male sterility,Incompatability, Hybrid vigour.

MODULE VI HUMAN GENOME PROJECT 9

Genetic diseases in humans, Genetics and society

L – 45; T – 15; Total Hours –60

REFERENCES:

1. In Introduction to genetic analysis, Griffiths, Miller, Suzuki, Lewontin and Gelbart, Freeman and Company.
2. Genetics, A.V.S.S. Sambamurty, Narosa Publishing House.
3. Concepts of Genetics, Klug & Cummings, Prientice Hall.
4. Molecular Cloning, Moniatisetal, Cold Spring Harbor Laboratory.

OUTCOMES:

At the end of the course students will be able to

- Describe the structure, function and replication of DNA as the genetic materialDescribe gene structure, expression and regulation
- Describe the chromosomal basis of inheritance and how alterations in chromosome number or structure may arise during mitosis and meiosis

GECX113	FUNDAMENTALS OF PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students would gain knowledge on

- Technicalities attached to Project Management and Significance of Quality Consideration
- Project management methodologies – tools and techniques, supplemented with examples from case studies
- The importance of Efficient HR team and role of Communication in executing Projects.
- Managing Risks in Project Management

MODULE I INTRODUCTION TO PROJECT MANAGEMENT 9

Introduction to Project and Project Management-Project Management as a Career-Project Management Skill Sets-Project Scope Management: Project Charter, Scope Creep, Scope Validation, Scope Change Control-Type of Organization: Organization Structure-Influence of Organization Structure on Project, Project Stakeholders and Organizational Productivity.

MODULE II PROJECT MANAGEMENT PROCESS, TOOLS AND TECHNIQUES 8

Project life cycle-Initiation, Planning, Execution, Monitoring and Closing Phase; - Link between project management process, process groups and knowledge areas; Project management tools and techniques- Project Stakeholders description and mapping - Stakeholder Management Process

MODULE III PROJECT QUALITY, COST AND SCHEDULE MANAGEMENT 10

Triple constraints of project-quality, cost and schedule-Quality Planning, Quality Assurance and Quality Control, Process Control, Cost of Quality, Seven Tools of Quality Control- Cost Management: Cost Estimating Methods, Estimating Completion Cost, Earned Value Management, Budgeting, Life-Cycle Cost analysis- Project Time Management: Duration Estimation Method, FS/FF/SS/ SF Relations, Lead/Lag, Arrow Diagram Method and Precedence Diagram Method for Scheduling-Resource Allocation

MODULE IV PROJECT HR MANAGEMENT 5

Organizational Goals- (MBO/MBE/MBP)-Responsibility Assignment Matrix (RAM)-Types of Powers- Manage or Lead-Conflict management Techniques-Performance Evaluation Process-Motivation Theories and its Application for execution of Projects-Leadership Styles-Project Team Building-Project Staffing Constraints/Policies

MODULE V COMMUNICATION MANAGEMENT 5

Communication Management: Understanding Body languages of Project Personnel-Effective Communications- Interpersonal Skills for project Managers-PMIS-Communicating with the Customer-Communicating with Management-Formal vs. Informal Communications-Written, Verbal and Non-Verbal Communications.

MODULE VI PROJECT PROCUREMENT & RISK MANAGEMENT 8

Introduction to Project Procure Management: Soliciting RFQ/RFP-Contract Proposals-Contract Negotiation-Contract Closure-Risk Management: Defining risks-Risk management process-Risk identification-Qualitative and Quantitative Risk-Probability and Decision trees-Risk Response strategies / methods-Expected monetary value-Risk vs. life cycle phases

L – 45; Total Hours –45

REFERENCES:

1. Jack. R. Meredith, Samuel. J. Mantel & Scott. M. Shafer, Project Management in Practice, Fifth Edition, Bangalore: Wiley, 2015
2. Bob Hughes, Mike Cotterrel “Software Project Management”, Tata McGraw-Hill, 2009

OUTCOMES:

- Learners will be able to identify the Key Knowledge Areas and apply PM process in hypothetical project assignments given as continuous assessment.
- They would be able to suitably recognize tools and techniques required for various phases included in a project.
- They would also be able to manage scope, time, cost and other major components that would help them to execute the project efficiently.

GECX114 OPERATIONS RESEARCH

L	T	P	C
3	0	0	3

OBJECTIVES:

- To acquire knowledge and training in optimization techniques.
- To get knowledge about optimization in utilization of resources.
- To understand and apply operations research techniques to industrial operations

MODULE I LINEAR PROGRAMMING PROBLEM 8

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 ARTIFICIAL VARIABLE AND TWO PHASE METHOD, DUALITY 6

Artificial variable - Big M method – Two phase method – alternative optimal solution – unbounded solution - Duality – primal dual relationships - rules of constructing the dual from primal.

MODULE III TRANSPORTATION PROBLEM & ASSIGNMENT PROBLE 8

Transportation problems – Initial basic feasible solutions, MODI method, Unbalance in transportation, Degeneracy in transportation models, Assignment problem – Minimization and Maximization type of problems by Hungarian method.

MODULE IV NETWORK AND SEQUENCING PROBLEMS 8

PERT and CPM – Network diagram – Fulkerson's rule - CPM Probability of achieving completion date – Crash time – Cost analysis. Sequencing N jobs through 2 machines and 3 machines.

MODULE V QUEUING THEORY & SIMULATION 7

Poisson arrivals and exponential service times – characteristics of Queuing models – single channel – Introduction to multi channel models – Random number generation – Monte Carlo Simulation.

MODULE VI INVENTORY CONTROL, REPLACEMENT MODELS AND GAME THEORY 8

Types of inventory- Inventory cost - EOQ - Deterministic inventory problems – Introduction to probabilistic models & system level inventory control - Replacement models – Replacement of items that deteriorate with time – value of money changing with time – not changing with time – Individual and group replacement policy - Game theory – simple games.

L – 45; Total Hours –45

TEXT BOOKS:

1. Hamdy ATaha, “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.

A. Ravindran, D. T. Phillips and J. J. Solberg, "Operations Research:Principles and Practice", 2nd edition, John Wiley & Sons, New York, 1992.

3. 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

- solve linear programming problems
- solve transportation and assignment problems.
- solve network and sequencing problems.
- apply the operations research techniques to solve industrial problems.

GECX115 NANO TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basic concepts of Nanoscience relevant to the field of engineering.
- To provide an exposure about the importance of various synthesis method.
- To enrich the knowledge of students in various characterisation techniques.

MODULE I INTRODUCTION & CLASSIFICATION OF NANOMATERIALS 9

Definition - Origin of nanotechnology - Difference between bulk and nanomaterials- Top-down and bottom-up processes - Size dependent properties (magnetic, electronic,transport and optical), Classification based on dimensional property - 0D, 1D, 2D and 3D nanostructures – Kubo gap.

MODULE II TYPES OF NANOMATERIALS 9

Metal oxides and metal nano particles - Ceramic nano particles - Semi conducting quantum dots - Core-shell quantum dots - Nanocomposites - Micellar nanoparticles.

MODULE III PRODUCTION OF NANOPARTICLES 7

Sol-gel, hydrothermal, solvothermal, Plasma Arcing, Electro deposition, RF sputtering, Pulsed laser deposition, Chemical vapour, deposition.

MODULE IV CARBON BASED NANOMATERIALS 6

Carbon nanotubes: Single wall nanotubes (SWNT), Multiwall nanotubes (MWNT) - structures-carbon nanofibre, Fullerenes-Application of carbon nanotubes and Fullerenes.

MODULE V NANOPHOTONICS 7

Light and nanotechnology, Interaction of light and nanotechnology, Nanoholes and photons, nanoparticles and nanostructures; Nanostructured polymers, Photonic Crystals, Solar cells.

MODULE VI CHARACTERISATION TECHNIQUES 7

Basic principles of scanning Electron Microscopy (SEM), Atomic force microscopy (AFM), Scanning tunneling microscopy (STM), Scanning probe

microscopy (SPM) and Transmission electron microscopy (TEM), Particle size analyzer, Luminescence techniques.

L – 45; Total Hours –45

TEXT BOOKS:

1. Hari Singh Nalwa, “Handbook of Nanostructured Materials and Nanotechnology”, Academic Press, 2000.
2. Guozhong Cao, “Nanostructures and Nano materials-Synthesis, Properties and Applications”, Imperial College Press (2011).
3. Zhong Lin Wang, “Handbook of Nanophase and Nanomaterials (Vol 1 and II)”, Springer, 2002.
4. Mick Wilson, Kamali Kannangara, Geoff smith, “Nanotechnology: Basic Science and Emerging Technologies”, Overseas press, 2005.

REFERENCES:

1. A. Nabok, “Organic and Inorganic Nanostructures”, Artech House, 2005.
2. C.Dupas, P.Houdy, M.Lahmani, Nanoscience: “Nanotechnologies and Nanophysics”, Springer-Verlag Berlin Heidelberg, 2007.
3. Mick Wilson, Kamali Kannangara, Michells Simmons and Burkhard Raguse, “Nano Technology – Basic Science and Emerging Technologies”, 1st Edition, Overseas Press, New Delhi,2005.
4. M.S. Ramachandra Rao, Shubra SinghH, “Nanoscience and Nanotechnology: Fundamentals to Frontiers”, Wiley, 2013.

OUTCOMES:

At the end of this course, the students will be able to:

- Apply the knowledge of different types of nanomaterials for various engineering applications.
- Acquire the knowledge of various methods of production of nanomaterials.
- Familiarize with various characterization techniques.

