UNIVERSITY VISION AND MISSION

VISION

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

MISSION

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

VISION AND MISSION OF THE DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION

The Department of Electronics and Communication Engineering envisions to be a leader in providing state of the art education through excellence in teaching, training, and research in contemporary areas of Electronics and Communication Engineering and aspires to meet the global and socio economic challenges of the country.

MISSION

- The Department of Electronics and Communication Engineering endeavors to produce globally competent Engineers prepared to face challenges of the society.
- To enable the students to formulate, design and solve problems in applied science and engineering.
- To provide excellent teaching and research environment using state of the art facilities.
- To provide adequate practical training to meet the requirement of the Electronics & communication industry.
- To train the students to take up leadership roles in their career or to pursue higher education and research.

PROGRAMME EDUCATIONAL OBJECTIVES AND OUTCOMES
B.Tech. (Electronics and Communication Engineering)

PROGRAMME EDUCATIONAL OBJECTIVES

- To provide a fundamental knowledge in Mathematics and Basic Sciences to enable to solve problems in Electronics and Communication Engineering
- To impart necessary knowledge and skill in the area of Microelectronics, Signal Processing, Telecommunication and Networking.
- To impart practical knowledge and skill sets with the state of the art industrial hardware and software tools to meet the industrial requirement
- To provide knowledge in related disciplines of electronics engineering through elective courses to enable them to work in multidisciplinary areas.
- To train in soft skills to attain leadership roles in industries

PROGRAMME OUTCOMES

On completion of the program the graduates will have

- The ability to apply knowledge of Mathematics, Sciences and Engineering to solve real time engineering problems pertaining to Electronics and Communication Engineering
- Ability to design and implement microprocessor / microcontroller based real time applications
- The ability to process signals and images for solving real time communication problems
- Knowledge to simulate, synthesize and perform FPGA implementation of VLSI circuits related to digital applications
- Professional and ethical responsibility with ability to communicate effectively and execute the work as a team
- Adequate knowledge and exposure to industry-standard software and hardware, to lead to professional career in Electronics and Communication

B.S.ABDUR RAHMAN
UNIVERSITY
B.S. ABDUR RAHMAN INSTITUTE OF SCIENCE & TECHNOLOGY
(Estd.u/s 3 of the UGC Act, 1956)
(FORMERLY B.S.ABDUR RAHMAN CRESCENT ENGINEERING COLLEGE)
Seethakathi Estate, G.S.T. Road, Vandalur, Chennai - 600 048.

REGULATIONS 2013
FOR
B.TECH. DEGREE PROGRAMMES

REGULATIONS - 2013 FOR
B.TECH. DEGREE PROGRAMMES

1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

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

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

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

iv) **"University"** means B.S.Abdur Rahman University.

v) **"Dean (Academic Affairs)"** means the Dean (Academic Affairs) of B.S. Abdur Rahman University.

vi) **"Dean (Student Affairs)"** means the Dean (Students Affairs) of B.S.Abdur Rahman University.

vii) **"Controller of Examinations"** means the Controller of Examination of B.S. Abdur Rahman University, 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 University 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 University 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

University for admission. The entrance examination shall test the proficiency of the candidate in Mathematics, Physics and Chemistry on the standards prescribed for plus two academic stream.

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

3.0 BRANCHES OF STUDY

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

B.TECH. DEGREE PROGRAMMES:

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

4.0 STRUCTURE OF THE PROGRAMME

4.1 Every Programme will have a curriculum with syllabi consisting of theory and practical courses such as,

i) Basic Sciences (BS)

ii) Humanities & Social Sciences (HS)

iii) Management Sciences (MS)

iv) Engineering Sciences Fundamentals (ESF)

v) Engineering Core Courses (EC)

vi) Professional Electives (PE)

vii) General Electives (GE)

viii) Workshop practice, laboratory work, industrial training, seminar presentation, project work, etc.

4.2 Each course is normally assigned certain number of credits :

one credit per lecture period per week

one credit per tutorial period per week

one credit for two to three periods and two credits for four periods of laboratory or practical courses

one credit for two periods of seminar / project work per week

one credit for two weeks of industrial internship

4.3 Each semester curriculum shall normally have a blend of lecture courses not exceeding seven and practical courses not exceeding four.

4.4 For the award of the degree, a student has to earn a minimum total credits specified in the curriculum of the relevant branch of study. This minimum will be between 175 and 185 credits, depending on the program.

4.5 The medium of instruction, examinations and project report shall be English, except for courses on 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 a 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 or 450 periods.

5.3 Semester end examination will normally follow immediately after the last working day of the semester.

6.0 CLASS ADVISOR AND FACULTY ADVISOR

6.1 CLASS ADVISOR

A faculty member will be nominated by the HOD as Class Advisor for the whole class (2nd to 8th semester).

He/she is responsible for maintaining the academic, curricular and co-curricular records of all students throughout their period of study.

However, for the first semester alone the class advisors and faculty advisors will be nominated by first year coordinator.

6.2 FACULTY ADVISOR

To help the students in planning their courses of study and for general counseling on the academic programme, the Head of the Department of the students will attach a certain number of 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 offer advice to the students on academic and personal matters, and guide the students in taking up courses for registration and enrolment every semester.

7.0 COURSE COMMITTEE

Common course offered to more than one discipline or group, shall have a "Course Committee", comprising all the faculty members 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 on whether all the faculty members teaching the common course belong to the same department / different departments.

8.0 CLASS COMMITTEE

During first semester, a common Class Committee will be constituted for all branches by the Dean (Academic Affairs). During other semesters, separate Class Committees will be constituted by the respective Head of the Department of the students

8.1 The first semester Class Committee composition will be as follows:

i) Coordinator for the first semester shall be the Chairman of the class committee

ii) Course coordinators of all common courses.

iii) Faculty members of all individual courses.

iv) One male and one female first semester student of each class of B.Tech, program to be nominated by the first semester coordinator

v) All first semester class advisors and faculty advisors

8.2 The composition of the class committee for each branch of B.Tech, from 2nd to 8th semester, will be as follows:

i) One senior faculty member preferably not teaching to the concerned class, appointed as Chairman by the Head of the Department

ii) Faculty members of individual courses

iii) Two students, (preferably one male and one female) of the class per group of 30 students or part thereof, to be nominated by the Head of the Department, in consultation with the faculty advisors.

iv) All faculty advisors and the class advisor of the class

v) Head of the Department

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

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

8.5 The class committee, excluding the student members and the invited members, shall meet within 10 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 the grades for students 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. If the course is common to more than one branch of study, grades for such courses shall be finalized in the course committee meetings in consultation with the Dean (Academic Affairs).

9.0 REGISTRATION AND ENROLMENT

9.1 Except for the first semester, every student shall register for the ensuing semester during a specified week before the semester end examination of the current semester. Every student shall submit a completed Registration

form indicating the list of courses intended to be enrolled during the ensuing semester. Late registration with the approval of Dean (Academic Affairs) along with a late fee will be permitted up to the last working day of the current semester.

9.2 From the second year onwards, all students shall pay the prescribed fees for the year on a specific day at the beginning of the semester confirming the registered courses. Late enrolment along with a late fee will be permitted up to two weeks from the date of commencement of classes. If a student does not enroll, his/her name will be removed from rolls.

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

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

10.1 CHANGE OF A COURSE

A student can change an enrolled course within 15 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 second assessment for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

11.0 TEMPORARY BREAK OF STUDY FROM A PROGRAMME

A student can avail a onetime temporary break of study covering the current semester and/or next semester period with the approval of the Head of the Institution at any time before the start of third assessment of current semester, within the maximum period of 14 or 12 semesters as the case may be. If any student is debarred for want of attendance or suspended due to any act of indiscipline it will not be considered as break of study.

A student availed break of study has to rejoin only in the same semester from where he left.

12.0 CREDIT LIMIT FOR ENROLMENT & MOVEMENT TO HIGHER SEMESTER

12.1 A student can enroll for a maximum of 30 credits during a semester including redo courses.

12.2 The minimum credit requirement to move to the higher semester is

- Not less than a total of 20 credits, to move to the 3rd semester
- Not less than a total of 40 credits, (20 for lateral entry) to move to the 5th semester
- Not less than a total of 60 credits, (40 for lateral entry) to move to the 7th semester

12.3 However, a student who has secured "I" grade (due to shortage of attendance) in all the courses of a particular semester is not eligible to move to the next higher semester.

13.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

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

Assessment No.	Course Coverage in Weeks	Duration	Weightage of Marks
Assessment 1	1 to 4	1.5 hours	15%
Assessment 2	5 to 8	1.5 hours	15%
Assessment 3	9 to 12	1.5 hours	15%
Attendance #	-	-	5%
Semester End Exam	1 to 18 (full course)	3 hours	50 %

\# 76-80% - 1 Mark ; 81-85 - 2 Marks ; 86-90 - 3 Marks ; 91-95 - 4 Marks and 96 - 100 - 5 Marks

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

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

13.4 In the case of Industrial training, the student shall submit a report, which will be evaluated along with an oral examination by a committee of faculty members, constituted by the Head of the department. A progress report from the industry will also be taken into account for evaluation.

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

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

13.7 The continuous assessment marks earned for a course during his/her first appearance will be used for grading along with the marks earned in the semester-end examination / arrear examination for that course until he/she completes.

14.0 SUBSTITUTE EXAMINATIONS

14.1 A student who has missed, for genuine reasons, a maximum of one of the four assessments of a course may be permitted to write a substitute examination. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accident or admission to a hospital due to illness, etc. by a committee constituted by the Dean of School for that purpose.

14.2 A student who misses any assessment in a course shall apply in a prescribed form to the Head of the department / Dean within a week from the date of missed assessment. However the substitute tests and examination for a course will be conducted within two weeks after the last day of the semester-end examinations.

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 University 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. If the course is a core course, the candidate should register for and repeat the course when it is offered next.

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

15.3 A student should register to re-do a core course wherein "I" or "W" grade is awarded. If the student is awarded, "I" or "W" grade in an elective course either the same elective course may be repeated or a new elective course may be taken.

15.4 A student who is awarded "U" or “AB” grade in a course will have the option of either to write semester end arrear examination at the end of the subsequent semesters, or to redo the course during summer term / regular semester. Marks earned during the redo period in the continuous assessment for the course, will be used for grading along with the marks earned in the end-semester (re-do) examination. If any student obtained "U" grade during summer term course, the marks earned during the redo period for the continuous assessment for that course will be considered for further appearance as arrears.

15.5 If a student with "U" or “AB” grade prefers to redo any particular course fails to earn the minimum 75% attendance while doing that course, then he/she will be awarded "I" grade in that course.

16.0 SUMMER TERM COURSES

16.1 A student can register for a maximum of three courses during summer term, if such courses are offered by the concerned department during the summer term. Students may also opt to redo such courses during regular semesters.

16.2 The Head of the Department, in consultation with the department consultative committee may arrange for the conduct of a few courses during the summer term, depending on the availability of faculty members during summer and subject to a specified minimum number of students registering for each of such courses.

16.3 However, in the case of students who have completed eighth semester, but having arrears in the earlier semesters in a maximum of two courses, summer courses may be offered, even if less than minimum students are registering for the course.

16.4 The number of contact hours and the assessment procedure for any course during summer term will be the same as those during regular semesters except that there is no provision either for withdrawal from a summer term course or for substitute examination.

17.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

17.1 All assessments of a course will be made on absolute marks basis. However, the Class Committee without the student members and the invited members shall meet within 10 days after the semester-end examination and analyze the performance of students in all assessments of a course and award letter grade. The letter grades and the corresponding grade points are as follows:

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

"W" denotes withdrawal from the course

"I" denotes inadequate attendance in the course and hence prevented from writing semester-end examination.

"U" denotes unsuccessful performance in the course.

"AB" denotes Absent 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.

17.3 The results, after awarding of grades, shall be signed by the Chairman of the Class Committee and Head of the Department and 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 courses, on payment of prescribed fees, through proper application to Dean (Academic Affairs). The concerned HOD shall constitute a revaluation committee consisting of Chairman of the class committee as convener, the faculty member of the course and a senior member of faculty knowledgeable in that course. The committee shall meet within a week to revalue the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

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

If Ci, is the number of credits assigned for the ith course and GPi is the Grade Point in the ith course

$$GPA = \frac{\sum_{i=1}^{n}(C_i)(GPi)}{\sum_{i=1}^{n} C_i} \qquad Where\ \ n = number\ of\ courses$$

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

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

"U", "I", "AB" and **"W"** grades will be excluded for calculating CGPA

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

Classification	CGPA
First Class with Distinction	8.50 and above and passing all the courses in the first appearance and completing the programme within the normal 8 or 6 (for lateral entry) semesters
First Class	6.50 and above and completing the programme within a maximum of 10 or 8 (for lateral entry) semesters.
Second Class	All 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 covered by the minimum duration plus authorized break of study, if any (clause 11). To be eligible for First Class, a student should have passed the examination in all courses within the specified minimum number of semesters reckoned from his/her commencement of study plus two semesters. For this purpose, the authorized break of study will not be counted. The students who do not satisfy the above two conditions will be classified as second class. For the purpose of classification, the CGPA will be rounded to two decimal places. For the purpose of comparison of performance of students and ranking, CGPA will be considered up to three decimal places.