GECX116	VEHICLE MAINTENANCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To know about the various methods of maintaining procedure, vehicle insurance and basic problems in a vehicle.
- The student able to impart knowledge in maintaining of engine components and subsystems.
- The student able to impart knowledge in maintaining of transmission, driveline, steering, suspension, braking and wheels.
- The student able to impart **carefully maintaining their vehicle and can increase driving safety.**

MODULE I MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS **7**

Maintenance – Need, importance, primary and secondary functions, policies - classification of maintenance work - vehicle insurance - basic problem diagnosis. Automotive service procedures – workshop operations – workshop manual - vehicle identification. Safety – Personnel, machines and equipment, vehicles, fire safety - First aid. Basic tools – special service tools – measuring instruments – condition checking of seals, gaskets and sealants. Scheduled maintenance services – service intervals - Towing and recovering.

MODULE II ENGINE AND ENGINE SUBSYSTEM MAINTENANCE **8**

General Engine service- Dismantling of Engine components- Engine repair- working on the underside, front, top, ancillaries- Service of basic engine parts, cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis- servicing emission controls.

MODULE III TRANSMISSION AND DRIVELINE MAINTENANCE **8**

Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

MODULE IV STEERING AND SUSPENSION MAINTENANCE 7

Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers. Dismantling and assembly procedures. Inspection, Maintenance and Service of steering linkage, steering column, Rack and pinion steering, Recirculating ball steering service- Worm type steering, and power steering system.

MODULE V BRAKE AND WHEEL MAINTENANCE 7

Inspection, Maintenance and Service of Hydraulic brake, Drum brake, Disc brake, parking brake. Bleeding of brakes. Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation.

MODULE VI AUTO ELECTRICAL AND AIR CONDITIOING MAINTENANCE 8

Maintenance of batteries, starting system, charging system and body electrical - Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

L – 45; Total Hours –45

TEXT BOOKS:

1. Ed May, "Automotive Mechanics Volume One" , Mc Graw Hill Publications, 2003
2. Ed May, "Automotive Mechanics Volume Two" , Mc Graw Hill Publications, 2003
3. Vehicle Service Manuals of reputed manufacturers
4. Vehicle maintenance and garage practice by Jigar A.Doshi Dhru U.Panchal,Jayesh P.Maniar. 2014
5. A Practical Approach to Motor Vehicle Engineering and Maintenance 3rd Edition by Allan Bonnick.

REFERENCES:

1. Bosch Automotive Handbook, Sixth Edition, 2004.
2. Advanced Automotive Fault Diagnosis by Tom Denton 2011.
3. Nissan Patrol Automotive Repair Manual: 1998-2014 by Haynes Manuals Inc.
4. Automobile electrical manual a comprehensive guide by Haynes manual car repair.

OUTCOMES:

On completion of the course student should be able to

- Prepare maintenance schedules and procedures with appropriate tools.
- Demonstrate the procedure and methods to repair and calibrate the engine.
- **Analyze the causes and remedies for fault in transmission and drive line systems.**
- **Analyze the causes and remedies of steering and suspension systems.**
- **Analyze the causes and remedies of brake system.**
- **Demonstrate the procedure for wheel alignment and wheel balanced.**

GECX117 FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

L	T	P	C
3	0	0	3

OBJECTIVES:

- Describe and explain basic principles of digital image processing
- Design and implement algorithms that perform basic image processing
- Design and implement algorithms for advanced image analysis
- Assess the performance of image processing algorithms and systems

PRE-REQUISITES:

- Basic knowledge of transforms in Mathematics

MODULE I DIGITAL IMAGE FUNDAMENTALS 8

Elements of Image Processing System, Fundamentals steps in Digital Image Processing, Image Sampling & Quantization, Spatial and Gray Level Resolution.

MODULE II COLOR IMAGE PROCESSING 8

Fundamental of color image processing, color models- RGB, CMY, HIS, Pseudo color image processing

MODULE III IMAGE ENHANCEMENT 7

Basic gray level Transformations, Histogram Processing, Spatial Filtering

MODULE IV IMAGE TRANSFORMS 7

2D-DFT, DCT, Haar Transform,Fundamentals of 2D-wavelet transform, sub-band coding

MODULE V IMAGE SEGMENTATION AND RESTORATION 8

Point, line and edge detection methods ,Image Segmentation and its types, Restoration: Noise model, Inverse filter and Wiener filter.

MODULE VI IMAGE COMPRESSION 7

Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, JPEG and MPEG Compression standards.

TOTAL HOURS : 45

TEXT BOOKS

1. Gonzalez and Woods, "Digital Image Processing", 3rd Edition, Pearson Education, 2016.
2. Anil. K. Jain, "Fundamentals of Digital Image Processing"; 4th Edition, PHI, 2007

REFERENCES

1. Pratt William, "Digital Image Processing", John Wiley & Sons, 2007.
2. Arthur Weeks Jr., "Fundamentals of Digital Image Processing", PHI, 2006.

OUTCOMES:

On completion of the course, students will be able to

- Explain the fundamental concepts of digital image processing.
- Discuss about color image processing
- Recognize & apply various image enhancement techniques.
- Apply various transforms for image processing.
- Apply various techniques for image segmentation and restoration.
- Identify and use appropriate image compression techniques

Group II courses
(To be offered in VII Semester)

GECX201	GREEN DESIGN AND SUSTAINABILITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on the concepts of sustainable development and fundamentals of socio economic systems.
- To understand the basics of green building and frame work for the attainment of sustainability.
- To enhance the student's interest in the design of green building and energy efficient measures in a buildings.

MODULE I CONCEPTS OF SUSTAINABLE DEVELOPMENT 7

Objectives of Sustainable Development - Need for sustainable development- Environment and development linkages - Globalisation and environment- Population, poverty and pollution- global, regional and local environment issues- Green house gases and climate change.

MODULE II SUSTAINABLE DEVELOPMENT OF SOCIO ECONOMIC SYSTEMS 8

Demographic dynamics of sustainability- Policies for socio economic development- Sustainable Development through trade- Economic growth-Action Plan for implementing sustainable development- Sustainable Energy and Agriculture.

MODULE III FRAME WORK FOR ACHIEVING SUSTAINBAILITY 7

Sustainability indicators- Hurdles to sustainability- Business and Industry – Science and Technology for Sustainable Development- Performance indicators of sustainability and assessment mechanism- Constraints and barriers of Sustainable Development.

MODULE IV GREEN BUILDINGS 8

Introduction to Green Building- Energy- Water- Materials and Resources - Sustainable Sites and Land Use - Indoor Environmental Quality- Life Cycle Assessment- Energy, water and materials efficiency.

MODULE V ENERGY CONSERVATION AND EFFICIENCY 7

Energy savings- Energy Audit- Requirements- Benefits of Energy conservation- Energy conservation measures for buildings- Energy wastage- impact to the environment.

MODULE VI GREEN BUILDINGS DESIGN 8

Elements of Green Buildings Design- Foundation, Electrical, Plumbing, flooring, Decking, roofing, insulation, wall coverings, windows, siding, doors and finishing, LEED certification for Green Buildings, Green Buildings for sustainability.

Total Hours –45

TEXT BOOKS:

1. Kirby, J., Okeefe, P., and Timber lake, “Sustainable Development”, Earthscan Publication, London, 1995.

REFERENCES:

1. Charles Kibert, J., “Sustainable Construction: Green Building Design and Delivery”, 2nd Edition, John Wiley and sons, 2007.

OUTCOMES:

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

- explain the objective, need for the sustainability and also the link between the globalization and environment.
- Address the economic, environmental, and social concerns in the sustainable development.
- Acquire knowledge on the performance indicators, constraints and barrier for sustainability.
- Explain the relationship between sustainability and emergence of green building practices.
- Recommend relevant energy conservation measures in a building
- describe the elements in green building design and suggest ideas for attainting sustainability in building.

GECX202 APPROPRIATE TECHNOLOGY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the concepts of appropriate technology and expose the students to the basics of financial analysis and energy fundamentals.
- To create awareness on the appropriate technology with relevant to building design, water, sanitation and waste management.
- To enhance student's interest in energy efficient techniques and impart knowledge on relevant policies.

MODULE I BASICS CONCEPTS 7

Back ground, Tools, Choices and Implications, Appropriate Technology Movement (an overview) - Basic design process, basic financial analysis-discounted cash flow, and energy fundamentals.

MODULE II APPROPRIATE TECHNOLOGY WITH REFERENCE TO BUILDING DESIGN 7

Appropriate Building Materials, Appropriate Energy Saving Techniques, Water Conservation (Indoor), Rain Water Harvesting.

MODULE III WATER, HEALTH AND SANITATION MANAGEMENT 7

Water Storage: Designing Dams and Pipelines, Appropriate Selection for Sanitation Technique, Sewerage, Communal Health and Waste Water Recycling.

MODULE IV WASTE MANAGEMENT 8

Types of Waste - Sources - Collections and On-Site Processing -Transferring Stations - Disposal Systems - Recycling.

MODULE V ENERGY EFFICIENT TECHNIQUES 8

Green building concepts-renewable energy sources- Solar – Steam and wind-Biofuels - Biogas – Electricity.

MODULE VI TECHNOLOGY POLICY 8

Government Policies- Energy Policy-Appropriate technology Development Centre-its function and responsibilities-Building policies-Case Studies.