18.0 ELECTIVE CHOICE: OPTION TO DO PROJECT ALONE IN FINAL SEMESTER

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 In the curriculum of eighth Semester, along with the project work, if two elective courses alone are listed, then the Dean (Academic Affairs) may permit a

student, as per approved guidelines, on the recommendation of the Head of the department, to do a full semester major industrial project work. In such a case, the above two elective courses or any other two elective courses in lieu thereof have to be enrolled during any semester including the summer, preceding or succeeding the project work, if offered.

19.0 PERSONALITY AND CHARACTER DEVELOPMENT

19.1 All students shall enroll, on admission, in any of the personality and character development programmes, NCC / NSS / NSO / YRC / Rotaract and undergo practical training.

- **National Cadet Corps (NCC)** will have to undergo specified number of parades.
- **National Service Scheme (NSS)** will have social service activities in and around Chennai.
- **National Sports Organization (NSO)** will have sports, games, drills and physical exercises.
- **Youth Red Cross (YRC)** will have social service activities in and around Chennai.
- **Rotaract** will have social service activities in and around Chennai.

20.0 DISCIPLINE

20.1 Every student is required to observe disciplined and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

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

21.0 ELIGIBILITY FOR THE AWARD OF DEGREE

21.1 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 disciplinary action pending against him/her.

21.2 The award of the degree must have been approved by the University.

22.0 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.

CURRICULUM AND SYLLABI FOR B.TECH. ELECTRONICS & COMMUNICATION ENGG., (Eight Semesters / Full Time)

CURRICULUM

SEMESTER I

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1	BS	MAB1181	Algebra, Geometry and Calculus	3	1	0	4
2	HS	ENB1181 FRB1181 ISB1181	English* French* Arabic*	3	0	0	3
3	BS	PHB1181	Physics	3	0	0	3
4	BS	CHB1181	Chemistry	3	0	0	3
5	ESF	GEB1101	Engineering Graphics	2	0	3	3
6	HS	SSB1181	Introduction to Economics	3	0	0	3
7	BS	PHB1182	Physics Lab	0	0	2	1
8	BS	CHB1182	Chemistry Lab	0	0	2	1
9	ESF	GEB1102	Basic Engineering Practices Laboratory	0	0	2	1
10	ESF	GEB1103	Computer Programming & Applications	2	0	2	3
							25

* Any one language

SEMESTER II

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BS	MAB1282	Advanced Calculus	3	1	0	4
2.	BS	PHB1283	Physics of Engineering Materials	3	0	0	3
3.	ESF	GEB1211	Basic Engineering Mechanics	3	1	0	4
4.	EC	ECB1211	Network Analysis and Synthesis	3	0	0	3
5.	EC	ECB1212	Electron Devices	3	0	0	3

6.	HS	SSB1182	Sociology, Ethics & Human Values	3	0	0	3
7.	HS	ENB1282	Written Communication	0	0	2	1
8.	EC	ECB1213	Electron Devices Lab	0	0	3	1
9.	BS	PHB1284	Physics of Engineering Materials Lab	0	0	2	1
							23

SEMESTER III

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BS	MAB2181	Transforms and Applications	3	1	0	4
2.	HS	SSB2181	Law for Engineers	3	0	0	3
3.	EC	CSB2181	Data structures using C++	3	0	0	3
4.	EC	ECB2101	Electronic Circuits I	3	0	0	3
5.	EC	ECB2102	Signals and Systems	3	1	0	4
6.	EC	ECB2103	Electromagnetic Fields	3	1	0	4
7.	HS	ENB2181	Oral Communication	0	0	2	1
8.	EC	CSB2182	Data structures using C++ Lab	0	0	3	1
9.	EC	ECB2104	Electronic Circuits I Lab	0	0	3	1
							24

SEMESTER IV

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BS	MAB2284	Random Process	3	1	0	4
2.	EC	ECB2211	Electronic Circuits II	3	0	0	3
3.	EC	ECB2212	Digital Electronics	3	0	0	3
4.	EC	ECB2213	Analog Communication	3	0	0	3
5.	EC	ECB2214	Linear Integrated Circuits	3	0	0	3
6.	BS	LSB2181	Biology for Engineers	3	0	0	3

7.	HS	ENB2282	Confidence Building & Behavioral Skill	0	0	2	1
8.	EC	ECB2215	Digital Electronics Lab	0	0	3	1
9.	EC	ECB2216	Electronic Circuits II Lab	0	0	3	1
10.	EC	ECB2217	Communication Engineering Lab-I	0	0	3	1
							23

SEMESTER V

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	EC	ECB3101	Digital Signal Processing	3	1	0	4
2.	EC	ECB3102	Digital Communication	3	0	0	3
3.	EC	ECB3103	Microprocessors and Microcontrollers	3	0	0	3
4.	EC	ECB3104	Transmission Lines and Antennas	3	1	0	4
5.	HS	MSB3181	Management of Business Organization	3	0	0	3
6.	PE		Professional Elective I	3	0	0	3
7.	HS	ENB3181	Career Building & People Skill	0	0	2	1
8.	EC	ECB3105	Digital Signal Processing Lab	0	0	3	1
9.	EC	ECB3106	Communication Engineering Lab-II	0	0	3	1
10.	EC	ECB3107	Microprocessor & Microcontroller Lab	0	0	3	1
							24

SEMESTER VI

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BS	GEB3201	Environmental Science and Engineering	3	0	0	3
2.	EC	ECB3211	RF & Microwave Engineering	3	1	0	4
3.	EC	ECB3212	VLSI Design	3	0	0	3
4.	EC	ECB3213	Optical Communication	3	0	0	3
5.	PE		Professional Elective II	3	0	0	3

6.	PE		Professional Elective III	3	0	0	3
7.	EC	ECB3214	VLSI Lab	0	0	3	1
8.	EC	ECB3215	Microwave and Optical Communication Lab	0	0	3	1
							21

SEMESTER VII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	EC	ECB4101	Cellular Mobile Communication	3	0	0	3
2.	EC	ECB4102	Embedded Systems	3	0	0	3
3.	EC	ECB4103	Computer Networks	3	0	0	3
4.	PE		Professional Elective IV	3	0	0	3
5.	PE		Professional Elective V	3	0	0	3
6.	GE		General Elective I	3	0	0	3
7.	EC	ECB4104	Mini Project - Design & Implementation	0	0	3	1
8.	EC	ECB4105	Networks Lab	0	0	3	1
9.	EC	ECB4106	Embedded Systems Lab	0	0	3	1
							21

SEMESTER VIII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PE		Professional Elective VI	3	0	0	3
2.	GE		General Elective II	3	0	0	3
3.	EC	ECB4211	Project	0	0	18	9
							15

Total Credits: 176

PROFESSIONAL ELECTIVES

Sl. No.	Course Group	Course Code	Course Title
			RF COMMUNICATION
1.	PE	ECBX01	RF System Design
2.	PE	ECBX02	Electromagnetic Interference & Compatibility
3.	PE	ECBX03	Telecommunication Switching Networks
4.	PE	ECBX04	Wireless Networks
5.	PE	ECBX05	Satellite Communication
6.	PE	ECBX06	Multimedia Communication Systems
7.	PE	ECBX07	Advanced Microwave Systems
8.	PE	ECBX08	Radar & navigational Aids
			VLSI & EMBEDDED SYSTEM
1.	PE	ECBX 09	Advanced Microprocessor and Microcontrollers
2.	PE	ECBX10	RTOS
3.	PE	ECBX11	Digital VLSI Testing
4.	PE	ECBX12	Computer Architecture
5.	PE	ECBX13	Advanced Digital System Design
6.	PE	ECBX14	VLSI Signal Processing
7.	PE	ECBX15	ASIC Design
8.	PE	ECBX16	Reconfigurable Computing
			SIGNAL PROCESSING
1.	PE	ECBX17	Advanced Digital Signal Processing
2.	PE	ECBX18	Image Processing
3.	PE	ECBX19	DSP Architecture and Programming
4.	PE	ECBX12	Computer Architecture
5.	PE	ECBX06	Multimedia Communication Systems
6.	PE	ECBX20	Biomedical Signal Processing
7.	PE	ECBX14	VLSI Signal Processing
8.	PE	CSBX52	Soft Computing

GENERAL ELECTIVES

Sl. No.	Course Group	Course Code	Course Title	Offering Department
1.	GE	GEBX01	Disaster Management	Civil
2.	GE	GEBX02	Nano Technology	Physics
3.	GE	GEBX03	Control Systems	EEE
4.	GE	GEBX04	Green Design and Sustainability	Civil
5.	GE	GEBX05	Knowledge Management	CSE
6.	GE	GEBX06	Appropriate Technology	Civil / Mechanical
7.	GE	GEBX07	System Analysis and Design	Mechanical
8.	GE	GEBX08	Value Analysis and Engineering	Mechanical
9.	GE	GEBX09	Optimization Techniques	Mathematics
10.	GE	GEBX10	Engineering System Modeling and Simulation	Mechanical
11.	GE	GEBX11	Supply Chain Management	CBS
12.	GE	GEBX12	Total Quality Management	Mechanical
13.	GE	GEBX13	Energy Studies	Mechanical
14.	GE	GEBX14	Robotics	Mechanical
15.	GE	GEBX15	Cyber security	IT
16.	GE	GEBX16	Usability Engineering	CSE
17.	GE	GEBX17	Industrial Safety	Mechanical

SEMESTER I

MAB1181 ALGEBRA, GEOMETRY AND CALCULUS

L	T	P	C
3	1	0	4

OBJECTIVES:

The course is aimed at

- developing the skills of engineering students in the basics of chosen topics of Mathematics that are imperative for effective understanding of engineering subjects.
- laying the foundation for learning further topics of Mathematics in higher semesters in a graded manner.
- enabling the learners to appreciate the important role of mathematical concepts in engineering applications.

MODULE I MATRICES **8**

Eigenvalue Problems – Eigenvalues and Eigenvectors of a real matrix, Engineering Applications –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 VECTOR ALGEBRA **6**

Operations on vectors – Scalar Product, Vector Product, Projection of Vectors - Angle between two vectors - Gradient, divergence and curl.

MODULE III THREE DIMENSIONAL ANALYTICAL GEOMETRY **8**

Direction cosines & 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 IV DIFFERENTIAL GEOMETRY **7**

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

MODULE V MULTI-VARIATE FUNCTIONS **8**

Functions of two variables – partial derivatives – total differential – Implicit Functions – Jacobians - Taylor's series expansion – maxima and minima – Lagrange's multiplier method.

MODULE VI ORDINARY DIFFERENTIAL EQUATIONS 8

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.

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" (42nd edition), Khanna Publishers, New Delhi, 2012.

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 I, 2nd edition, National Publishing Co., Chennai, 2003.

OUTCOMES:

On completion of the course the students will be able to

- solve Eigenvalue and Eigenvector problems
- solve three dimensional geometry problems.
- use differential calculus for solving problems pertaining to engineering applications.

ENB1181 **ENGLISH** **L T P C**
3 0 0 3

OBJECTIVES:

- To enable students to use language appropriately and effectively
- To help learners improve their vocabulary and to enable them speak fluently and appropriately in different contexts.
- To help students develop listening skills for academic and professional purposes
- To develop reading comprehension skills and enhance their ability to read official documents.
- To develop their creative thinking and practice creative writing.

MODULE I BASIC LANGUAGE SKILLS AND GRAMMAR **4**

Conducting a language proficiency test in the language laboratory to assess the use of various parts of speech, vocabulary, phrasal verbs and idiomatic expressions of students.

MODULE II LISTENING **8**

Listening to BBC radio plays and VOA special lessons to teach Phonetics, accent and intonation of spoken English

Appreciation and critical review of popular movies like 'My Fair Lady', 'Sound of Music'. (Excerpts from the movies) - Historical/popular speeches made by Winston Churchill, Abraham Lincoln (Gettysberg's Address), Swami Vivekananda.

MODULE III SPEAKING **8**

(a) Self introduction – pair work – introducing one another – short conversations – exchanging opinions – agreement /disagreement

(b) Short presentation (extempore speech) based on visuals – Personal narrations

MODULE IV READING **8**

Newspaper articles, circular, notices – Note making – vocabulary extension – Critical review of newspaper articles.

(a) Science fiction- Issac Asimov's "The Dead Past"(Abridged version) - Wings of Fire – Creative thinking – retelling a story with different ending; critical appreciation of plot and characters

MODULE V CREATIVE WRITING 8

(a) Writing slogans for Advertisements

(b) Writing descriptive paragraphs based on visuals

MODULE VI ENGLISH FOR ACADEMIC AND BUSINESS PURPOSES 9

(a) English for academic purpose: letters to the editor, letter seeking permission for industrial visit, letter inviting a dignitary for technical symposium

(b) English for Business purpose: Telephone etiquette – telephone conversations – taking and leaving phone messages.

Total Hours: 45

REFERENCES:

1. Mohan, Krishna, Meera Bannerjee, 'Developing Communication Skills', Macmillan India Ltd. Chennai (2001).
2. Sen , Leena 'Communication Skills' Prentice Hall, New Delhi (2004).
3. Rutherford , Andrea J. 'Basic Communication Skills For Technology' Pearson Education Asia (2002).
4. Grant Taylor, ' English Conversation Practice' Tata Mcgraw Hill , New Delhi (2001)
5. P.K.Dutt, G. Rajeevan and C.L.N. Prakash, 'A Course in Communication Skills', Cambridge University Press, India (2007).

OUTCOME:

- After completion of the course, students will have the ability to communicate correctly and effectively in academic and professional contexts through exposure and practice in LSRW skills.

FRB1181	FRENCH	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To improve their proficiency in French language.
- To empower them for successful communication in their professional contexts.

DOSSIER 0 FENÊTRE SUR… 7

Contenus –l'alphabet - se présenter – les langues – les nationalités – les nombres de 0 à 60 – les adjectifs de nationalités – les verbes : s'appeler, être.

L'acte de parole

DOSSIER 1 LES UNS, LES AUTRES…. 12

Contenus - Les salutations (formelles et informelles) - les jours de la semaine – Les articles définis – les adjectifs possessifs – la négation (ne…..pas) – les verbes : avoir.

Demander quelque chose – les mois de l'année – les nombres de 70 à 99 – les articles indéfinis – l'adjectif interrogatif (quel, quelle)

Quelques événements culturels – donner des informations personnelles – indiquer ses gouts – l'expression des gouts – les prépositions (les noms de pays).

L'acte de parole

DOSSIER 2 ICI /AILLEURS 12

Contenus – Parler de sa ville – Donner/ Demander des explications – les prépositions de lieu – articles contractés – pourquoi / parce que

Auberges de jeunesse et hôtels – s'informer sur un hébérgement- quelques verbes et indications de direction – quelques formules de politesse.

Le code postal et les départements le libellé d'une adresse en France – Ecrire une carte postale – Dire le temps qu'il fait – les adjectifs démonstratifs - Formules pour commencer / terminer.

L'acte de parole

DOSSIER 3 SOLO OU DUO **14**

Contenus – Les animaux de compagnie les animaux préférés des Français - parler de sa profession – les professions - les activités sportifs - les noms animaux – les verbes : aimer , adorer, détester, faire, aller.

Nouveaux mode de rencontres – caractériser une personne (physique et psychologique) – les adjectifs qualificatifs – les pronoms toniques.

Les sorties – proposer, refuser, accepter une sortie – fixer un rendez-vous – inviter – Donner des instructions – L'impératif : 2^{e} personne – Le pronom on=nous – Les verbes : Pouvoir, vouloir, devoir.

L'acte de parole

L'examen oral

Total Hours: 45

TEXT BOOK:

1. Alter EGO I – Goyal – Langers (0 – 5 Lessons)

OUTCOMES:

On completion of the course,

- The students will be able to deal with their clients effectively at global level.
- Their proficiency in French Language will have improved.

ISB1181	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 BOOK:

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.

PHB1181	PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce basic physics concepts relevant to Engineering and Technology students.
- To get familiarize with solving problems in basic physics.
- To acquaint applications of physics for Engineering issues.

MODULE I PROPERTIES OF MATTER **7**

Elasticity – Stress strain diagram – Factors affecting elasticity – Twisting couple on a wire – Shaft – Torsion pendulum – Depression on a cantilever – Young's modulus by cantilever – Uniform and non-uniform bending – Viscosity.

MODULE II CRYSTAL PHYSICS **6**

Introduction – Space lattice – unit cell – Bravais lattices – Miller Indices for cubic crystals – Inter planar spacing in cubic lattice – Simple crystal structures – SC, BCC, FCC and HCP structures – Atomic radius, coordination number, Packing factor calculation – Crystal imperfections.

MODULE III QUANTUM PHYSICS **7**

Black body radiation – Planck's theory of radiation – Deduction of Wien's displacement law and Rayleigh – Jeans law from Planck's theory – Compton effect – Theory and experimental verification – Dual nature of matter – de Broglie's wavelength- Physical significance of wave function – Schroedinger wave equation – Time independent and time dependent wave equation – Particle in one dimensional box.

MODULE IV WAVE OPTICS **9**

Interference theory – Air wedge – Michelson interferometer – Diffraction – Fresnel and Fraunhofer diffraction - Polarization – Double refraction – Theory of plane polarized, circularly polarized and elliptically polarized light – Quarter wave plate, Half wave plate – Production and detection of plane, circularly and elliptically polarized lights – Photoelasticity – Photo elastic effect – Stress optic law – Effect of stressed model in a plane polariscope (qualitative) –Photo elastic bench.

MODULE V LASER & FIBRE OPTICS **9**

Principle of spontaneous emission and stimulated emission - Characteristics of laser light -Einstein's A & B coefficients (derivation) – Population inversion - pumping - Nd:YAG laser – CO2 laser – Applications – Material processing and holography (construction and reconstruction of hologram)- Optical fibre – Principle and propagation of light in optical fibers – Numerical aperture and acceptance angle – Types of optical fibers - applications – Fibre optic communication system (block diagram only)- Fibre optic sensors (displacement and pressure sensors (qualitative), Medical endoscope.

MODULE VI ULTROSONICS AND NDT **7**

Ultrasonics – Production – Magnetostriction and piezo electric methods – Properties of ultrasonic waves – Detection of ultrasonic waves – Applications –Ultrasonic interferometer- Acoustical grating – SONAR – Depth of sea – Measurement of velocity of blood flow – Non Destructive Testing (NDT) methods – Ultrasonic flaw detector – A,B & C scanning methods.

Total Hours: 45

TEXT BOOKS:

1. Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2003.
2. Palanisamy P.K., Physics for Engineers, Vol1 & Vol2, 2nd Edition, Scitech Publications, 2003.

REFERENCES:

1. Uma Mukherji, "Engineering Physics", Narosa Publishing House, New Delhi, 2007.
2. Charles Kittel, "Introduction to solid state physics", 7th Edition, John Wiley & sons (ASIA) Pvt. Ltd, 2008.
3. Avadhanulu M.N., "Engineering Physics", 1st Edition, S.Chand & Company Ltd., New Delhi, 2007.
4. Schiff, "Quantum Mechanics", 3rd Edition, Tata McGraw-Hill Education, 2010.
5. Rajendran V. and Marikani A., "Applied Physics for Engineers", 3rd Edition, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 2003.

6. William T. Silfvast, “Laser Fundamentals”, 2nd edition, Cambridge University Press, 2004.

7. Arumugam M., “Engineering Physics”, 5th Edition, Anuradha Agencies, 2003.

OUTCOMES:

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

- Apply the knowledge of properties of matter in Engineering Mechanics and Fluid Dynamics.
- Characterize Engineering materials
- Use Lasers for Fiber Optics Technology and Material Processing
- Do non-destrictive testing using Ultrasonic Techniques

CHB1181 CHEMISTRY L T P C
3 0 0 3

OBJECTIVES:

To make students conversant with the

- Water quality for potable and industrial purposes.
- Different engineering materials, their physico-chemical properties and specific applications.
- Concept of electrochemistry, corrosion and theories of corrosion.
- Principles of spectroscopy and applications.
- Basic principles of green chemistry and the need for green processes in industries.

MODULE I WATER TECHNOLOGY 8

Introduction – Impurities present in water – Hardness, Types of Hardness, Estimation of Hardness (EDTA method) (Problems) – Alkalinity, Estimation of Alkalinity – Disadvantages of hard water in industries – Conditioning methods: external treatment method: Ion exchange method – internal treatment: colloidal, phosphate, calgon, carbonate methods – drinking water standards (BIS) – treatment of domestic water: screening, sedimentation, coagulation, filtration, disinfection: by chlorination, UV treatment, ozonization – desalination and reverse osmosis (principle only).

MODULE II ENGINEERING MATERIALS 8

Abrasives: Moh's scale of hardness – natural abrasives: diamond, corundum, emery, garnets and quartz – artificial abrasives: silicon carbide, boron carbide.

Refractories: characteristics, classification – acidic, basic and neutral refractories, properties – refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling – general method of manufacture of refractories, properties and uses of high alumina bricks, magnesite and zirconia bricks.

Nanomaterials: Definition – types of Nanomaterials; nanofilms, nanowires, carbon nanotubes, quantum dots and fullerenes (C_{60}) – Size and shape

dependent optical, electrical, thermal and mechanical properties; Synthesis of nanomaterials – Top down and bottom up approach; Applications of nanomaterials – Catalysis, Electronics and Telecommunication, Medicines, Composites and Energy.

MODULE III ELECTROCHEMISTRY AND CORROSION 9

Construction of a cell – Standard and single electrode potential – electrochemical series – EMF and its measurement – Nernst equation, application and problems – Types of electrodes: standard hydrogen electrode, calomel electrode, ion selective electrode - glass electrode and determination of pH using glass electrode – polarization, overvoltage, decomposition potential (statements only) – Conductometric and potentiometric titrations.

Corrosion: Definition – Dry corrosion and Wet corrosion with mechanisms – Factors influencing corrosion.

MODULE IV CHEMISTRY OF POLYMERS 6

Monomers – functionality – polymer – degree of polymerization – classification – Polymerization techniques: addition, condensation and co-polymerization with example – mechanism of polymerization: free radical, cationic and anionic mechanism – thermoplastics and thermosetting plastics with examples – compounding and moulding of plastics: injection moulding and compression moulding.

MODULE V SPECTROSCOPY 9

Electromagnetic spectrum – absorption of radiation – electronic, vibrational, translational and rotational – intensities of spectral lines – Beer-Lambert's Law (Problems) – Colorimetric analysis: estimation of concentration of a solution – Flame photometry: theory, instrumentation (block diagram only) and application – UV-Visible spectroscopy: Principles, instrumentation (block diagram only) and simple applications – IR spectroscopy – simple applications only.

MODULE VI GREEN CHEMISTRY 5

Introduction – Significance – Industrial applications of green chemistry; Green technology – Latest green laboratory technique for saving experimental resources and infrastructural framework; Principles of green chemistry – R4M4

model (Reduce, Reuse, Recycle, Redesign; Multipurpose, Multidimensional, Multitasking, Multi-tracking) – Life cycle analysis technique (cradle to grave approach)

Total Hours: 45

TEXT BOOKS:

1. Jain P.C and Renuka Jain, 'Physical Chemistry for Engineers', Dhanpat Rai and Sons, New Delhi. (2001).
2. Paul T. Anastas, John C. Warner, 'Green Chemistry: Theory and Practice', Oxford University Press, (1998).

REFERENCES:

1. Bahl B.S., Tuli and Arun Bahl, 'Essentials of Physical Chemistry', S. Chand and Company Ltd., New Delhi, (2004).
2. Kuriacose J.C. and Rajaram J, 'Chemistry in Engineering and Technology', Volume1, Tata McGraw- Hill publishing company, New Delhi, (1996).
3. Puri B.R., Sharma L.R. and Madan S. Pathania, 'Principles of Physical Chemistry', Shoban Lal Nagin Chand and Co., Jalandhar, (2000).

OUTCOMES:

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

- estimate the degree of hardness in water; solve related problems and treatment methods for potable water.
- select materials for specific engineering applications.
- use electrochemistry principles to understand the mechanism of corrosion.
- analyze trace quantity of metals using instrumental methods.
- realise the need of green practices in industries.

GEB1101 ENGINEERING GRAPHICS **L T P C**
2 0 3 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 an exposure to the appropriate standards for technical drawings
- To provide practical exposure on important aspects like drawing analytic curves, orthographic projections, section of solids, development of surfaces, pictorial views 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, involutes, helix

MODULE II ORTHOGRAPHIC PROJECTION **8**

Orthographic projection – first angle, third angle projection methods, free hand sketching of orthographic views of simple machine parts as per first angle projection. Projection of points. Commands and demonstration of drafting packages.

MODULE III PROJECTION OF STRAIGHT LINES AND PLANES **10**

Straight lines in first quadrant – true length and true inclinations, traces – rotating line and trapezoidal methods. Projection of plane lamina in first quadrant – trace of plane.

MODULE IV PROJECTION OF SOLIDS **10**

Projection of solids: 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 **10**

Section of solids: prism, pyramid, cone, cylinder, and sphere – sectional views – true shape of sections - solids in simple position and cutting plane inclined to one reference plane only.

Development of surfaces: truncated solids - prism, pyramid, cone, cylinder, frustum of cone and pyramid.

MODULE VI PICTORIAL PROJECTIONS **12**

Isometric projection: isometric scale - isometric projection and view of prism, pyramid, cylinder, cone, frustums and truncated solids.

Perspective projection: prism, pyramid, cylinder, frustums – visual ray and vanishing point methods.

Total Hours: 60

TEXT BOOK:

1. N.D. Bhatt, 'Engineering Drawing' Charotar Publishing house, 46th Edition, (2003)

REFERENCES:

1. K.V. Natarajan, 'A text book of Engineering Graphics', Dhanalakshmi publishers, Chennai. (2006)
2. Venugopal. K, and V. Prabhu Raja, Engineering Graphics, New Age International (P) Ltd., Publication, Chennai. (2011)

OUTCOMES:

Students who complete this course will be able to:

- draw various views of engineering components
- graphically communicate their concepts and ideas on new designs

SSB1181 INTRODUCTION TO ECONOMICS

L	T	P	C
3	0	0	3

OBJECTIVES:

- Primarily to give an overview of fundamentals of economics to the engineering students
- In particular
  - To introduce the basic concepts of demand, supply and equilibrium.
  - To familiarize on National Income concepts
  - To provide fundamental concepts of money, banking and exchange.
  - To give an idea on industrial sector, markets and trade.
  - To give an overview on five year plans, budget, policies and taxation.
  - To provide an overview of Indian economy and the role of engineers in economic development.