Total Hours –45

TEXT BOOKS:

1. Barrett Hazeltine and Christopher Bull, “Appropriate Technology: Tools Choices and Implications”, Academic Press, Orlando, USA, 1998.
2. Ken Darrow and Mike Saxenian, “Appropriate Technology Source Book : A Guide to Practical Books for Village and Small Community Technology”, Stanford, 1986.

REFERENCES:

1. Richard Heeks, “Technology and Developing Countries: Practical Applications Theoretical Issues”, 1995.
2. John Pickford, “The Worth of Water : Technical Briefs on Health, Water and Sanitation”, Intermediate Technology Publications, 1998.

OUTCOMES:

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

- describe about the tools, choices of appropriate technology along with concepts of energy fundamentals
- conceptualize the techniques to be adopted in building design for saving energy and water.
- acquire knowledge about the techniques for water, health and sanitation management
- explain the classification, collection dispose and recycling systems adopted in waste management.
- elucidate the concepts of green building and renewable energy sources.
- express the polices relevant to technology and recommend an appropriate technology for an sustainable development.

GECX203 ENGINEERING SYSTEM MODELLING AND SIMULATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn the concepts, techniques, tools for modeling and simulation systems and environments through the use of computers.
- To study the various aspects of discrete dynamic, stochastic systems modeling and conducting experiments with those models on a computer.

MODULE I INTRODUCTION 6

Systems – Modelling – types – systems components – Steps in model building- Simulation Algorithms and Heuristics; Simulation Languages.

MODULE II RANDOM NUMBERS / VARIATES 7

Random numbers – methods of generation – random variates for standard distributions like uniform, exponential, Poisson, binomial, normal etc. – Testing of Random variates – Monte Carlo Simulation.

MODULE III MODELLING PROCESS 7

Primitive Models : Establishing relationships via physical laws; Establishing relationships via curve fitting; Parameters estimation problems; Elementary state transition models.

MODULE IV DESIGN OF SIMULATION EXPERIMENTS 9

Steps on Design of Simulation Experiments – Development of models using of Highlevel language for systems like Queuing, Inventory, Replacement, Production etc., – Model validation and verification, Output analysis.

MODULE V SIMULATION LANGUAGES 10

Need for simulation Languages – Comparisons & Selection of Languages – GPSSARENA- EXTEND – Study of any one of the languages.

MODULE VI CASE STUDIES USING SIMULATION LANGUAGES 6

Case Study using simulation languages

L – 45; Total Hours –45

REFERENCES:

1. Law, A.M., & W.D. Kelton, “Simulation Modelling and Analysis”, McGraw Hill, Singapore, 2000.
2. Harrel, C.R., et. al., “System Improvement Using Simulation”, 3rd Edition, JMI Consulting Group and ProModel Corporation, 1995.
3. Harrel, C.R. & T. Kerim, “Simulation Made Easy, A Manager’s Guide”, IIE Press, 1995.
4. Geoffrey Gordon, “Systems Simulation”, Prentice Hall, 2002.
5. David Kelton, Rondall P Sadowski, David T Sturrock, “Simulation with Arena”, Mc Graw Hill, 2004.

OUTCOMES:

The student should be able to

- Model and simulate systems and environments through the use of computers.
- Conduct experiments with discrete dynamic, stochastic system models on a computer.

GECX204 VALUE ANALYSIS AND ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To get acquainted with value analysis and engineering tool for productivity improvement.
- To understand and analyze the theory and methodology of Value Engineering.

MODULE I VALUE ENGINEERING BASICS 8

Origin of Value Engineering, Meaning of value, Definition of Value Engineering and Value analysis, Difference between Value analysis and Value Engineering, Types of Value, function - Basic and Secondary functions, concept of cost and worth, creativity In Value Engineering.

MODULE II VALUE ENGINEERING JOB PLAN AND PROCESS 6

Seven phases of job plan, FAST Diagram as Value Engineering Tool, Behavioural and organizational aspects of Value Engineering, Ten principles of Value analysis, Benefits of Value Engineering.

MODULE III ORIENTATION AND INFORMATION PHASES 8

Launching Value Engineering project work - Objectives and Targets - VE Project work: a time-bound programme - Projects and Teams - Time Schedule - Co-ordination - Consultant. Technical data - Marketing related information - Competition profile - Cost data - Materials Management related information - Quality related information - Manufacturing data.

MODULE IV FUNCTION ANALYSIS AND CREATIVE PHASES 9

Objectives - Function definition - Classification of functions - Higher level functions – Function – Cost – Function – Worth - Value Gap - Value index - How to carry out Function Analysis? – Fast Diagraming - Cost Modelling.

Creativity - How to improve creativity of an individual? – How to promote creativity in the organisation? - Obstacles to Creativity - Mental road blocks - Creativity killer phrases. Positive thinking - Ideas stimulators - Creativity techniques - Brainstorming.

MODULE V EVALUATION, INVESTIGATION AND RECOMMENDATION **6**

Paired comparison and Evaluation Matrix techniques - Criteria for selection of VE solutions. Design – Materials – Quality – Marketing – Manufacturing - Preview session. The report - presentation.

MODULE VI IMPLEMENTATION PHASE AND CASE STUDIES **8**

Design department - Materials department - Production Planning & Control - Quality Control – Manufacturing – Marketing - Need for co-ordinated teams - The Action Plan. Value Engineering case studies.

L – 45; Total Hours –45

TEXT BOOKS:

1. Mudge, Arthur E. “Value Engineering- A systematic approach”, McGraw Hill, New York, 2000.
2. Kumar S, Singh R K and Jha J K (Ed), “Value Engineering”, Narosa Publishing House, 2005.

REFERENCES:

1. Park RJ, “Value Engineering: A Plan for Invention”, St.Lucie Press, New York, 1999.
2. Lawrence, D.M., “Techniques of Value Analysis and Engineering”, McGraw Hill 1988.
3. George, E.D., “Engineering Design: a Material and Processing Approach”, McGraw Hill, 1991.
4. Heller, D.E., “Value Management, Value Engineering and Cost Reduction”, Addison Wesley, 1988.

OUTCOMES:

- The student will be able to realize the value of products, processes and implement value analysis to achieve productivity improvement.

GECX205	INDUSTRIAL SAFETY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the various safety measures to be taken in different industrial environments.

MODULE I SAFETY MANAGEMENT 7

Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety. safety education and training.

MODULE II SAFETY IN MANUFACTURING 7

Safety in metal working-Machine guarding -Safety in welding and gas cutting - Safety in cold forming and hot working of metals -Safety in finishing, inspection and testing -Regulation.

MODULE III SAFETY IN CONSTRUCTION 8

General safety consideration in Excavation, foundation and utilities – Cordoning – Demolition – Dismantling –Clearing debris – Types of foundations – Open footings.

Safety in Erection and closing operation - Safety in typical civil structures – Dams-bridges-water Tanks-Retaining walls-Critical factors for failure-Regular Inspection and monitoring.

MODULE IV ELECTRICAL SAFETY 8

Electrical Hazards – Energy leakage – Clearance and insulation – Excess energy – Current surges – Electrical causes of fire and explosion – National electrical Safety code.

Selection of Environment, Protection and Interlock – Discharge rods and earthing device – Safety in the use of portable tools - Preventive maintenance.

MODULE V SAFETY IN MATERIAL HANDLING 8

General safety consideration in material handling devices - Ropes, Chains, Sling, Hoops, Clamps, Arresting gears – Prime movers.

Ergonomic consideration in material handling, design, installation, operation and maintenance of Conveying equipments, hoisting, traveling and slewing mechanisms.

Storage and Retrieval of common goods of shapes and sizes in a general store of a big industry.

MODULE VI SAFETY EDUCATION AND TRAINING 7

Importance of training-identification of training needs-training methods – programme, seminars, conferences, competitions – method of promoting safe practice - motivation – communication - role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

L – 45; Total Hours –45

REFERENCES:

1. Krishnan N.V, “Safety Management in Industry”, Jaico Publishing House, Bombay, 1997.
2. Blake R.B., “Industrial Safety”, Prentice Hall, Inc., New Jersey, 1973.
3. Fulman J.B., “Construction Safety, Security, and Loss Prevention”, John Wiley and Sons, 1979.
4. Fordham Cooper W., “Electrical Safety Engineering”, Butterworths, London, 1986.
5. Alexandrov M.P., “Material Handling Equipment”, Mir Publishers, Moscow, 1981.

OUTCOMES:

Students would be able to

- Acquire knowledge on various safety Hazards.
- Carry out safety measures for different industrial environments.

GECX206 ADVANCED OPTIMIZATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To introduce the various advanced optimization tools.
- To provide an understanding to deal with ill identified and fuzzy problems.

MODULE I INTRODUCTION 7

Review of conventional optimization techniques - limitations - limitation of exhaustive search - need for artificial intelligence - bio mimicking methods

MODULE II HEURISTICS METHODS 8

Introduction – Advanced methods of algorithm design: Greedy method, Backtracking method, Divide and Conquer method – Dynamic programming – Heuristics exploration algorithms – Greedy search - Local search – Hill climbing – Tabu search – Gradient search – Beam search – Simulated Annealing.

MODULE III GENETIC ALGORITHM 7

Introduction - Basics of GA – Population – Reproduction – Cross over – Mutation -genetic algorithms in search, optimization and machine learning-practical genetic algorithms.

MODULE IV ANT COLONY OPTIMIZATION 8

Introduction: Ant Colony Optimization – Meta-heuristic Optimization – History – The ACO Meta-heuristic – ACO Algorithms: Main ACO – Ant system – Ant colony system – Max-Min Ant system – Applications: Routing in telecommunication networks – Travelling salesmen – Graph Coloring – Advantages & Disadvantages

MODULE V FUZZY LOGIC AND ANN 8

Fuzzy logic, knowledge representation and inference mechanism – Fuzzy and expert control – standard Takagi-Sugeno mathematical characterizations – Design example – Biological foundations to intelligent systems: Artificial

neural networks, Back-propagation networks, Radial basis function networks, and recurrent networks.

MODULE VI IMPLEMENTATIONS & APPLICATIONS 7

Reduction of size of an optimization problem – multilevel optimization – parallel processing – multi objective optimization – Job shop scheduling – Vehicle scheduling – Line balancing – Sensor integration.

L – 45; Total Hours –45

REFERENCES:

1. Singiresu S. Rao, “Engineering optimization – Theory and practices”, John Wiley and Sons, 1996.
2. Ravindran – Phillips –Solberg, “Operations Research – Principles and Practice, John Wiley and Sons, 1987.
3. Fredrick S.Hillier and G.J.Liberman, “Introduction to Operations Research”, McGraw Hill Inc. 1995.
4. Kalymanoy Deb, “Optimization for Engineering Design”, PHI, 2003
5. Christos H. Papadimitriou, Kenneth Steiglitz, Combinatorial Optimization, PHI 2006

OUTCOMES:

At the end of the course student will be able to

- Formulate a real life situation as an optimization the problem.
- Identify the appropriate solution methodology and provide a solution

GECX 207	MATLAB SIMULATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Teach students how to mathematically model engineering systems
- Teach students how to use computer tools to solve the resulting mathematical models. The computer tool used is MATLAB and the focus will be on developing and solving models of problems encountered in engineering fields

MODULE I INTRODUCTION MATLAB DATA PRESENTATION 7

Vectors, Matrices -Vector/Matrix Operations & Manipulation- Functions vs scripts- Making clear and compelling plots-Solving systems of linear equations numerically and symbolically- Least squares regression -Curve fitting.

MODULE II MATLAB PLOT FUNCTION 7

Introduction- Plot Function – Animation- 3D Plots-Customizing Plots – Plot Applications- Saving &Painting Plots.

MODULE III ROOT FINDING AND COMPUTER REPRESENTATION OF NUMBERS 7

Linearization and solving non-linear systems of equations- The Newton-Rapson method- Integers and rational numbers in different bases- Floating point numbers- Round off and errors in basic arithmetic-Significant digits when reporting results

MODULE IV ORDINARY DIFFERENTIAL EQUATIONS 8

Numerical integration and solving 1^{st} order, ordinary differential equations (Euler's method and Runge-Kutta)- Use of ODE function in MATLAB

MODULE V NON-LINEAR DIFFERENTIAL EQUATIONS 8

Converting 2^{nd} order and higher ODEs to systems of 1^{st} order ODEs- Solving systems of ODEs via Euler's method and Runge-Kutta)- Solving single and systems of non-linear differential equations by linearization-Use of the function ODE in MATLAB to solve differential equations

MODULE VI INTRODUCTION OF SIMULINK 8

Simulink & its relations to MATLAB – Modeling a Electrical Circuit- Modeling a fourth order differential equations- Modeling the solution of three equations with three unknowns- Representing a model as a subsystem-Simulink demos.

L – 45; Total Hours –45

REFERENCES:

1. Griffiths D V and Smith I M, Numerical Methods for Engineers, Blackwell, 1991.
2. Laurene Fausett, Applied Numerical Analysis Using MATLAB, Pearson 2008.
3. Moin P, Fundamentals of Engineering Numerical Analysis, Cambridge University Press, 2001.
4. Wilson HB, Turcotte LH, Advanced mathematics and mechanics applications using MATLAB. CRC Press, 1997
5. Ke Chen, Peter Giblin and Alan Irving , Mathematical Exploration with MATLAB, Cambridge University Press, 1999.

OUTCOMES:

At the end of this unit students will be able to:

- Use Matlab as a convenient tool for solving a broad range of practical problems in engineering from simple models to real examples.
- Write programs using first principles without automatic use of built-in ones.
- Write programs for solving linear and nonlinear systems, including those arising from boundary value problems and integral equations, and for root-finding and interpolation, including piecewise approximations.
- Be fluent in exploring Matlab's capabilities, such as using matrices as the fundamental data-storage unit, array manipulation, control flow, script and function m-files, function handles, graphical output.
- Make use of Maltab visual capabilities for all engineering applications.
- An ability to identify, formulate, and solve engineering problems. This will be accomplished by using MATLAB to simulate the solution to various problems in engineering fields

GECX208	EMBEDDED SYSTEMS AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

MODULE I EMBEDDED SYSTEMS OVERVIEW 8

Introduction –Embedded Systems vs. General computing systems- Fundamental Components of embedded systems- Characteristics- Challenges-Examples- Embedded System design process.

MODULE II EMBEDDED COMPUTING PLATFORM 8

Overview of Processors and hardware units in an embedded system-CPU buses – Memory devices –Memory types- I/O devices – Designing with computing platforms- Consumer electronics architecture-Design example: Alarm clock.

MODULE III REAL TIME EMBEDDED SYSTEMS 8

Programming embedded systems in assembly and C – Real time systems – Hard and Soft real time systems- Need for RTOS in Embedded Systems- Multiple tasks and processes –Context switching-Scheduling policies- Interprocess communication and synchronization.

MODULE IV EMBEDDED SOFTWARE DEVELOPMENT PROCESS and TOOLS 8

Development process of an embedded system-software modules and tools for implementation of an embedded system- Integrated development environment- Host and target machines-cross compiler-cross assembler-Choosing right platform.

MODULE V PROGRAM MODELING IN EMBEDDED SYSTEMS 8

Program Models – Data Flow Graph model-control DFG model-Synchronous DFG model- Finite state machines- UML modeling – UML Diagrams.

MODULE VI EMBEDDED SYSTEMS APPLICATION 5

Application specific embedded system – case study: digital camera hardware and software architecture, embedded systems in automobile, embedded system for a smart card.

Total Hours –45

TEXT BOOKS:

1. Marilyn Wolf , "Computers as components", Elsevier 2012.
2. Shibu. K.V, “Introduction to Embedded Systems”, Tata Mcgraw Hill,2009.
3. Rajkamal, "Embedded Systems Architecture, Programming and Design",1st Reprint,Tata McGraw-Hill, 2003
4. Frank Vahid and Tony Gwargie, "Embedded System Design", John Wiley & sons,2002.

REFERENCES:

1. Sriram V Iyer and PankajGupta ,”Embedded Realtime Systems Programming ”TataMcGraw-Hill,2008
2. Qing Li and Carolyn Yao," Real-Time Concepts for Embedded Systems",CMPBooks, 2003
3. David E.Simon, "An Embedded Software Primer", Pearson Education, 2003

OUTCOMES:

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

- Identify the suitable processor and peripherals in embedded applications
- Develop embedded programs in assembly and c
- Choose the right platform for designing an embedded system
- Explore different scheduling mechanism in rtos
- Design the program model for embedded applications.
- Analyze different domain specific applications in embedded systems.

GECX209 USABILITY ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The objective of this course is

- To understand the emerging concept of usability, requirements gathering and analysis.
- To learn about human computer interaction with the help of interfaces that has high usability.

MODULE I INTRODUCTION 6

Cost Savings – Usability Now – Usability Slogans – Discount Usability Engineering – Usability – Definition – Example – Trade-offs – Categories – Interaction Design – Understanding & Conceptualizing Interaction – Cognitive Aspects.

MODULE II USER INTERFACES 8

Generation of User Interfaces – Batch Systems, Line Oriented Interfaces, Full Screen Interfaces, Graphical User Interfaces, Next Generation Interfaces, Long Term Trends – Usability Engineering Life Cycle – Interfaces – Data Gathering – Data Analysis Interpretation and Presentation.

MODULE III INTERACTION DESIGN 8

Process of Interaction Design - Establishing Requirements – Design,Prototyping and Construction - Evaluation and Framework.

MODULE IV USABILITY TESTING 8

Usability Heuristics – Simple and Natural Dialogue, Users' Language, Memory Load, Consistency, Feedback, Clearly Marked Exits, Shortcuts, Error Messages, Prevent Errors, Documentation, Heuristic Evaluation – Usability Testing - Test Goals and Test Plans, Getting Test Users, Choosing Experimenters, Ethical Aspects, Test Tasks, Stages of a Test, Performance Measurement, Thinking Aloud, Usability Laboratories.

MODULE V USABILITY ASSESSMENT METHODS 8

Observation, Questionnaires and Interviews, Focus Groups, Logging Actual Use, User Feedback, Usability Methods – Interface Standards - National,

International and Vendor Standards, Producing Usable In-House Standards.

MODULE VI USER INTERFACES 7

International Graphical Interfaces, International Usability Engineering, Guidelines for Internationalization, Resource Separation, Multilocale Interfaces – Future Developments – Case Study.

L – 45; Total Hours –45

TEXT BOOKS:

1. Yvonne Rogers, Helen Sharp, Jenny Preece, “Interaction Design: Beyond Human - Computer Interaction”, John Wiley & Sons, 3rd Edition, 2011 (Module I, II, III).
2. Jakob Nielsen, “Usability Engineering”, Morgan Kaufmann Academic Press, 1994. (Module I – VI).