MODULE I INTRODUCTION **8**

Classification of economy – open and closed economy – sectors of economy – Basic principles of micro economics – supply ,demand and equilibrium, elasticity of demand- pricing models.

MODULE II NATIONAL INCOME DETERMINATION **7**

National Income concepts – GNP, GDP, disposable Income; Aggregate demand and Aggregate supply, macroeconomic equilibrium - concepts of MPS, APS, MPC APC, Inflation – prices indices WPI, CPI and Inflation control.

MODULE III MONEY AND BANKING **7**

Monetary system - Role of Central Bank – Monetary policy – Commercial banks, Development banks; Money market – the role of money.

MODULE IV INDUSTRY, MARKET AND TRADE **7**

Public and private sectors – Contribution to the national economy, Industrial policy. Markets – labor, capital and debt market. Trade: domestic and International trade.

MODULE V BUDGET, POLICIES AND INDICATORS 8

Economic development – Five year plans, Macro-economic indicators; Central budget: Government revenue-tax and non-tax revenue, government expenditures-plan and non-plan expenditures – Fiscal policy – The impact of the budget on the economy.

MODULE VI ECONOMIC GROWTH AND THE ROLE OF ENGINEERS 8

India Economy – the role of market in the Indian economy – Development in the post independence era – Growth of the economy, Globalization and liberalization – reforms made and their effects, challenges and opportunities, Engineers – Engineers' contributions to the economic growth.

Total Hours : 45

REFERENCES:

1. Vanitha Agarwal, 'Macroeconomics: Theory and Practice', Pearson, (2010).
2. Dwivedi D.N, 'Macroeconomics: Theory and Policies', 3rd edn; McGraw Hill, (2010).
3. Samuelson,Paul A., 'Macroeconomics', 19th edn., TMH, (2009).
4. Gupta G.S, 'Macroeconomics: Theory and Applications', 3rd edn; TMH, (2007).

OUTCOMES:

- Students will have an exposure to the basic concepts of microeconomics and macroeconomics.
- Students will have gained knowledge in government budget, economic planning and its implementation, money, banking and trade.
- They will have learnt about the economic reforms introduced in Indian economy and the role of engineers towards the economic growth and development of the country.

PHB1182	PHYSICS LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the basic concepts of properties of matter, wave optics
- To understand the properties of ultrasonic and Laser.
- To understand the crystal growth technique.
- To correlate the experimental results with the theoretical values.

LIST OF EXPERIMENTS:

1. Torsional Pendulum- Determination of rigidity modulus of a given wire.
2. Determination of coefficient of viscosity of a liquid by Poiseuille's method .
3. Determination of Young's modulus of a beam using non – uniform bending method.
4. Determination of a thickness of a given wire – Air wedge.
5. Spectrometer- determination of wavelength of given source by using grating.
6. Determination of velocity of ultra sonic waves – Ultrasonic Interferometer.
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of particle size using Laser.
9. Growth of crystal by slow evaporation technique.
10. Determination of angle of divergence of Laser beam.
11. Photo electric effect experiment.

OUTCOMES:

On completion of this course, the student will know

- Properties of matter, wave optics and quantum physics
- Properties and application of Ultrasonic and Laser
- Principle and concept of crystal growth technique.

CHB1182	CHEMISTRY LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

To make students conversant with the

- estimation of hardness and TDS in water samples.
- Construction of cell and determination of EMF.
- Estimation of pH of solutions.
- Verification of Beer Lambert's law.

LIST OF EXPERIMENTS:

1. Estimation of hardness in domestic water.
2. Estimation of total dissolved solids (TDS) in domestic water
3. Construction and determination of emf of a cell.
4. Determination of single electrode potential.
5. Estimation of strong acid in the industrial effluents
6. Estimation of Fe^{2+} present in unknown sample – by Potentiometry
7. Verification of Beer-Lambert's law and estimation of Cu^{2+} present in unknown sample.
8. Estimation of Na and K present in the agricultural field – by flame photometry.
9. Study of effect of inhibitors in free radical polymerization (Demo)

OUTCOMES:

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

- estimate the degree of hardness and TDS in water samples.
- construct and calculate EMF of cell.
- apply the concept of Beer lamberts law.

GEB1102	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

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. Mould 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.

ELECTRONIC ENGINEERING PRACTICE

1. Identifications symbolic representation of active and passive electronic components
2. Solderingand 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

OUTCOMES:

Students who complete this course

- Should be able to appreciate the practical skills needed even in making of simple objects, assemblies and circuits
- Should be able to attend minor defects especially in items used in day to day life
- Should be aware of the safety aspects involved in using tools and instruments

GEB1103	COMPUTER PROGRAMMING & APPLICATIONS	L	T	P	C
		2	0	2	3

OBJECTIVES:

- Expose fundamental concepts and techniques in programming
- Give coverage on application logic in programming
- Focus on solving practical problems based on analyzing, designing, and implementing computer programs

MODULE I FUNDAMENTALS OF COMPUTERS **5**

Evolution – Generations - Classifications – Applications – Computer organization –Hardware in a typical computer Identification - Booting – Booting error messages - Number system - Number system conversions

MODULE II BASIC PROGRAMMING AND DEBUGGING **5**

Software types – Types of Operating systems - Software development steps – Information technology and internet - The programming tool - Structure of a basic program - Hello world program – Debugging it – Character set – Delimiters – Keywords, identifiers – Constants – Variables –- Tools and help features – Comments in a program

MODULE III INPUT AND OUTPUT **5**

Data types - Type conversions - Input/Output: Formatted functions – Unformatted functions – Library functions – Debugging the code – Systems software: Compiler – interpreter- linker – loader - Finding the correct answer given a code snippet and justifying it

MODULE IV PROBLEM SOLVING **5**

Problem solving techniques: Algorithm, flowchart – Pseudo-code – Examples of simple problems in algorithms and flowcharts – Sorting and Searching - Characteristics of a good program – Generations of programming language

MODULE V OPERATORS AND DECISION STATEMENTS **5**

Properties of operators – Priority of operators – Arithmetic relational logical and bitwise operators – 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

MODULE VI ARRAYS AND LOOP CONTROL STATEMENTS 5

Arrays – Initialization – Definition – Characteristics – One dimensional array – Two dimensional arrays - Multi dimensional arrays – Predefined streams - Operation with arrays – Sorting and searching – Structures – Operations on structures

LIST OF EXPERIMENTS: 30

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

Total Hours: 60

TEXTBOOKS:

1. Ashok N Kamthane, “Computer Programming”, 2nd Edition, Pearson Education, 2012.
2. Paul J. Deitel, Deitel & Associates, “C How to Program”, 7th Edition, Pearson, Education, 2012.

OUTCOMES:

Students who complete this course will be able to:

- Understand Modular design, logic flow, data abstraction
- Describe basic programming constructs, functions, and I/O.
- Write down programs for sorting and searching algorithms
- Write down programmes developing cycle for different applications
- The students will be able to debug the programs while solving some practical problems in programming

SEMESTER II

		L	T	P	C
MAB1282	**ADVANCED CALCULUS**	**3**	**1**	**0**	**4**

OBJECTIVE:

The aim of the course is to

- train the students in additional areas of Engineering Mathematics, necessary for grooming them into successful engineers. The topics will serve as basic tools for specialized studies in many engineering fields, significantly in fluid mechanics, field theory and communication engineering.

MODULE I DOUBLE INTEGRALS **7**

Double integration – Cartesian and Polar coordinates – change of order of integration – area as a double integral — change of variables between Cartesian and polar coordinates.

MODULE II TRIPLE INTEGRALS AND SPECIAL FUNCTIONS **7**

Triple integration in Cartesian coordinates - change of variables between cartesian, cylindrical and spherical polar coordinates - Beta and Gamma functions.

MODULE III VECTOR INTEGRATION **7**

Line, surface and volume integrals – Green's, Gauss Divergence and Stoke's theorems (without proof) – verification and evaluation of integrals using them.

MODULE IV ANALYTIC FUNCTION **8**

Analytic function - Necessary and Sufficient condition (Proof not included) – 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 V COMPLEX INTEGRATION **8**

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).

MODULE VI PARTIAL DIFFERENTIAL EQUATIONS 8

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.

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" (42nd edition), Khanna Publishers, New Delhi, 2012.

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.

OUTCOMES:

On completion of the course the students will be able to

- solve integrals of higher orders.
- apply vector calculus for solving engineering problems.
- solve complex differentiation and integration problems related to engineering.
- formulate practical problems in terms of partial differential equations, solve them and physically interpret the results.

PHB1283 PHYSICS OF ENGINEERING MATERIALS L T P C
(Common to ECE, EEE, AERO, CSE & IT Branches) 3 0 0 3

OBJECTIVE:

- To familiarize the physical, chemical, electrical and mechanical properties of different Engineering materials.

MODULE I CONDUCTING MATERIALS 10

Electron ballistics : charged particle, force on charged particles in an electric field, force on charged particles in Magnetic field - Parallel electric and magnetic field - Perpendicular electric and magnetic field - Classical free electron theory of metals – Derivation for electrical conductivity – Merits and drawbacks of classical theory – Quantum free electron theory of metals and its importance (qualitative) – Energy distribution of electrons in metals – Fermi distribution function – Density of energy states and carrier concentration in metals (derivation) – Fermi energy – Classification of solids into conductors, semiconductors and insulators on the basis of band theory.

MODULE II SEMICONDUCTING MATERIALS 9

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 III DIELECTRIC MATERIALS 7

Dielectric constant – Electric Susceptibility – Types of dielectric polarization – Frequency and temperature dependence of polarization – Internal field and deduction of Clausius-Mosotti's equation(derivation) – Dielectric loss – Types of dielectric breakdown – Uses of dielectric materials (capacitor & transformer).

MODULE IV MAGNETIC MATERIALS 6

Origin of magnetic moment –Types of magnetic materials and their properties –Ferromagnetism – Domain theory of ferromagnetism, hysteresis, soft and

hard magnetic materials – Anti ferromagnetic materials (qualitative) – Ferrites – Applications-Magnetic memory – Tapes & magnetic disk drives.

MODULE V SUPERCONDUCTING MATERIALS 6

Superconductivity - BCS theory - Meissner effect - Critical magnetic field - Type I and Type II superconductors - High temperature superconductors - Applications of superconductors: SQUID and magnetic levitation.

MODULE VI OPTICAL AND NEW ENGINEERING MATERIALS 7

Optical properties of semiconductors – Direct and indirect bandgap semiconductors – Color centers, exciton – Luminescence – Fluorescence – Phosphorescence – Liquid crystal display, Solar cell – Electro optic effect-Pockel's effect - Kerr effect – Faraday effect. Metallic glasses – Preparation, properties and applications - Shape Memory Alloys – Preparation, properties and applications, Nano phase materials – Synthesis, properties and applications.

Total Hours: 45

TEXT BOOKS:

1. Palanisamy P.K., Physics II, Material Science for ECE, Scitech Publications (India) Pvt Ltd., 2006.
2. Safa O. Kasap, Principles of Electronic materials and devices, McGraw Hill Publishers, 3rd Edition, 2006.

REFERENCES:

1. Arumugam.M, Physics II, Material Science for ECE, Anuradha Publishers, 5th Edition, 2005.
2. Jacob Millman, Christos C.Halkais, Electronic Devices and Circuits, Tata McGraw-Hill, New Delhi, 1991.
3. Charles Kittel, Introduction to solid state physics, 7th Edition, John Wiley & sons (ASIA) Pvt. Ltd.
4. Sze. S.M., Semiconductor Devices – Physics and Technology, 2nd edn. John Wiley, 2002.

5. Nandita Das Gupta and Amitava Das Gupta, Semiconductor Devices – Modelling and Technology, Prentice Hall of India, 2004.

6. Donald A. Neamen, "Semiconductor Physics and Devices" 3rd Ed., Tata McGraw Hill, 2002.

OUTCOMES:

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

- choose the correct semi-conductors for electronic devices and display.
- use dielectric materials for transformers and capacitors
- use ferromagnetic materials for solid state devices
- apply the concept of super conductivity for Engineering applications.

GEB1211 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 with scalar and vector approaches for representing forces and moments acting on particles and rigid bodies and their equilibrium
- To give an 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 **7**

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

MODULE II EQUILIBRIUM OF PARTICLE **6**

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 **6**

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 **8**

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.