REFERENCES:

1. Ben Shneiderman, Plaisant, Cohen, Jacobs, “Designing the User Interface: Strategies for Effective Human Interaction”, Pearson Education, 5th Edition, 2010.
2. Laura M. Leventhal, Julie A. Barnes, “Usability Engineering: Process, Products, and Examples”, Pearson/Prentice Hall, 2008

OUTCOMES:

Students who complete this course will be able to

- build effective, flexible and robust user interfaces.
- translate system requirements into appropriate human/computer interaction sequences.
- choose mode, media and device for the application requirements.

GECX210 SUPPLY CHAIN MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To understand the various decision phases in a supply chain
- To be aware of the Supply Chain and its drivers
- To design Supply Chain Network
- To build a aggregate plan in supply chain
- To understand Sourcing Decisions in Supply Chain
- To comprehend the influence of Information technology in Supply Chain

MODULE I INTRODUCTION TO SUPPLY CHAIN 7

Understanding Supply Chain - Decision phases - Supply chain performance - Competitive and supply chain strategies - Achieving strategic fit - Expanding strategic scope

MODULE II SUPPLY CHAIN DRIVERS AND DESIGN 7

Drivers of supply chain performance – Designing distribution network - Network Design in the Supply Chain - Network design in Uncertain Environment

MODULE III AGGREGATE PLANNING AND MANAGING SUPPLY, DEMAND AND INVENTORY 8

Aggregate Planning in a Supply chain: role - Managing Supply - Managing Demand in Supply Chain – Cycle and Safety inventory in supply chain – Level of product availability.

MODULE IV MANAGING INVENTORY IN SUPPLY CHAIN 8

Managing Economies of Scale in a Supply Chain : Cycle Inventory- Managing uncertainty in a Supply Chain Safety Inventory- Determining optimal level of Product Availability

MODULE V SOURCING AND TRANSPORTATION 8

Sourcing decision in supply chain - Third and Fourth – Party Logistics providers - Supplier scoring and assessment - Transportation in a Supply Chain – Risk and Trade-offs in transportation design.

MODULE VI INFORMATION TECHNOLOGY IN A SUPPLY CHAIN 7

Information technology in a supply chain – CRM, ISCM, SRM in supply chain - Over view of recent trends in Supply Chain: e-SRM, e-LRM, e-SCM.

L – 45; Total Hours –45

REFERENCES:

1. Sunil Chopra and Peter Meindl, “Supply Chain Management-Strategy Planning and Operation”, Pearson Education, 5th Indian Reprint, 2013.
2. Jananth Shah “Supply Chain Management – Text and Cases“ Pearson Education, 2008.
3. Altekar Rahul V, “Supply Chain Management-Concept and Cases”, Prentice Hall India, 2005.
4. Monczka et al., “Purchasing and Supply Chain Management”, Thomson Learning, 2nd Edition, 2nd Reprint, 2002.

OUTCOMES:

- After taking up the course the student will be able to brighten his prospects of taking up a career on supply chain management.
- The student decision making capability specific to supply chain issues in an industry is improved.
- The student can plan a well defined execution of supply chain strategy in companies.
- The student will be able to design a optimal distribution network as per the demands of the industry.
- The student can also determine the most favorable transportation plan for a company.
- The student will also be able to bring in company from paper environment to paperless environment.

GECX211 SYSTEMS ANALYSIS AND DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES:

- To describe the phases of the systems development life cycle
- To teach the automated tools for system development
- To develop and evaluate system requirements.
- To explain the organizational issues in system implementation
- To teach the usability testing and electronic data interchange
- To elucidate the importance of System analysis and design in electronic commerce.

MODULE I FUNDAMENTALS OF SYSTEM DEVELOPMENT 8

System Concept – Characteristics – Elements of System – Types of System – Modern Approach to System Analysis and Design – System Development Life Cycle – Approaches to Improving Development – Tools for System Development – Succeeding as a System Analyst – Skills – Managing the Project.

MODULE II AUTOMATED TOOLS FOR SYSTEMS DEVELOPMENT 7

What is requirements determination? Fact finding techniques, Tools for documenting procedure and decision-CASE Tools-Need for CASE tools-Reverse engineering and reengineering- phases of the software life cycle-Ranking projects-Value Chain Analysis- Corporate Strategic Planning vs. Information Systems Planning.

MODULE III SYSTEM ANALYSIS 8

Determining System Requirements – Traditional Methods - Modern Methods – Radical Methods – Structuring System Requirements – Process Modeling – Data Flow Diagramming – Logic Modeling – Conceptual Data Modeling – E-R Modeling.

MODULE IV SYSTEM DESIGN 8

System Implementation – Software Application Testing – Installation – Documentation – Training and Support – Organizational Issues in Systems Implementation – Maintaining Information System – Conducting System

Maintenance.

MODULE V USABILITY AND MEASURING USER SATISFACTION 7

Usability Testing-User satisfaction test- A tool for analyzing user satisfaction – Unified Modeling Language(UML)- Case study: System Design: Application in Human Resource-Financial Applications

MODULE VI SAD IN E-COMMERCE 7

Systems analysis and design in the era of electronic commerce: B2B, B2C and C2C e-commerce -advantages and disadvantages of e-commerce. E-commerce system architecture – physical networks, logical network, World Wide Web, web-services - HTML, XML - case studies-El electronic data interchange: EDI standards - virtual private networks - XML and EDI

L – 45; Total Hours –45

REFERENCES:

1. Jeffrey A. Hoffer, Joey F. George, Joseph S. Valacich, “Modern Systems Analysis and Design”,Fifth Edition, Prentice Hall,March 2007.
2. Ned Kock, “Systems Analysis & Design Fundamentals” Sage South Asia, May 2008.
3. Joseph S. Valacich, Jeffrey A. Hoffer, Joey F. George, “Essentials Of System Analysis And Design” Prentice Hall , August 2005.
4. Rumbaugh et al, “Succeeding with Booch and Rambaugh Methods”, Addisson Wesley, second Edition, 1998.
5. Larman, C.,” Applying UML and Patterns. An introduction to Object-Oriented Analysis and Design”. Prentice-Hall PTR, 2002.

OUTCOMES:

- List the characteristics of the system and specify the approaches in the development of the system.
- Summarize the phases of the software life cycle
- Differentiate Corporate Strategic Planning and Information Systems Planning.
- Illustrate the system requirements through various modeling diagrams.
- Use tools and techniques for process and data modeling.
- Solve realistic systems analysis problems and perform user satisfaction test.

GECX212 ADVANCED MATERIALS

L	T	P	C
3	0	0	3

OBJECTIVES:

To make the student conversant with

- Dielectric materials
- Magnetic materials
- Energy materials
- Nano materials
- Semi conductors
- Smart materials

MODULE I **8**

Dielectric Materials- Polarization and Mechanism-Internal or local field-Clausius-Mossotti relation- Dielectric loss- Temperature and Frequency effect-Measurement of Dielectric constant and loss using Scherring bridge- electric break down- ferro, piezo, pyroelectric materials and its application.

MODULE II **8**

Magnetic Materials- Terminology and classification of magnetic materials (Dia, Para, Ferro & Ferri) – Magnetic moments due to electrospin – Domain theory of Hysteresis – Heisenberg theory of Exchange Interaction (without derivation)- Structure and properties of Ferrites- Properties of Soft and Hard Magnetic Materials- Application: floppy disk, CD ROM, Magneto optical recording.

MODULE III **8**

Energy Materials (Nuclear) - Introduction to nuclear materials- Materials for nuclear fuel in fission and fusion reactors, Fissile and fertile materials- Control & Construction Materials for Nuclear reactors, Moderators, Heat Exchangers- Radiation proof materials- Brief discussion of safety and radioactive waste disposal.

MODULE IV **7**

Nano Materials- The nanosize range- classification of nanomaterials- processing of nanomaterials-properties of nanomaterials- mechanical, electrical, magnetic properties- other properties- carbon based nanomaterials- other nanomaterials and its application.

MODULE V **7**

Semiconductors- The energy gap in solids-Extrinsic Semiconductors- Intrinsic Semiconductors- Hall Effect in semiconductors- Application of Hall Effect- Basic ideas of compound semiconductors -Semiconductor materials- Fabrication of Integrated Circuits- Some semiconductor Devices

MODULE VI **7**

Smart materials- aerospace materials Ni and Co based super alloys, Special steels, Titanium alloys, Intermetallics, ceramics and their composites, New High strength material, Properties of Materials, Materials in Medical Applications, Stainless steel alloys,Cobalt based alloys, titanium based alloys, polymers

L – 45; Total Hours –45

REFERENCES:

1. Materials science and Engineering: A first course by V. RAGHAVAN, 6th ed., Eastern Economy edition,Prentice Hall of India,2015
2. Materials science and Engineering: An Introduction by William D. Callister Jr., 7th ed. John Wiley & Sons Inc. 2007
3. Material science by Dr.M.Arumugam, Anurasha agencies ,third revised edition ,2002

OUTCOMES:

Students will be able to know

- significance of dielectric materials
- types and applications of magnetic materials
- applications of nuclear materials for energy harvesting
- applications of nano materials
- significance of semi conductor devices
- applications of smart materials

GECX213	NATIONAL SERVICE SCHEME	L	T	P	C
		2	0	0	2

OBJECTIVES:

Primary Objective: Personality development through community service.
To achieve the above objective, the following should be adhered:

- To provide an understanding about the aims, structure and programmes and activities of National Service scheme in terms of Nation Building
- To develop certain basic skills for personality development through community development.
- Understand the community in which they work and their relation
- Identify the needs and problems of the community and involve them in problem-solving and
- Practice national integration and social harmony.

MODULE I INTRODUCTION TO NSS 8

Orientation and structure of NSS,-Aims and Objectives of National Service Scheme-The history of NSS- Symbol and meaning- NSS hierarchy from national to college level – Role and responsibilities of various NSS functionaries

MODULE II PERSONALITY AND COMMUNITY DEVELOPMENT SKILLS 8

Importance of youth Leadership, Traits of Good Leadership and Personality Development. Role of youth in creating awareness through NSS Programmes on Health & Hygiene; Environmental Conservation and Enrichment for Sustainable Development; Sanitation and Swachh Bharat.

MODULE III UNDERSTANDING YOUTH 7

Definition and Profiles of youth categories, Youth Issues, Challenges and Opportunities for Youth, Youth as agent of social change & Community Mobilization Role of Youth in Nation Building. National Youth Policy.

MODULE IV SOCIAL HARMONY AND NATIONAL INTEGRATION 7

National Integration, Various obstacles in the way of National Integration; such as caste, religion, language and provisional problems etc. Role of youth in Peace building and conflict resolution-Globalization and its Economic Social Political and

Cultural impacts.

L – 30; Total Hours –30

TEXT BOOKS:

- National Service Scheme – A Youth Volunteers Programme for Under Graduate students as per UGC guidelines J.D.S.Panwar et al. Astral International. New Delhi.
- National Service Scheme Revised Manual, 2006.Govt. of India. Ministry of Youth Affairs & Sports. New Delhi.
- Social Problems in India, *Ram Ahuja.*

REFERENCES:

1. National Youth Policy-2014. Ministry of Youth Affairs & Sports. .Govt. of India

OUTCOMES:

On successful completion of this course-

- Students will have exposure to the the aims, structure and programmes and activities of National Service scheme in terms of Nation Building
- Students will be trained to skills for personality development through community development.
- Students will gain knowledge about national integration and social harmony.
- Students will be exposed to the role of youths in Nation building Students will gain

GECX214	AUTOMOTIVE POLLUTION AND CONTROL	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To have a fair knowledge in automotive pollution control.
- To understand the concept of formation and control techniques of pollutants like UBHC, CO, NOx, particulate matter and smoke for both SI and CI engine will be taught to the students.
- To know about the instruments for measurement of pollutants
- To get introduced about emission standards

MODULE I EMISSION FROM AUTOMOBILES 8

Sources of Air Pollution. Various emissions from Automobiles — Formation — Effects of ollutants on environment and human beings. Emission control techniques – Modification of fuel, after treatment devices. Emission standards. Automotive waste management, old vehicle disposal, recycling, tyre recycling

MODULE II SI ENGINE EMISSIONS AND CONTROL 9

Emission formation in SI Engines- Carbon monoxide & Carbon di oxide - Unburned hydrocarbon, NOx, Smoke —Effects of design and operating variables on emission formation – controlling of pollutants - Catalytic converters, Charcoal Canister, Positive Crank case ventilation system, Secondary air injection, thermal reactor

MODULE III CI ENGINE EMISSION AND CONTROL 8

Formation of White, Blue, and Black Smokes, NOx, soot, Effect of Operating variables on Emission formation — Fumigation, Split injection, Catalytic Coating, EGR, Particulate Traps, SCR, Fuel additives — Cetane number Effect.

MODULE IV NOISE POLLUTION FROM AUTOMOBILES 8

Sources of Noise — Engine Noise, Transmission Noise, vehicle structural Noise, aerodynamics noise, Exhaust Noise. Noise reduction in Automobiles — Encapsulation technique for noise reduction —Silencer Design.

MODULE V TEST PROCEDURES 6

Constant Volume Sampling I and 3 (CVSI &CVS3) Systems- Sampling Procedures — Chassis dynamometers - Seven mode and thirteen mode cycles for Emission Sampling.

MODULE VI EMISSION MEASUREMENTS 6

Emission analysers —NDIR, FID, Chemiluminesecent, Smoke meters, Dilution Tunnel, SHED Test, Sound level meters.

L – 45; Total Hours –45

TEXT BOOKS:

1. V.Ganesan, 'Internal combustion Engines', Tata McGraw Hill Book Co, Eighth Reprint, 2005.
2. Crouse and Anglin, 'Automotive Emission Control', McGraw Hill company., Newyork 1993.

REFERENCES:

1. G.P.Springer ad D.J.Patterson, Engine Emissions, Pollutant formation, Plenum Press, New York. 1986.
2. D.J.Patterson and N.A.Henin, 'Emission from Combustion Engine and their control', Anna Arbor Science Publication,1985.
3. L.Lberanek, 'Noise Reduction', Mcgrawhill Company., Newyork1993.
4. C.Duerson, 'Noise Abatment', Butterworths ltd., London1990.
5. A.Alexander, J.P.Barde, C.lomure and F.J. Langdan, 'Road traffic noise',
6. Applied science publisher ltd., London,1987.

OUTCOMES:

On completion of the course student should be able to

- Identify the sources of emission from vehicles.
- Analyse the causes and effects of emissions.
- Analyse causes and effects of noise pollution
- Bring out solutions for control of emissions.
- Demonstrate the test procedures and emission norms.
- Select suitable instruments for measurement of emissions.

GECX215	MOTOR VEHICLE ACT, INSURANCE AND POLICY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn about basic act and regulation followed for road vehicle
- To learn about systematic steps involved to get licence and registration of motor vehicle
- To learn arbour various types of motor vehicle polices and insurances

MODULE I BASIC RULES FOR ROAD VEHICLE 8

Display and Use of Number Plates- Attachment of number plates- Number plates in horizontal position- Removal of number plates on transfer- Hours prescribed for lighted lamps- Mounting of lamps and reflectors- Multiple beam headlamps- Daytime running lamps- Auxiliary driving lamps- Parking lamps- Brakes- Stopping distances- Emergency or parking brakes- Horn- Muffler- Mirrors- Inspection of motor vehicles- Standards of safety and repair

MODULE II LICENSING OF DRIVERS OF MOTOR VEHICLES 8

Necessity of driving licence- Age limit in connection with driving of motor vehicle-Responsibility of owners of motor vehicles-Restriction on the holding of driving licence-Grant of learner's licence-Grant of driving licence-Addition to driving licence- Renewal of driving licence-Revocation of driving licence on grounds of disease or disability-Driving licence to drive motor vehicle belonging to the central government- power of court to disqualify- suspension of driving licence in certain cases- suspension or cancellation of driving licence on convection- Endorsement.

MODULE III REGISTRATION OF MOTOR VEHICLE 7

Necessity for registration – Registration Where and how to be made- Special provision for registration of motor vehicle of diplomatic officers-Temporary registration- Production of vehicle at the time of registration- Refusal of registration- renewal of certificate of registration- effectiveness in India of registration- Change of residence or place of business-transfer of ownership-Suspension of registration – cancellation of registration suspended under section 53- certificate of fitness of transport vehicle-cancellation of registration.

MODULE IV INSURANCE OF MOTOR VEHICLE 8

Necessity for insurance against third party – Requirements of policies and limits of liability- - Duty of insurers to satisfy judgements and awards against person insured in respect of third party risks-Duty to give information as to insurance-Settlement between insurers and insured persons- transfer of certificate of insurance-production of certain certificates, licences and permit in certain cases-Special provisions as to compensation in case of hit and run motor accident – Types of motor polices

MODULE V CONTROL OF TRANSPORT VEHICLES 7

Power to State Government to control road transport- Transport authorities-General provision as to applications for permits- Application for stage carriage permit- Procedure of Regional Transport Authority in considering application for stage carriage permit- Scheme for renting of motor cabs- Application for private service vehicle permit- Procedure in applying for and granting permits- Duration and renewal of permits- Transfer of permit- Replacement of vehicles-Temporary permits

MODULE VI OFFENCES AND PUNISHMENT 7

Driving without holding an effective driving licence- Driving by an under-aged person (Minor driving vehicle)- Holding of a driving licence permitting it to be used by other person.- Driving a vehicle at an excessive speed- Driving or permitting to drive a vehicle carrying excess load- Driving dangerously / its Abetment Driving an uninsured vehicle

Rider and pillion rider failing to wear protective head gear (Helmet) -Violation of Mandatory Signs -.e-challan and spot challan

L – 45; Total Hours –45

TEXT BOOKS:

1. The motor vehicle act 1988, Universal law publishing co.cpvt ltd. Newdelhi 2011
2. A Commentary On The Motor Vehicles Act, 1988 by SUKHDEV AGGARWAL The Bright Law House, New Delhi

REFERENCES:

1. The Motor Vehicles Act, 1988 Along with Latest Case Law, Notifications & Table of Offences and Punishments Asia Law House; 15th edition (2014)
2. Assessment of Compensation in Accidents under Motor Vehicles Act by Karkara Delhi Law House (2013)

OUTCOMES:

On completion of the course students should be able to

- Explain the analysis of rules and regulations for road vehicles
- Analyze the procedure for getting driving license for vehicles at national and international level
- Analyze the procedure for registration of vehicles.
- Analyze the procedure for Insurance of vehicles and claims.
- Analyze the procedure for obtaining Government Permits and renewal
- Analyze the consequences of not following the rules and regulations

GECX216	PRINCIPLES OF COMMUNICATION SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the analog and digital modulation techniques.
- To elaborate the working of communication receivers in the presence of noise.
- To give an overview of various communication systems.

MODULE I LINEAR MODULATION 8

Baseband signals, Amplitude Modulation – Modulation Index, Power Transmitted, Double Side Band and Single Side Band AM, AM Modulators and AM Receivers, AM Radio systems, Frequency Division Multiplexing.