MODULE V LAWS OF MOTION 10

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

MODULE VI FRICTION 8

Introduction to friction- types of friction- Laws of Coloumb friction- Frictional force – simple contact friction – Rolling resistance –ladder friction

Total Hours: 45

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 to resolve forces, moments and solve problems using various principles and laws
- should be able to understand the concept of equilibrium, kinetics and kinematics and capable of formulating the governing equations to practical problems and provide solutions for those equations

ECB1211 NETWORK ANALYSIS AND SYNTHESIS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the concept of circuit elements lumped circuits, circuit laws and network reduction
- To solve the electrical network using mesh and nodal analysis by applying network theorems
- To analyze the network in s-domain

MODULE I BASICS OF CIRCUITS AND NETWORKS **7**

Ideal sources – Dependent and Independent sources – Linear relation between voltage and current of Network elements – source Transformation – Types of Networks – Network reduction – voltage division – current division – Star – delta transformation

MODULE II NETWORK THEOREMS **9**

Formation of matrix equations and analysis of complex circuits using Mesh current method and nodal method -Thevenin's Theorem- Norton's Theorem- Superposition theorem-Maximum power transfer theorem, substitution theorem, Reciprocity theorem, Millman's theorem, Tellegen's theorem

MODULE III TRANSIENTS **6**

Steady state and transient response- DC response of an R-L Circuit- DC response of an R-C Circuit- DC response of an R-L-C Circuit-Sinusoidal response of an R-L Circuit- Sinusoidal response of an R-C Circuit- Sinusoidal response of an R-L-C Circuit

MODULE IV TWO PORT NETWORKS **7**

Open circuit Impedance(Z) Parameters - short Circuit Admittance (Y) Parameters, Transmission (ABCD) Parameters and Inverse Transmission Parameters-Hybrid (h) Parameters and Inverse Hybrid Parameter- Conversion between parameters-interconnection of two-port networks.

MODULE V NETWORK TOPOLOGY **8**

Introduction-Tree and co-tree- Twigs and links-Incidence matrix –properties of Incidence matrix-Tie-set matrix-cut-set –tree branch voltage.

MODULE VI ANALYSIS OF NETWORKS IN 'S' DOMAIN **8**

Transform Impedance and Transform circuits-series and parallel connection

of elements-Terminal pairs-network functions for 1 port and 2 port networks-poles and zeroes of network functions-properties of driving point functions-properties of transfer functions-stability criterion for active network-Routh criterion.

Total Hours: 45

TEXT BOOKS:

1. William H.Hayt, Jr, J.E.Kemmerly & Steven M.Durban, "Engineering Circuit Analysis" 6th Edition, Mcgraw Hill, 2002
2. A.Sudhakar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis", 2nd Edition, Tata McGraw Hill, 1994
3. Someshwar C. Gupta, Jon W. Bayless, Behrouz Peikari, “Circuit Analysis - with computer applications to problem-solving", Wiley-Eastern Ltd., 1991.
4. Vanvalkenburg, "Network Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 1994.

REFERENCES:

1. M.L Soni & J.C. Gupta, "Electric Circuit Analysis", Dhanpat Rai & Sons, New Delhi, 1981
2. Joseph Edminster, "Electric Circuits", Schaum's Outline Series, McGrawHill 5th Edition, 2011
3. Franklin F. Kuo, "Network Analysis and Synthesis", John Wiley. 2nd Edition

OUTCOMES:

At the end of the course the students will be able to:

- Understand about the network elements, types of networks, network topology & analysis of complex circuits using Mesh current & Nodal voltage method.
- Understand the concept of two port network.
- Gain knowledge about the transient and sinusoidal state analysis.
- Get an insight into analysis in S-domain

ECB1212 ELECTRON DEVICES L T P C
3 0 0 3

OBJECTIVES:

- To understand the concepts of quantum theory of solids and semiconductor materials.
- To provide a basis for understanding the characteristics, operation and limitations of semiconductor devices.

MODULE I ELECTRON BALLISTICS AND INTRINSIC SEMICONDUCTORS 9

Force on charge in electric field-Motion of Charge in uniform and time varying electric fields. Forces on a moving charge in a magnetic field-calculation of cyclotron frequency - calculation of electrostatic and magnetic deflection sensitivity. Energy band structure of conductors, semiconductors and insulators-Density distribution of available energy states in semiconductors-Fermi - Diac probability distribution function at different temperature. Thermal generation of carriers-calculation of electron and hole densities in intrinsic semiconductors-intrinsic concentration-Mass Action Law.

MODULE II EXTRINSIC SEMICONDUCTOR 7

N and P type semiconductors and energy band structures-Law of electrical neutrality-calculation of location of Fermi level and free electron and hole densities in extrinsic semiconductors-Mobility, drift current and conductivity-Diffusion current-Continuity equation-Hall effect.

MODULE III PN JUNCTION DIODES 7

Band structure of PN Junction – Current Component in a PN Junction – Derivation of diode equation – Temperature dependence of diode characteristics - Transition and diffusion capacitance – charge control description of diode – switching characteristics of diode- Avalanche and Zener breakdown - Temperature dependence of breakdown voltages- Zener diode & its applications –Diode as Clipper & Clamper.

MODULE IV BIPOLAR JUNCTION TRANSISTORS FIELD EFFECT TRANSISTORS 8

Construction of PNP and NPN transistors – BJT current components – Emitter to collector and base to collector current gains – Base width modulation -CB and CE characteristics – Breakdown characteristics – Ebers-Moll model – Transistor switching times. Construction and Characteristics of JFET – Relation between Pinch off Voltage and drain current – Derivation.- MOSFETS – Enhancement and depletion types.

MODULE V SPECIAL DIODES & POWER CONTROL DEVICES 7

Varactor diode – Backward diode – Tunneling effect in thin barriers- Tunnel diode – Photo diode - Schottky diodes- Power control devices- Characteristics and equivalent circuit of UJT - intrinsic standoff ratio- PNPN diode – Two transistor model, SCR, Triac, Diac.

MODULE VI CCD AND OPTOELECTRONIC DEVICES 7

Charge transfer and charge coupled devices – theory and applications. Semiconductor Opto electronic devices – LED, LASER diode, LCD, OLED, Photo diode Solar Cell. Plasma Devices

Total Hours: 45

TEXT BOOK:

1. Jacob Millman & Christos C.Halkias, “Electronic Devices and Circuits” Tata McGraw–Hill, 1991.

REFERENCES:

1. Nandita Das Gupta and Amitava Das Gupta, Semiconductor Devices – Modelling and Technology, Prentice Hall of India, 2004.
2. Donald A.Neaman, “Semiconductor Physics and Devices” 3rd Ed., Tata McGraw-Hill 2002.
3. S.Salivahanan, N.Sureshkumar and A.Vallavaraj, Electronic Devices and Circuits,TMH. 1998.
4. S.M.Sze, Semiconductor Devices – Physics and Technology, 2nd edn. John Wiley, 2002.

5. Ben G.Streetman and Sanjay Banerjee, Solid State Electronic Devices, Pearson Education 2000.

OUTCOMES:

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

- apply fundamentals of semiconductor physics to the understanding of electronic devices .
- use ordinary differential equations (ODEs) to solve engineering problems in semiconductors .
- apply their understanding of the behavior of semiconductor devices (pn junctions, BJTs, and field effect devices) in designing variations of those devices for special applications .
- identify the best semiconductor and device parameters to make the best device for a specific application, incorporating design constraints.

SSB1182 SOCIOLOGY, ETHICS AND HUMAN VALUES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To give an overview of the fundamental of sociology.
- To expose how society developed in India, classes and impact.
- To introduce sociological aspects relating to industry
- To provide some basic concepts on ethics and human rights.
- To stress the role of engineer to the society, environment and sustainability.

MODULE I FUNDAMENTALS OF SOCIOLOGY **7**

Sociology - definition, evolution – scope – basic concepts – social process, sociological theories, social institutions, culture and social stratification – family – economic – politics – religion – education, state and civil society – social control.

MODULE II SOCIOLOGY IN INDIAN CONTEXT **7**

Development – Institutions, classes – women and society – impact of social laws, social change in contemporary India – secularism and communalism – social exclusion and inclusion.

MODULE III INDUSTRIAL SOCIOLOGY **7**

Definition and perspectives – industry in India – social groups in industry, behaviour pattern – group dynamics – focus groups – team – enhancing group behaviour.

MODULE IV INDUSTRIAL – SOCIETY INTERFACE **8**

Perspectives – social responsibilities – sociological effect on industrialization – urbanization, child labour, psychological impact, Impact of technology, modernization – globalization – challenges – role of engineers.

MODULE V ETHICS AND HUMAN VALUES **8**

Ethics and values – organizational values – personal worth, ethical behavior, professional ethics, whistle blowing, international ethics, corruption.

MODULE VI ENGINEERS AND SOCIETY **8**

Quality of life and society – engineer in economic development, technology development – invention, innovation and diffusion – appropriate technology – engineer's contribution, ecology and environment – sustainability – role of engineers.

Total Hours: 45

REFERENCES:

1. Samir Das Gupta and Paulomi Saha, An Introduction to Sociology, Pearson, Delhi, 2012.
2. Narender Singh, Industrial Sociology, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.
3. Vidya Bhushan and D.R. Sachdeva, Fundamental of Sociology, Pearson, Delhi, 2012.
4. Deshpande, Satish, Contemporary India : A Sociological view, Viking (2002)
5. Thopar, Romila, Early India, Penguin (2003).
6. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, New York, 1996.

OUTCOMES:

- Students will have an exposure to the fundamentals and basic concepts of Sociology.
- Students will gain knowledge in Industrial Sociology.
- Students will have gained knowledge about the impact of technology, modernization, globalization and their contribution towards society.

ENB1282	WRITTEN COMMUNICATION	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To develop their creative thinking skills and write reviews.
- To train them with the nuances of corporate correspondence
- To train them in writing official letters, technical reports and proposals.
- To expose them to the writing of Statement of Purpose.

MODULE I WRITTEN COMMUNICATION 4

Introduction - process of writing – ABC of academic and professional writing – Writing an article.

MODULE II CREATIVE WRITING 5

Writing stories based on visuals - Preparing an outline for a story - Writing critical reviews on an article / a paper

MODULE III CORPORATE CORRESPONDENCE 3

Tone in formal writing – e-mail writing, memo, fax, agenda and minutes writing.

Lab: viewing e-mail etiquette, format and conventions of writing memo.

MODULE IV OFFICIAL LETTERS 6

Writing Statement of purpose, Letter of Application and Resume – Assessing one's strengths and weaknesses – peer evaluation.

Lab: Resume writing – Viewing different types – Functional, Chronological - Writing one's resume using wiki, Letter calling for interview and seeking promotion.

MODULE V TECHNICAL WRITING I 6

Describing an experiment, writing instructions and recommendations, Feasibility report and progress report, Synopsis – Group assignment – case study.

MODULE VI TECHNICAL WRITING II **6**

Writing a technical proposal – Format – cover page, executive summary, timeline chart, budget estimate, drafting, conclusion,.

Total Hours: 30

REFERENCES:

1. Riordan & Pauley. 'Report Writing Today'. 9th Edition. Wadsworth Cengage Learning, USA. 2005.
2. Gerson, Sharon & Steven M. Gerson, 'Technical Writing: Process and Product' Pearson Education, New Delhi. 2004.
3. M Ashraf Rizvi 'Effective Technical Communication'. Tata McGraw-Hill Education, 2005.
4. Sharma, R.C. & Krishna Mohan, "Business Correspondence and Report Writing". Tata MacGraw – Hill Publishing Company Limited, New Delhi. 2002.
5. Anderson, Durston & Pool. "Thesis and Assignment Writing". 4th Edition. John Wiley & Sons. Australia. 2002.

OUTCOME:

- On completion of the course, the students will have the ability to write all kinds of formal correspondence like letters, reports and proposals.

ECB1213	ELECTRON DEVICES LAB	L	T	P	C
		0	0	3	1

OBJECTIVE:

- To verify the fundamental characteristics of various Semiconductor Devices

LIST OF EXPERIMENTS:

1. PN Junction Diode characteristics.
2. Zener Diode characteristics.
3. Applications of Diode as Clipper and Clamper.
4. Input and Output characteristics of BJT in CB configuration.
5. Input and Output characteristics of BJT in CE configuration.
6. Characteristics of JFET.
7. Switching Characteristics of Diode & BJT
8. UJT Characteristics.
9. SCR Characteristics.
10. DIAC Characteristics.
11. TRIAC Characteristics
12. Characteristics of Photo diode and Photo transistor.

OUTCOMES:

On completion of this course the student will

- Experimentally analyze the characteristics of diodes, BJT's and FET's.
- Experimentally analyze the characteristics of UJT, SCR, DIAC, TRIAC, Photo devices

PHB1284	PHYSICS OF ENGINEERING MATERIALS LABORATORY (Common to ECE, EEE, AERO, CSE & IT Branches)	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To study the characteristics of conducting, semiconducting, dielectric, magnetic and optical materials.

LIST OF EXPERIMENTS:

1. Determination of magnetic field along the axis of a circular coil – Stewart and Gees experiment.
2. Determination of electrical conductivity of a given metal by four point probe method.
3. Determination of Hall coefficient of a given semiconductor material.
4. Determination of band gap of a semiconductor diode.
5. Determination of dielectric loss of a dielectric material using LCR bridge method.
6. Determination of time constant of an RC circuit by charging and discharging of a capacitor.
7. Determination of magnetic susceptibility of a paramagnetic material using Quincke's method.
8. Determination of energy loss of a given transformer coil using Hysteresis – B-H curve.
9. Determination of Verdet constant of a material using Faraday Effect.
10. Determination of Kerr constant using electro optic modulators.

OUTCOMES:

At the end of the course, the student will be able to

- Know the properties of conducting, semiconducting, dielectric and magnetic materials.
- Know the principle and working of Kerr modulator and Faraday rotator.

SEMESTER III

		L	T	P	C
MAB2181	**TRANSFORMS AND APPLICATIONS (Common to all B.Tech Programmes)**	**3**	**1**	**0**	**4**

OBJECTIVES:

The course aims to

- develop the skills of the students in the areas of boundary value problems and transform techniques .
- acquire knowledge on different transforms like Laplace Transform, Fourier Transform and Z Transform.

MODULE I LAPLACE TRANSFORM **8**

Laplace transform - sufficient condition - Transforms of elementary functions- Properties - Transforms of Derivatives and Integrals - Initial and Final Value Theorem - Transform of Periodic functions - Inverse transforms - Convolution Theorem.

MODULE II FOURIER SERIES **7**

Dirichlet's conditions - General Fourier series - Odd and even functions - Half-range sine series - Half-range cosine series - Complex form of Fourier Series- Parseval's identity - Harmonic Analysis.

MODULE III BOUNDARY VALUE PROBLEMS **8**

Classification of second order quasi linear partial differential equations - Solutions of one dimensional wave equation - One dimensional heat equation- Steady state solution of two-dimensional heat equation (Insulated edges excluded) - Fourier series solutions in Cartesian coordinates.

MODULE IV FOURIER TRANSFORM **7**

Fourier integral theorem (without proof) - Fourier transform pair - Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

MODULE V Z -TRANSFORM AND DIFFERENCE EQUATIONS 7

Z-transform - properties – Inverse Z–transform – Convolution theorem - Formation of difference equations.

MODULE VI APPLICATIONS OF TRANSFORMS 8

Applications of Laplace Transform in solving linear ordinary differential equations- Second order with constant coefficients, Simultaneous First order equations - Applications of Z-transform in solving difference equations using Z-transform.

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", 42nd Edition, Khanna Publishers, New Delhi, 2012.

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", 1st Edition, Academic Press, USA, 2002.
5. Ramana B.V, "Higher Engineering Mathematics", 4th Edition,Tata Mc Graw Hill Publishing Co. New Delhi, 2006.

OUTCOMES:

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

- solve Enginering problems in the area of heat conduction, communication systems, electro-optics and electromagnetic theory using different Transforms.
- solve Boundary value problems encountered in engineering practices.

SSB2181 LAW FOR ENGINEERS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To familiarize with Indian Constitution and Governance of our country.
- To apprise on human rights, local and International and redressal mechanism.
- To provide important aspect of corporate laws.
- " To give an introduction of important industrial and labour laws of our country.
- To provide an exposure on laws on contracting and arbitration.
- To give an overview on intellectual property related laws.

MODULE I INDIAN CONSTITUTION 7

Constitution - meaning and history - making of constitution - salient features, preamble, Citizenship, Fundamental rights, Fundamental duties, Equality and social justice, Directive principles, Constitutional amendments.

MODULE II GOVERNANCE AND POWERS VESTED 7

Union executive, Legislature - Union - State and union territories, Union and state relations, powers vested with parliament and state legislature, emergency provisions - People's Representations Act - Election Commission - Election for parliament and state legislature, Judiciary.

MODULE III HUMAN RIGHTS 7

Human rights - meaning and significance, International law on human rights, Covenant on civil and political rights; Covenant on Economic, social and cultural rights - protocol, UN mechanism and agencies, watch on human rights and enforcement - role of judiciary and commission, Right to information Act 2005- evolution - concept - practice.

MODULE IV CORPORATE AND LABOUR LAWS 7

Corporate laws - meaning and scope - laws relating to companies, Companies Act 1956 - collaboration agreement for Technology transfer, Corporate liability- Civil and criminal - Industrial employment (standing orders) Act 1946, Industrial Disputes Act, 1947, Workmen's Compensation Act 1923, The Factories Act, 1948 - Industry related other specific laws.

MODULE V CONTRACTS AND ARBITRATION 9

Types of contract - standard form of contracts - General principles under Indian Contract Act, 1872 - protection against exploitation - judicial approach to contracts, Arbitration and conciliation - meaning, scope and types, model law, judicial intervention, international commercial arbitration - arbitration agreement, arbitration tribunal - powers and jurisdiction, enforcement and revision, Geneva Convention, Awards, Confidentiality.

MODULE VI LAWS RELATED TO IPR 8

IPR - Meaning and scope, International Convention - Berne and Parrys Conventions, International organization - WIPO - TRIPS, Major Indian IPR Acts- Copyright laws, Patent and Design Act, Trademarks Act, Trade Secret Act, Geographical Indicator, Securing of International patents.

Total: 45 Hours

REFERENCES:

1. Jain M.P," Indian Constitutional Law", 5th Edition, Wadhwa & Co., 2005.
2. Subhash G. & Kashyap, "Our Constitution : An introduction to India's Constitution and Constitutional Law", National Book Trust, 3rd Edition., India, 2001.
3. Agarwal H.D., "International Law and Human Rights",14th Edition Central Law Publications, 2008.
4. Meena Rao, "Fundamental Concepts in Law of Contract", 3rd Edition, Professional offset, (2006).
5. Ramappa, "Intellectual Property Rights Law in India", 1st Edition,Asia Law House,2010.
6. Avtar Singh, "Company Law", 15th Edition, Eastern Book Co., 2007.
7. Rustamji R.F., "Introduction to the Law of Industrial Disputes", 3rd Edition,Asia Publishing House.
8. Acts : Right to Information Act, Industrial Employees (standing order) Act, Factories Act, Workmen Compensate Act.

OUTCOMES:

At the end of this course the student will be

- Familiar with Indian Constitution and Governance of our country, local and International redressal mechanism.
- Familiar with intellectual property related laws.
- Able to apply corporate laws, important industrial and labour laws of our country.
- Able to take up managerial, professional, ethical, social and economic responsibilities.

CSB2181 DATA STRUCTURES USING C++

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provide Programming knowledge in Object Oriented Programming.
- To expose to the basic concepts of Data structures and abstract data types.
- To understand the algorithms related to Trees, Graphs, Searching and Sorting.

MODULE I OBJECT ORIENTED PROGRAMMING 7

Object oriented programming paradigm - Concepts - Applications of OOP - Structure of a C++ program- Operator and control structures- Functions.

MODULE II CLASSES AND OBJECTS 8

Class Definition, Classes and Objects, - attributes -Access specifiers, Data Members, Member Functions, Private and Public Members, Arrays - Structure & classes, Friend function, Inline function, Scope resolution - constructors - Destructors - Pointers.

MODULE III OPERATOR OVERLOADING AND INHERITANCE 8

Overloading: Rules for overloading Operators and Methods - Defining derived classes - Single inheritance - Multilevel inheritance - Multiple inheritance - Hierarchical inheritance - Hybrid inheritance

MODULE III DATA STRUCTURES AND ABSTRACT DATA TYPES 7

Data and Information - Data Structure Types - Concept of Data Types - Abstract Data Types- - List ADT - Stack ADT - Queue ADT - Singly Linked List - Double Linked List - Stack and Queue using Linked List - Circular Queue

MODULE IV TREES & GRAPHS 8

Binary Trees - Search Tree ADT - Binary Search Tree - Tree Traversals - Terminologies of Graphs - Graph Traversals - Shortest Path Algorithm - Dijkstra's Algorithm - Spanning Trees - Prim's Algorithm - Kruskal's Algorithm - Depth First Search - Breadth First Search - Undirected Graphs - Biconnectivity

MODULE V SEARCHING AND SORTING **7**

Linear Search - Binary Search - Insertion Sort - Selection Sort - Shell sort - Bubble Sort - Heap sort - Merge sort- Quick sort

Total Hours: 45

TEXT BOOKS:

1. Matt Weisfeld," Object-Oriented Thought Process", 4th Edition, Pearson Education, 2013.
2. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of data structures in C++", 1st Edition,Galgotia Publications, 2006

REFERENCES:

1. B. Trivedi, "Programming with ANSI C++", 3rd Edition,Oxford University Press, 2007.
2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structure and Algorithmic Puzzles", 2nd Edition, Create Space Independent Publishing Platform, 2011.

OUTCOMES:

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

- Analyse and design algorithms and write programs in an Object Oriented Approach.
- Design and implement effective data structures for a given problem.

ECB2101 ELECTRONIC CIRCUITS - I

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study the methods of transistors biasing.
- To design simple amplifier circuits.
- To analyze more sophisticated transistor models.
- To design, analyze and test multi-stage amplifiers.
- To design power amplifiers.

MODULE I BIASING OF DISCRETE BJT AND MOSFET 7

DC Load line, operating point, Various biasing methods for BJT-Design-Stability-Bias compensation, Thermal stability, Design of biasing for MOSFET and JFET.

MODULE II BJT AMPLIFIERS 7

Small signal Analysis of Common Emitter-AC Load line, Voltage swing limitations, Common collector and common base amplifiers - JFET amplifiers-Differential amplifiers- CMRR- Darlington Amplifier-Bootstrap technique - Cascaded stages - Cascode Amplifier

MODULE III MOSFET AMPLIFIERS 7

Small signal Analysis of Common source, Source follower and Common Gate amplifiers -CMOS Inverters -DC Analysis of CMOS Inverters - Voltage transfer curve - BiCMOS Cascode - Design of NMOS inverter using resistive load - Noise Margin - VTC.

MODULE IV IC MOSFET AMPLIFIERS 9

Single stage IC MOS amplifiers - Active Loads - Depletion MOS, Enhancement MOS, MOS in Triode region, NMOS current source and PMOS Current source, their equivalent circuits and load line on the VI characteristics- Current steering circuit using MOSFET -- CMOS common source amplifier and CMOS Common source follower - CMOS differential amplifier - CMRR

MODULE V HIGH FREQUENCY ANALYSIS AND LARGE SIGNAL AMPLIFIERS 8

Short circuit current gain, cut off frequency - f_1 and f_h - gain and bandwidth - Miller effect-frequency Analysis of CS and CE Amplifiers-Determinations of BW of Single stage and Multistage Amplifier- Analysis of Class A, Class B, Class AB with darlington output stage and with output stage utilizing MOSFETs-Class C, Class D, Class E power amplifiers.

MODULE VI RECTIFIERS AND REGULATORS 7

Half-wave, full-wave and bridge rectifiers with resistive load. Analysis for VDC and ripple voltage with C, L, L-C and C-L-C filters. Voltage multipliers, Zener diode regulator. Power control using SCR.

Total Hours :45

TEXT BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 9th Edition., Pearson Education, 2007.
2. Millman J. and Halkias .C., " Integrated Electronics ", 4th Edition,Tata McGraw-Hill. 2001

REFERENCES:

1. Floyd, "Electronic Devices", 6th Edition, Pearson Education, 2006.
2. Allen Mottorshed, "Electron Devices & Circuits - An Introduction", 9th Edition, Prentice Hall of India Pvt. Ltd., 1999.

OUTCOMES:

At the end of the course the students would

- Gain knowledge about the design and analysis of basic analog circuits.
- Learn how to design and analyze basic amplifiers.

ECB2102 SIGNALS AND SYSTEMS L T P C
3 1 0 4

OBJECTIVES:

- To introduce the students to the concept of Signals and it's processing.
- To give students a foundation for advanced courses like DSP, Analog & Digital Communication, DIP etc.

MODULE I INTRODUCTION TO SIGNALS 9

Time-Domain Representation of Discrete and Continuous Signals. Standard elementary signals - unit step, unit ramp, sinusoidal, unit impulse signal and complex-exponential signal. Basic Time-Domain operations on signals - time shifting, time- scaling, signal addition, signal multiplication, differentiation and integration, convolution of signals. Signal Measurements - mean, median, standard deviation, energy, power and correlation of signals. Signal Classification and Symmetry. Periodicity of discrete-time signals. Synthesis of simple signals.

MODULE II INTRODUCTION TO SYSTEMS 8

Continuous-Time and Discrete-Time Systems. Characteristics of Systems - Static and Dynamic systems, Linearity, Causality, Time-Invariance, Stability. Invertibility and inverse systems.Linear and Time-Invariant Systems. Impulse response, convolution sum and convolution integral. Properties of LTI System, Causality and Stability of LTI Systems. Interconnection of LTI Systems. Differential and Difference Equation representation of LTI systems.

MODULE III FOURIER SERIES AND FOURIER TRANSFORM ANALYSIS 8

Fourier Series representation of continuous-time and discrete-time periodic signals. Properties of Fourier Series.Continuous-Time Fourier Transform and its properties. Frequency Response of LTI Systems. Discrete-Time Fourier Transform and its properties.Discrete Fourier Transform (DFT) and its properties.

MODULE IV LAPLACE TRANSFORM ANALYSIS 8

Unilateral and Bilateral Laplace Transform. Convergence of Laplace Transform, s-plane and ROC. Properties of Laplace Transforms and its ROC. Poles and Zeros. Inverse Laplace Transform.Solving Differential Equations with Initial

Conditions. The Transfer Function of LTI Systems. Causality and Stability of LTI Systems. Determination of Frequency response from Poles and Zeros, Bode Plots.

MODULE V Z- TRANSFORM ANALYSIS 7

z-Transform, z-plane and ROC. Properties of z-Transform and its ROC. Poles and Zeros. Methods for Inversion of z-Transform. Transfer Function of LTI Systems and Difference Equation. Causality and Stability. Computational Structures for Implementing Discrete-Time LTI systems.