MODULE II ANGLE MODULATION 8

Frequency Modulation and Phase Modulation, Frequency deviation and modulation index, Bandwidth of FM, FM Modulators and FM receivers, FM Radio and FM Stereo Systems

MODULE III SAMPLING AND PULSE MODULATION 7

Sampling, Nyquist's Sampling Theorem, Pulse Modulations - PAM, PPM and PWM, Time Division Multiplexing, Bandwidth of TDM systems.

MODULE IV DIGITAL COMMUNICATION 7

Digital baseband data,Digital Modulations – ASK, FSK, PSK and QPSK. Digital Communication Transmitters and Receivers.

MODULE V NOISE 8

Sources of Noise, Thermal Noise, shot noise, White noise, Narrow band Noise, Effect of noise in communication, SNR, Receiver Noise Temperature and Noise Equivalent Bandwidth.

MODULE VI COMMUNICATION SYSTEMS & NETWORK 7

FM Radio Systems, Cellular Mobile network, Satellite Communications, Optical Fiber Communication.

L – 45; T – 0; Total Hours – 45

TEXT BOOKS:

1. A.Bruce Carlson, Paul B. Crilly, “Communication Systems”, 5th Edition, McGraw Hill Int., 2011.
2. B.P. Lathi, Zhi Ding, Hari M. Gupta, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2017.

REFERENCES:

1. Herbert Taub, Donald L. Schilling, Goutam Saha, “Principles of Communication Systems” 4th Edition, McGraw Hill Int. 2013.
2. Simon Haykin, “An Introduction To Analog And Digital Communications”, 1st Edition, Wiley India, 2010.
3. Simon Haykin , “Communications Systems” 4th Edition, Wiley India, 2006.
4. Hwei P. Hsu, “Analog and Digital Communications” 3rd Edition,

OUTCOMES:

On completion of the course students will be able to

- Identify various communication systems and the corresponding modulation schemes.
- Predict the characteristics of various analog and digital modulation schemes.
- Interpret the effect of noise and bandwidth in a communication systems
- Apply the Nyquist criteria for a given baseband signals.
- Evaluate the performance of communication receivers.
- Demonstrate the applications of common communication systems.

GECX 217	LEAN MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objective of the Course to make the student know about

- The basics of leanproduction management,
- How Lean principles are applied to the Construction industry to improve the operation management and product development.

MODULE I **7**

Lean production – Introduction, background, and lean thinking. Importance of philosophy, strategy, culture, alignment, focus and systems view. Discussion of Toyota Production System.

MODULE II **8**

Manufacturing systems – an overview of manufacturing strategies. Job shops, batch flow, and flexible manufacturing systems Flow production and lean production systems

MODULE III **7**

Value stream mapping in process design and product development Waste reduction - lead time reduction

Process cycle time and value-added vs. non-value added activities Optimum lot sizing

MODULE IV **8**

Lean production processes, approaches and techniques.—Importance of focusing upon flow. Tools -. Workplace organization – 5S. - Stability. - Just-In-Time – One piece flow – Pull. - . Cellular systems. - . Quick change and set-up reduction methods. f. Total productive maintenance. -. Poka-Yoke – mistake proofing, quality improvement. Standards. - . Leveling. - . Visual management. Just-in-time techniques – SMED and Takt Times - Standard work processes and line balancing Poka-yoke and pull systems material handling reduction and facilities planning

MODULE V **8**

Managing change in the lean organization Human resource management and

the lean enterprise Employee involvement – Teams – Training – Supporting and encouraging involvement – Involving people in the change process -- communication -- Importance of culture. Startup of lean processes and examples of applications. Sustaining improvement and change, auditing, follow-up actions.

MODULE VI **7**

The lean enterprise and supply chain management Costs and risks of lean initiatives - Measuring lean initiatives

Total Hours –45

TEXT BOOKS:

1. The Toyota Way Field book, Jeffrey Liker and David Meier, McGraw-Hill, 2006. Lean Production Simplified, Pascal Dennis, Productivity Press, 2007.
2. Womack, James P., and Daniel T. Jones. Lean Thinking. New York, NY: Simon and Schuster, 2003. ISBN: 0743249275.
3. Murman, Earll. Lean Enterprise Value. New York, NY: Palgrave Macmillan, 2002. ISBN: 0333976975.

REFERENCES:

1. Readings athttp://www.leanconstruction.org/readings.htm
2. Hopp,W.J.,andSpearman,M.L.(2011).FactoryPhysics,ThirdEdition, WavelandPress,LongGrove,Il. 720pp.

OUTCOMES:

The student will be able to

- Describe the manufacturing approaches employed and the background and philosophy of lean production.
- Illustrate the concept of waste reduction
- Apply evaluation techniques that can be used in preparation for and use in learn production activities.
- Select the tools that can be used implementing lean production in production operations.
- Discuss the importance of workplace organization, pull production, cellular arrangement and employee involvement, need for employee creativity
- Describe about the Methods for promoting success in implementing lean transformations

GECX218 SPATIAL DATA MODELING AND ANALYSIS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To impart knowledge on the fundamental representation and analysis of geospatial phenomena and provides the various methods and algorithms used in GIS analysis.
- To focus in terrain modeling, geomorphometry, watershed analysis and introductory GIS-based modeling of landscape processes (water, sediment). The course includes analysis from lidar data, coastal change assessment and 3D visualization.

MODULE I INTRODUCTION TO GEOSPATIAL DATA 7

Mapping natural phenomena –Concept of continuous fields and discrete sampling – Units, projections, coordinate transformation – Georeferencing, geospatial formats, conversions, geospatial data abstraction library – Raster and vector representation, raster and vector conversions and resampling.

MODULE II DATA DISPLAY AND VISUALIZATION 7

Display of continuous and discrete data, use of color, shading, symbols, to extract the spatial pattern and relationships – 3D visualization: multiple surfaces and volumes, 3D vector objects – visualization for data analysis (lighting, scaling, transparency, cutting planes, animations) – view/create maps/post your data on-line (Google Earth/Maps, GPS visualizer)

MODULE III GEOSPATIAL ANALYSIS 7

Foundations for analysis of continuous and discrete phenomena – neighborhood operations and buffers – analysis and modeling with map algebra – cost surfaces and least cost path – spatial interpolation and approximation (gridding)

MODULE IV TERRAIN MODELING AND ANALYSIS 9

terrain and bathymetry mapping – mathematical and digital representations (point clouds, contour, raster, TIN) – DEM and DSM, working with multiple return lidar data – spatial interpolation of elevation data and topographic analysis, line of sight, view shed analysis – solar irradiation, photovoltaic energy potential, time series of elevation data, analysis of coastal change.

MODULE V FLOW TRACING, WATERSHED ANALYSIS AND LANDFORMS 8

Methods for flow routing and flow accumulation – Extraction of stream networks – Extraction of watershed boundaries and building watershed hierarchies – feature extraction, types of landforms.

MODULE VI MODELING OF GEOSPATIAL PROCESSES 7

Model formulation, input data processing – introduction to GIS-based hydrologic, erosion and environmental modeling – Geocomputational methods, including agent-based modeling, artificial neural networks and evolutionary computing.

Total Hours –45

TEXT BOOKS:

1. Hassan A, Karimi (2017), Geospatial Data Science Techniques and Applications, CRS Press & Co.
2. Sudipto Banerjee, Bradley P, Carlin, Alan E. Gelfand (2014), Hierarchical Modeling and Analysis for Spatial Data, CRS Press & Co.

REFERENCES:

1. Maguire, D., M. Batty, and M. Goodchild. 2015. GIS, Spatial analysis, and modeling. ESRI Press (G70.212 .G584 2005)
2. Zeiler, M. 2010. Modeling Our World: The ESRI Guide to Geodatabase Design. Second Ed. ESRI Press, Redlands, California

OUTCOMES:

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

- apply the basic concepts of Conceptualize models as representations of real life systems with inputs, outputs, and processes.
- employ the spatial tools to make simulations and predictions of real life phenomena.
- integrate and develop models with geospatial data through GIS.
- evaluate models in terms of accuracy, sensitivity, and uncertainty.
- perform a system-based approach for problem solving, with an emphasis on sustainability.
- execute the hydrological, erosion and environmental modeling through GIS.

GECX 219	ADVANCED ENTREPRENEURSHIP	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop an entrepreneurial mindset.
- To learn the tools and methods for achieving sustainable growth.
- To explore various funds for a business and to get know about importance of a good team.
- To select public image branding and examine all channel types.
- To identify technology needs and establish key metrics to measure progress the business.
- To know about legal issues, regulations of starting and operating a venture and capstone presentation on practice venture.

Course Pre-requisites Completion of Social Entrepreneurship CourseAccess to Learnwise Platform

MODULE I ENTREPRENEURSHIP BASICS & REFINING BUSINESS MODEL 8

EntrepreneurshipBasics - Recap of Key Concepts, Introduction to First Venture, Recap of idea selection and Lean Canvas, Revisit product/service, Business model, Team formation**. Refining Business Model –**Pivoting, Types of Business Model, Refining Business Models, Evaluate business model, Identify additional customer segments, Analyze Business Model of Competitors, Importance of Product Management.

MODULE II BUSINESS PLANNING & REVENUE 8

Business Planning – Introduction to Business Plan, Make a Sales Plan, Hiring Sales Team, Make a People Plan for Venture, Financial Planning and Forecasting Template, Revisit Business Model, Create a Procurement Plan, Negotiation. **Revenue** –Exploring ways to Increase Revenue, Understanding Primary Revenue Source, Customer Lifecycle for Growing Customers, Exploring Secondary Sources of Revenue.