MODULE VI MULTI-DIMENSIONAL SIGNALS AND SAMPLING THEOREM 5

Representation of Two-dimensional signals, Images, Introduction to 2-D Fourier Transform and 2-D Filters. Ideal Sampling of Continuous-Time signals, Reconstruction and Sampling Theorem and Nyquist rate

TotalHours:60

TEXT BOOKS:

1. Simon Haykin, Barry Van Veen, "Signals and Systems", 2nd Edition, John Wiley & Sons Pvt Ltd., 2004.
2. Alan V. Oppenheim, Alan S. Willsky , S. Hamid Nawab, "Signals & Systems", 2nd Edition, Pearson Education, 1997.
3. Hwei P. Hsu, "Signals And Systems", 2nd Edition,Schaum's Outlines, McGraw Hill, 1995.

REFERENCES:

1. M. J. Roberts, "Signals and Systems Analysis using Transform method and MATLAB", 1st Edition,Tata McGraw Hill, 2003.
2. K. Lindner, "Signals and Systems", 2nd Edition, McGraw Hill International, 1999.
3. Chi-Tsong Chen, "Signals and Systems", 3rd Edition, Oxford University Press, 2004.
4. Roger E. Ziemer, William H. Tranter, D.R. Fannin, "Signals & Systems: Continuous and Discrete", 4th Edition, Prentice Hall, 1998.

5. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing - Principles, Algorithms and Applications", 3rd Edition, Prentice Hall of India, 2000.

6. Ashok Amhardar, "Analog and Digital Signal Processing", 2nd Edition, Thomson, 2002.

OUTCOMES:

- Students should be able to classify, evaluate and manipulate signals.
- Students should be able to identify, analyze and synthesis various LTI Systems.
- Students should be able to apply the tools such as Fourier Transform, Laplace Transform, z-Transform in their problem solving.

ECB2103 ELECTROMAGNETIC FIELDS L T P C
3 1 0 4

OBJECTIVES:

- To analyze fields and potentials due to static charges.
- To evaluate static magnetic fields.
- To understand how materials affect electric and magnetic fields.
- To understand the relation between the fields under time varying situations.
- To understand principles of propagation of uniform plane waves.

MODULE I VECTOR ANALYSIS AND COORDINATE SYSTEM 5

Scalar and vector quantities, Representation of vectors, scalar and vector fields, Co-ordinate System - Rectangular, Cylindrical and Spherical Coordinate System - Introduction to line, Surface and Volume Integrals - Definition of Curl, Divergence and Gradient - Meaning of Stokes theorem and Divergence theorem. Coulomb's Law in Vector Form - Definition of Electric Field Intensity - Principle of Superposition.

MODULE II STATIC ELECTRIC FIELD 8

Electric Field due to discrete charges - Electric field due to continuous charge distribution - Electric Field due to charges distributed uniformly on an infinite and finite line - Electric Field on the axis of a uniformly charged circular disc - Electric Field due to an infinite uniformly charged sheet. Electric Scalar Potential- Relationship between potential and electric field - Potential due to infiniteuniformly charged line - Potential due to electrical dipole - Electric Flux Density - Gauss Law - Proof of Gauss Law - Applications.

MODULE III STATIC MAGNETIC FIELD 7

The Biot-Savart Law in vector form - Magnetic Field intensity due to a finite and infinite wire carrying a current I - Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I - Ampere's circuital law and simple applications. Magnetic flux density - The Lorentz force equation for a moving charge and applications - Force on a wire carrying a current I placed in a magnetic field - Torque on a loop carrying a current I.

MODULE IV ELECTRIC AND MAGNETIC FIELDS IN MATERIALS 9

Poisson's and Laplace's equation - Electric Polarization-Nature of dielectric materials- Definition of Capacitance - Capacitance of various geometries using Laplace's equation - Electrostatic energy and energy density - Boundary conditions for electric fields - Electric current - Current density - point form of ohm's law - continuity equation for current. Definition of Inductance - Inductance of loops and solenoids - Definition of mutual inductance - simple examples. Energy density in magnetic fields - Nature of magnetic materials - magnetization and permeability - magnetic boundary conditions.

MODULE V TIME VARYING ELECTRIC AND MAGNETIC FIELDS 7

Faraday's law - Maxwell's Second Equation in integral form from Faraday's Law -Equation expressed in point form. Displacement current - Ampere's circuital law in integral form - Modified form of Ampere's circuital law as Maxwell's first equation in integral form - Equation expressed in point form. Maxwell's four equation in integral form and differential form. Poynting Vector and the flow of power - Power flow in a co-axial cable - Instantaneous Average and Complex Poynting Vector.

MODULE VI ELECTROMAGNETIC WAVES 9

Derivation of Wave Equation - Uniform Plane Waves - Maxwell's equation in Phasor form - Wave equation in Phasor form - Plane waves in free space and in a homogenous material.Wave equation for a conducting medium - Plane waves in lossy dielectrics - Propagation in good conductors - Skin effect. Linear, Elliptical and circular polarization - Reflection of Plane Wave from a conductor- normal incidence - Reflection of Plane Waves by a perfect dielectric - normal and oblique incidence. Dependence on Polarization. Brewster angle.

TotalHours:60

TEXTBOOKS:

1. William H.Hayt "Engineering Electromagnetics", 6th Edition,Tata McGraw - Hill, 2003

2. E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems, " Prentice Hall of India 2nd Edition, McGraw-Hill, 2003.

REFERENCES:

1. M.N.O.Sadiku: "Elements of Engineering Electromagnetics", 4th Edition, Oxford University Press, ,2007.

2. Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics", 3rd Edition, John Wiley & Sons, 2003

3. Narayana Rao, N : "Elements of Engineering Electromagnetics", 4th Edition, Prentice Hall of India, New Delhi, 1998.

4. David K.Cherp: "Field and Wave Electromagnetics", 2nd Edition, Pearson Edition, 2004

OUTCOMES:

On completion of this course the student will understand

- The coordinate Systems, basic laws and theorems involved in electromagnetic fields.
- Knowledge of the static and time varying electric and magnetic fields.
- The concept of electric and magnetic fields in materials.
- The wave propagation in different medium.

ENB2181	ORAL COMMUNICATION	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To help the students acquire efficiency in Spoken English with due importance to Stress, Accent and Pronunciation.
- To hone the listening skills and understand native accent.
- To enable them to make presentations effectively.
- To develop their ability to persuade and convince people to accept a point of view.
- To prepare them for Placement Interviews, Group discussions etc.

MODULE I **8**

(i) Oral Communication - Implications in real life and work place situations

(ii) One-minute Presentations (JAM) on concrete and abstract topics that test their creative thinking

(iii) Prepared presentations and extempore presentations

(iv) Group project - presentation on any social issue. The group will have to research on the history of the problem, its cause, impact and outcome hoped for and then make a presentation

(v) Recording presentations and feedback - Peer and faculty evaluation

MODULE II **2**

Listening to ESL Podcast - Viewing Multimedia - Listening to BBC News - Received Pronunciation (RP)/ VOA/ NDTV - exposure to paralinguistic features.

MODULE III **4**

Developing persuasive skills - Selling a product - marketing skills - the topics will be on advertising, convincing someone on social issues such as preservation of water, fuel, protection of environment, gender discrimination.

MODULE IV **4**

Debates on pros and cons on topics of relevance like Nuclear Energy, Appropriate Technology, Internet, Social Media. This will be followed by Peer and Faculty feedback

MODULE V **6**

Brainstorming - Think, pair and share activity - Discussion etiquette - Assigning different roles in a GD (Note-taker, Manager, Leader and Reporter) Peer and faculty feedback

MODULE VI **6**

Interview Skills - Assessing one's strengths and weaknesses, SWOC Analysis, Mock interview - Verbal and Non-verbal Communication - Types of Job Interview- Telephone Interview, Stress Interview.

Total Hours:30

REFERENCES:

1. Hancock, Mark. "English Pronunciation in Use". Cambridge University Press, UK, 2005.
2. Anderson, Kenneth & et.al. "Study Speaking : A Course in Spoken English for Academic Purposes", 2nd Edition, Cambridge University Press, UK, 2004.
3. Hurlock, B. Elizabeth. "Personality Development". 6th Edition Tata McGraw Hill, New York, 2004.

OUTCOMES:

- On completion of the course, the students will have the ability to speak confidently and effectively in Presentations and Group Discussions.

CSB2182 DATA STRUCTURES USING C++ LAB

L	T	P	C
0	0	3	1

OBJECTIVES:

- To implement the basic concepts of object oriented programming using C++.
- To understand basic ADTs such as arrays and linked lists.
- To design and implement operations on stacks, queues, trees and graphs.
- To design and implement algorithms for searching and sorting, Trees and Graphs.

LIST OF EXPERIMENTS:

1. Classes, Object and Constructors.
2. Arrays and related operations.
3. Pointers and related operations.
4. Overloading - Operators and Methods.
5. Inheritance.
6. List ADT - implementation of Stacks, Queues.
7. Singly Linked List - implementation of Stacks, Queues.
8. Binary tree - traversals.
9. Implementation of search algorithms - linear search and Binary Search.
10. Implementation of sorting algorithms (selection sort, bubble sort, quick sort).
11. Representation of graph and traversal algorithm (DFS & BFS).

OUTCOMES:

Students who complete this course will be able to:

- Understand the object-oriented approach in programming.
- Understand and design appropriate data structures to solve a given problem.
- Design and implement operations on arrays, linked lists, stacks and queues.
- Design and write algorithms for traversing trees and graphs.

ECB2104 ELECTRONIC CIRCUITS - I LAB

L	T	P	C
0	0	3	1

OBJECTIVES:

- To familiarize the students with the analysis and design of basic Transistor, amplifier circuits, rectifiers and power supplies.

LIST OF EXPERIMENTS:

1. Study of BJT Biasing Circuits - Fixed Bias, Self Bias, Voltage Divider Bias and Collector feedback bias.
2. Study of FET Biasing Circuits - Fixed Bias, Self Bias, Voltage Divider Bias.
3. Determination of frequency response, input impedance and output impedance of CE amplifier.
4. Determination of Mid band Voltage gain, input impedance and output impedance of CC amplifier.
5. Determination of frequency response, input impedance and output impedance of Two stage RC Coupled Amplifier.
6. Determination of Mid band Voltage gain, input impedance and output impedance of Darlington amplifier.
7. Determination of frequency response, input impedance and output impedance of Cascode amplifier.
8. Determination of CMRR of Differential amplifier.
9. Determination of frequency response, input impedance and output impedance of CS amplifier.
10. Study of Class B Complementary Symmetry Power amplifier.
11. Determination of Ripple factor of HWR & FWR with and without filter.
12. Design & Study of Series and Shunt voltage regulators.

OUTCOMES:

On completion of this course the student will understand

- The methods of biasing transistors.
- Design of simple amplifier circuits.
- Design of multistage amplifiers.
- Analysis and design of voltage regulators.

SEMESTER IV

		L	T	P	C
MAB2284	**RANDOM PROCESSES**	**3**	**1**	**0**	**4**

OBJECTIVES:

- This course aims at providing the necessary basic concepts in random processes.

MODULE I PROBABILITY CONCEPTS **7**

Axioms of probability - Addition and Multiplication Theorem - Conditional probability - Total probability - Baye's theorem.

MODULE II RANDOM VARIABLES **7**

Random variable - Probability mass function - Probability density functions - Properties - Moments - Moment generating functions and their properties.

MODULE III STANDARD DISTRIBUTIONS **8**

Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, and Normal distributions and their properties - Functions of a random variable.

MODULE IV TWO DIMENSIONAL RANDOM VARIABLES **8**

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and regression - Transformation of random variables - Central limit theorem.

MODULE V CLASSIFICATION OF RANDOM PROCESSES **7**

Definition and examples - first order, second order, strictly stationary, wide - sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

MODULE VI CORRELATION AND SPECTRAL DENSITIES **8**

Auto correlation - Cross correlation - Properties - Power spectral density - Cross spectral density - Properties - Wiener-Khintchine relation - Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function -Linear systems with random inputs - Auto correlation and cross correlation functions of input and output.

Total Hours: 60

TEXT BOOKS:

1. Sheldon M. Ross, "Introduction to Probability Models", 10th Edition, Academic Press, USA, 2009.
2. Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Publishers, 4th Edition, New Delhi, 2002. (Chapters 6, 7 and 8).

REFERENCES:

1. Henry Stark and John W. Woods "Probability and Random Processes with Applications to Signal Processing", 3rd Edition, Pearson Education, Delhi, 2002.
2. Ochi, M.K., "Applied Probability and Stochastic Process", 2nd Edition, John Wiley & Sons,New York, 1990.
3. Howard M.Taylor and Samuel Karlin," An Introduction to Stochastic Modeling", 3rd Edition, Academic Press, USA, 1998.
4. Athanasios Papoulis, S. Unnikrishna Pillai, "Probability, random variables, and stochastic processes", 4th Edition, Tata McGraw-Hill Education, Delhi, 2008.

OUTCOMES:

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

- solve real life problems using standard distributions.
- characterize phenomena which evolve with respect to time in probabilistic manner.
- analyze the response of random inputs to linear time invariant systems.

ECB2211 ELECTRONIC CIRCUITS - II

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study and analyze feedback amplifiers
- To understand the design concepts of Oscillators, Tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time based generators.

MODULE I FEEDBACK AMPLIFIERS AND STABILITY 7

Basic feedback concepts - Properties of Negative feedback - Four feedback topologies with amplifier circuit. Examples - Analysis of series - shunt feedback amplifiers - stability problem - Frequency compensation.