MODULE III FUNDING GROWTH & BUILDING A-TEAM 7

Funding Growth – Funding Options for an Entrepreneur, Explore the Right Funding Options, Exploring crowd funding platforms, Create Your Funding Plan, Pitch Practice. **Building A-Team** – Intro to Building an A-Team, Defining roles and responsibilities, Pitching to Attract Talent, Setting Your Team Up for Success, Defining Role of a New Hire

.

MODULE IV BRANDING AND CHANNEL STRATEGY 7

Branding and Channel Strategy– Intro to Branding, Draw your Venture's Golden Circle, Define Your Values, Positioning Statements, Selecting Brand Name, Social Media Handle, Logo and Mobile app names forYour Venture, Creating online public profiles, Bulls Eye Framework and other traditional channel types, Identify your Right Channel using Bulls Eye Framework.

MODULE V LEVERAGING TECHNOLOGIES AND AVAILABLE PLATFORMS & MEASURING PROGRESS 8

Leveraging Technologies and Available Platforms – Leaping Ahead with Technology, Digital Marketing for Your Startup, Plan a Social Media Campaign, Digital Collaboration, Store Your Documents Online, Other Platforms, Make Your Tech Plan and Platform Wish List. Measuring Progress – Metrics for Customer Retention and Satisfaction, Find your CAC, CLV, and ARPU, Key Financial Metrics, How to Communicate Your Metrics, Find New Revenue Streams based on Your Key Financial Metrics, Re-forecast your Financial Plan to Increase Margin.

MODULE VI LEGAL MATTERS & SEEKING SUPPORT & FINAL PROJECT 7

Legal Matters – Identify the Professional Help and Legal and Compliance Requirements for Your Venture, Conduct a Trademark Search for Your Company/Brand Name. **Seeking Support** – How Mentors Help to Create Successful Startups, Identify Mentors and Advisors, Scout for Board of Directors.**Final Project –** Capstone Project Presentation.

Total Periods- 45

TEXT BOOKS

1. Learn wise platform - Wadhwani Foundation, 2018.
2. All Lessons are delivered as Online videos accessible using Wadhwani Foundation's Learnwise Platform - https://lms.learnwise.wfglobal.org

OUTCOMES:

On completion of the course, students will be able to

- Achieve sustainable growth by pivoting, refining business models, expand customer segments, and business planning for developing early customer traction into a repeatable business.
- Develop strategies to grow revenues and markets.
- Develop an A-Team, brand strategy and create digital presence.
- Develop brand and channel strategy for customer outreach
- Leverage social media to reach new customers cost effectively.
- Explore licensing and franchising for business expansion.

GECX220	ELECTRIC VEHICLES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the concept of Electric Vehicles.
- To familiarize the basic energy transfer processes that govern existing and proposed methods of power generation for Electric Vehicles.
- To familiarize with the traditional and non-traditional sources for Electric Vehicles in terms of energy content, accessibility, required processing steps and projected remaining reserves

MODULE I INTRODUCTION 8

A Brief History - Types of Electric Vehicle in Use Today : Battery electric vehicles - The IC engine/electric hybrid vehicle - Fuelled electric vehicles - Electric vehicles using supply lines - Solar powered vehicles - Electric vehicles which use flywheels or super capacitors - Ultra Capacitor – Ultra high Speed Flywheels.

MODULE II BATTERIES 7

Battery Parameters - Lead Acid Batteries - Nickel-based Batteries - Sodium-based Batteries - Lithium Batteries - Metal Air Batteries - Battery Charging - Choice of Battery - Use of Batteries in Hybrid Vehicles - Battery Modeling.

MODULE III FUEL CELLS 8

Hydrogen Fuel Cells - Fuel Cell Thermodynamics - Connecting Cells in Series - Water Management in the PEM Fuel Cell - Thermal Management of the PEM Fuel Cell - A Complete Fuel Cell System - Hydrogen Supply - Fuel Reforming - Hydrogen Storage.

MODULE IV ELECTRIC VEHICLE MODELLING AND DESIGN CONSIDERATIONS 7

Tractive Effort - Modeling Vehicle Acceleration - Modelling Electric Vehicle Range - Aerodynamic Considerations - Transmission Efficiency - Electric Vehicle Chassis and Body Design - General Issues in Design.

MODULE V DESIGN OF ANCILLARY SYSTEMS 7

Heating and Cooling Systems - Design of the Controls - Power Steering - Choice of Tyres - Wing Mirrors, Aerials and Luggage Racks - Electric Vehicle Recharging

and Refueling Systems.

MODULE VI ENVIRONMENTAL IMPACT AND ENERGY STORAGE 8

Vehicle Pollution - The Effects - A Quantitative Analysis - Vehicle Pollution in Context - Alternative and Sustainable Energy Used via the Grid Hybridization of Energy Storages - Energy Consumption in Braking - Brake System of EVs and HEVs - Antilock Brake System.

Total Hours – 45

REFERENCES:

1. James Larminie and John Lowry, “Electric Vehicle Technology Explained”,John Wiley & Sons Ltd, 2nd edition, 2015.
2. M. Ehsani, Y. Gao, Stefano Lango, K.M.Ebrahimi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 3rd Edition,2018.
3. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, 2nd edition, CRC Press, 2016.
4. Tom Denton, “Electric and Hybrid Vehicles” Routledge Publishers, 1st edition, March 2016.

OUTCOMES:

At the end of the course, the student is expected to possess knowledge and achieve skills on the following:

- Identify and quantify the important energy transfer for Batteries and fuel cell schemes.
- Identify the opportunities and challenges of advances in Electric Vehicles.
- Choose a suitable drive scheme for developing an electric hybrid vehicle depending on Resources
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles.
- Choose proper energy storage systems for vehicles
- Identify the current industry activities by car makers, electricity utilities, parts, suppliers (motors and batteries), including joint ventures, product announcements and pilot projects.

GECX 221 ARTIFICIAL INTELLIGENCE AND EVOLUTIONARY COMPUTING USING MATLAB

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OBJECTIVES:

- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks.
- To teach about the concept of fuzziness involved in various systems.
- To provide adequate knowledge about fuzzy set theory.
- To provide comprehensive knowledge of fuzzy logic control and its application to real time systems.
- To expose the ideas of GA and EP in optimization and control.

MODULE I FUNDAMENTALS OF ARTIFICIAL NEURAL NETWORKS 9

Objectives,history, biologicalinspiration, neuron model, McCulloch-Pitts neuron model, single-input neuron, multi-input neuron, network architectures, perceptron architecture, single-neuron perceptron, multi-neuron perceptron, perceptron learning rule, constructing learning rules, training multiple-neuron perceptron

MODULE II ASSOCIATIVE NETWORKS 9

Simple associative networks, auto-associative and hetero-associative nets, learning in neural nets, supervised and unsupervised learning, unsupervised Hebb rule, Kohonen rule, ADALINE and MADALINE network, back propagation neural networks,Hopfield networks, adaptive networks, applications using Neural Network toolbox in Matlab.

MODULE III FUZZY SET THEORY 6

Fuzzy versus crisp, crisp sets, fuzzy sets, operations and properties, membership function, crisp relations, fuzzyrelations.

MODULE IV FUZZY SYSTEMS 6

Crisp logic – fuzzy logic – fuzzy rule-based system- defuzzification methods – applications – Greg Viot’s fuzzy cruise controller - fuzzy logic control using FIS in Matlab

MODULE V FUNDAMENTALS OF GENETIC ALGORITHMS 7

Genetic algorithms, history, basic concepts, working principle, encoding, fitness

function, reproduction

MODULE VI GENETIC MODELING AND APPLICATIONS 8

Genetic operators, cross over types, mutation operator, coding steps of GA, convergence characteristics, applications of AI techniques in various domains using GATOOL in matlab

Total Hours –45

REFERENCES:

1. Laurance Fausett, Englewood cliffs, N.J., 'Fundamentals of Neural Networks',Pearson Education, 1992.
2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Tata McGraw Hill,1997.
3. David Goldberg, "Genetic Algorithms and Machine learning", PHI
4. Wassermann, P. D. "Neural Computing" Van Reinhold, 1988.
5. Zimmermann, H. J., 'Fuzzy Set Theory and Its Applications', 2nd Edition,Kluwer Academic Publishers.
6. Martin T. Hogan, Howard B.Demuth. M,'Neural network design'4th edition
7. Zureda, J.M.,'Introduction to Artificial Neural Systems', Jaico publishing house Bombay, 1994.
8. Bose N.K, Liang P. 'Neural Network Fundamentals with graphs, Algorithms and applications', TMH Pub. Co. Ltd, 2001.
9. S.Rajasekaran, G.A.Vijayalaksmi Pai , Neural Networks, Fuzzy logic and Genetic algorithms Synthesis and Applications , PHI private learning Ltd.,.New Delhi, 2011.

OUTCOMES:

At the end of the course, the student is expected to possess knowledge andachieve skills on the following:

- Enumerate the theoretical basis of soft computing.
- Discuss the neural networks and supervised and unsupervised learning networks
- Design suitable neural networks, fuzzy systems, genetic representations with appropriate fitness functions for simple problems
- Apply the most appropriate soft computing algorithm for a given situation
- Know the key issues in using these techniques for search of difficult search-spaces
- Be aware of the different approaches and different applications in the field.