MODULE II OSCILLATORS 7

Barkhausen criteria for oscillator - Analysis of RC oscillators - Phase shift Wein bridge oscillators - LC oscillators - Colpitt, Hartley, Clapp, Crystal , Armstrong, Franklin and Ring Oscillators.

MODULE III TUNED AMPLIFIERS 7

Basic principles - Inductor losses - Use of transformers - Single tuned amplifier frequency analysis - Amplifier with multiple tuned circuits - Cascade - Synchronous tuning - Stagger tuning - Stability of tuned amplifiers using Neutralization techniques.

MODULE IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 8

RL & RC Integrator and Differentiator circuits. Diode clippers, clampers and slicers. Collector coupled and Emitter coupled Astable multivibrator. Monostable multivibrator. Bistable multivibrators. Triggering methods. Storage delay and calculation of switching times. Speed up capacitors. Schmitt trigger circuit.

MODULE V BLOCKING OSCILLATORS AND TIME BASE GENERATORS 9

Pulse transformers, Monostable Blocking Oscillators using Emitter and base timing. Frequency control using core saturation. Astable blocking oscillator, UJT saw tooth generators. Bootstrap and Miller saw-tooth generators. Voltage sweep generators - Current sweep generators.

MODULE VI POWER SUPPLIES **7**

Halfwave and fullwave rectifiers with filters - Ripple factor - Series Voltage Regulator analysis and design - IGBT - working and characteristics - AC voltage control using thyristors - SMPS - DC/DC convertors - Buck, Boost, Buck-Boost analysis and design.

Total Hours:60

TEXT BOOKS:

1. Millman and Halkias. C., "Integrated Electronics", 1st Edition, Tata McGraw-Hill, 1991.
2. Schilling and Belove, "Electronic Circuits", 3rd Edition,TMH, 2002
3. Millman J. and Taub H., "Pulse Digital and Switching waveform", 3rd Edition McGraw-Hill International, 2000.

REFERENCES:

1. Sedra and Smith, "Micro Electronic Circuits", 5th Edition,Oxford University Press, 2004.
2. David A. Bell, "Solid State Pulse Circuits ", 3rd Edition, Prentice Hall of India, 1992.

OUTCOMES:

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

- Analyze and design feedback amplifier circuits.
- Design oscillator for a given frequency.
- Design electronic circuits to meet desired specifications.

ECB2212 DIGITAL ELECTRONICS L T P C
3 0 0 3

OBJECTIVES:

- To study the basic laws of Boolean algebra.
- To introduce the methods for simplifying Boolean expressions.
- To outline the procedures for the analysis and design of combinational circuits and sequential circuits.
- To illustrate the concept of synchronous and asynchronous sequential circuits.
- To illustrate the concept of HDL.
- To introduce the concept of memories and programmable logic devices.

MODULE I BOOLEAN ALGEBRA AND LOGIC GATES 8

Binary number systems- Binary Arithmetic- Binary codes-Boolean algebra and theorems- Boolean functions- Karnaugh map and Quine- McCluskey Method- Logic gates. Implementations of Logic Functions using gates.

MODULE II COMBINATIONAL CIRCUITS 8

Analysis and design procedures- Circuits for arithmetic operations - Multiplexer/ Demultiplexer- Encoder / decoder - Parity checker- Code converters.

MODULE III SEQUENTIAL CIRCUITS 8

Flip flops - Analysis and design of synchronous sequential circuits-Shift registers- counters. Analysis and Design of Asynchronous sequential circuits- cycles - Races -Hazards.

MODULE IV MEMORY DEVICES AND IC FAMILIES 6

Memory devices and organization- Programmable Logic Devices-digital logic Families - Implementation of combinational logic using MUX, ROM, PAL and PLA.

MODULE V VERILOG HARDWARE DESCRIPTION LANGUAGE 7

Introduction to HDL-HDL for Combinational logic circuits -HDL for sequential logic circuits.

MODULE VI COMPUTER ARCHITECTURE 8

Introduction to computer architecture and Organization. Von Neuman Architecture, Flynn Classification. Computer Organization and Design: Instruction cycle, computer registers, computer instructions, design of a basic computer.

Total Hours:45

TEXT BOOKS:

1. M. Morris Mano, "Digital Design", 3rd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2003
2. John .M Yarbrough, "Digital Logic Applications and Design", Thomson- Vikas publishing house, New Delhi, 2005.
3. Samir Palnitkar ,"A guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall 2003
4. William Stallings,"Computer Organization and Architecture", 8th Edition, Pearson Education Asia, 2010.

REFERENCES:

1. Donald D. Givone, "Digital Principles and Design", Tata McGraw Hill Publishing company limited, New Delhi, 2003.
2. Charles H. Roth, "Fundamentals of Logic Design", 2nd Edition, Thomson Publication Company, 2003.
3. Donald P. Leach and Albert Paul Malvino, "Digital Principles and Applications", 5th Edition , Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
4. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 3rd Edition., New Delhi, 2003.
5. Thomas L. Floyd, "Digital Fundamentals", 8th Edition Pearson Education, Inc, New Delhi, 2003
6. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", 5th Edition, 2002.

OUTCOMES:

On completion of this course the student will understand:

- The methods of simplifying Boolean Expressions.
- The design of Combinational and Sequential Circuits.
- The design of Programmable Logic Array (PLA) and Programmable Array Logic (PAL).

ECB2213 ANALOG COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

The purpose of this course is to introduce students to

- The principles and applications of continuous-wave modulation techniques.
- Different communication systems according to transmission bandwidth, transmitted power (noise performance) and system complexity.
- Sampling theorem, pulse analog modulation and digital transmission of analog signals.

MODULE I AMPLITUDE MODULATION 8

Introduction - Need for modulation, Principles of amplitude modulation. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop.

MODULE II SSB AND VSB MODULATION 7

Single side-band modulation - Phase discrimination method for generating an SSB modulated wave, Demodulation of SSB waves. Vestigial side band modulation - Generation of VSB modulated wave, Envelop detection of VSB wave plus carrier, Frequency translation, Frequency division multiplexing, Application: Radio broadcasting, AM radio.

MODULE III ANGLE MODULATION 8

Angle modulation - Frequency modulation, transmission bandwidth of FM signals, frequency spectrum, phase modulation, relationship between FM & PM, narrow band FM & wide band FM. Generation of FM waves: direct method, indirect method of FM generation. Detection of FM waves: Balanced frequency discriminator, Zero crossing detector, Phase locked loop, Foster seely discriminator, ratio detector.

MODULE IV NOISE THEORY 7

Sources of noise - shot noise, thermal noise, white noise, Noise bandwidth, Noise temperature, Noise figure - Measurement of noise figure, Signal in presence of noise, Narrow band noise.

MODULE V NOISE IN CONTINUOUS WAVE MODULTION 7

Noise in SSB and DSB - SC receiver, Noises in AM receiver threshold effect - noise in FM receivers capture effect - FM threshold effect - pre emphasis & de emphasis in FM.

MODULE VI PULSE MODULATION AND DIGITAL TRANSMISSION 8

Sampling process and sampling theorem. Pulse modulation - Generation and detection of PAM, PWM and PPM, Pulse code modulation, delta modulation, adaptive delta modulation, differential pulse code modulation.

Total Hours:45

TEXT BOOKS:

1. Simon Haykin, "Communication System", 4th Edition, John Wiley & Sons, 1991.
2. Taub & Schilling, Gautam Sahe, "Principles of Communication Systems", 3rd Edition, TMH, 2008.
3. Wayne Tomasi, "Electronic Communication Systems: Fundamentals Through Advanced", 6th Edition, Pearson Education, 2007.

REFERENCES:

1. Roddy and Coolen, "Communication Systems", 4th Edition, PHI learning, New Delhi, 2003.
2. George Kennedy and Bernard Davis, "Electronic Communication Systems", 4th Edition, Tata McGraw Hill, 2008.
3. K.N.Hari Bhat & Ganesh Rao, "Analog communications", 2nd Edition, Pearson Publication, 2008
4. J.G. Proakis and M. Salehi, Communication Systems Engineering, 2nd Edition, Prentice Hall, 2002.

OUTCOMES:

At the completion of this module the student should be:

- Familiar with continuous modulation techniques.
- Familiar with AM, DSB-SC, SSB and VSB Systems.

- Able to compare the performance of different communication systems according to transmission bandwidth, transmitted power (noise performance) and system complexity.
- Familiar with the sampling theorem, pulse analog modulation and digital transmission of analog signals.

ECB2214 LINEAR INTEGRATED CIRCUITS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study the characteristics and internal circuit of op-amps.
- To design the various linear and non-linear applications of op-amps.
- To gain knowledge of data converters and special purpose ICs.

MODULE I INTRODUCTION AND CIRCUIT CONFIGURATION OF LINEAR ICS **8**

Op Amp characteristics, Ideal versus Practical, Building Blocks of Op amp, Current sources, Current mirror, analysis of difference amplifier-Derivation of transfer characteristic, Analysis with active load, circuits for improving input impedance, level translator, output stage. Op Amp Specifications: input bias current, offset current, offset voltage, bandwidth, Gain Bandwidth product, frequency compensation and slew rate.

MODULE II LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS **7**

Linear circuits using operational amplifiers and their analysis: virtual ground, Inverting and non-inverting modes; adder, subtractor, difference amplifier; common mode rejection ratio (CMRR), Differentiator, Integrator, V to I converter and I to V converter, Instrumentation Amplifier, sine wave Oscillators, Log and Antilog amplifiers.

MODULE III NON LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS AND ANALOG MULTIPLIER **8**

Precision rectifier, Comparator, Application of comparator, Schmitt trigger, Multivibrators, Triangular wave generator. Analysis of four quadrant (Gilbert cell) and variable transconductance multiplier, DC analysis of Gilbert multiplier cell, Application of Gilbert cell as complete analog multiplier, modulator and phase detector. .

MODULE IV DAC and ADC **8**

Analog switches, High speed Sample and Hold circuit. DAC techniques: Weighted Resistor, R-2R ladder, Inverted R-2R ladder, ADC techniques: Flash type, Counter type, Successive approximation, Single slope and Dual slope.

DAC and ADC specifications - Linearity, accuracy, Monotonicity, Settling time and stability

MODULE V TIMER AND ACTIVE FILTERS 6

555 timer IC, Applications: Astable and Monostable operation, Active filters: First order, second order and higher order Low pass and high pass and band pass filter, Butterworth Filters.

MODULE VI PLL AND VOLTAGE REGULATORS 8

Voltage controlled Oscillator, PLL and Closed loop analysis of PLL, Applications of PLL: Frequency translation, AM, FM and FSK modulators and demodulators, Frequency synthesizers. Voltage regulator ICs: Linear and switched mode types, Switched capacitor filters, Frequency to voltage converter

Total Hours:45

TEXT BOOKS:

1. D. Roy Choudhry, Shail Jain, "Linear Integrated Circuits", 2nd Edition, New Age International Pvt. Ltd., 2003.
2. Gray and Meyer, 'Analysis and Design of Analog Integrated Circuits', 4th Edition, Wiley International, 2009.

REFERENCES:

1. J.Michael Jacob, 'Applications and Design with Analog Integrated Circuits', 4th Edition, Prentice Hall of India, 1996.
2. Ramakant A. Gayakwad, 'OP-AMP and Linear IC's', 3rd Edition, Prentice Hall / Pearson Education, 1994.
3. Millman.J. and Halkias.C.C. 'Integrated Electronics', 2nd Ediiton,McGraw-Hill, 1972.
4. William D.Stanely, 'Operational Amplifiers with Linear Integrated Circuits'.4th Edition, Pearson Education, 2004.
5. Sedra & Smith, "Micro Electronic Circuits", 5th Edition, Oxford University Press, 2004.
6. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 3rd Edition, Tata McGraw-Hill , 2002.

OUTCOMES:

On completion of this course the students can:

- Analyze and design Op-Amp based circuits for various applications.
- Analyze and design differential amplifiers and current sources.
- Have the knowledge of special purpose ICs such as PLL, 555, 723 etc.,

LSB2181 BIOLOGY FOR ENGINEERS

L	T	P	C
3	0	0	3

OBJECTIVES:

The aim of the course is to introduce basic biological concepts to the engineering students to promote cross-breeding of ideas. In particular,

- To provide an overview of cell structure and function.
- To give basic idea on biochemistry related to biological aspects.
- To introduce genes, their structure, inheritance and about living organisms.
- To give an understanding on metabolism, respiration, etc.
- To inform students of engineering about the interface of biology and engineering.

MODULE I BASICS OF CELL STRUCTURE AND FUNCTION 7

Cells as unit of life – basic chemistry of cell – cell structure and functions – Prokaryotic and Eukaryotic cells, cell wall, plasma membrane, endoplasmic reticulum, nucleus, chromosomes- cell division – mitosis, meiosis.

MODULE II BIOCHEMISTRY 8

Biomolecules – introduction – pH and biological buffers – carbohydrates- mono, di, oligo and polysaccharides, lipids- phospholipids, glycolipids, sphingolipids, cholesterol, steroids, prostaglanin – proteins – types – glycoproteins, lipoproteins – structures - primary, secondary, tertiary and quarternary – Nucleic acids – RNA – Types – tRNA, mRNA, giRNA, miRNA, DNA – rDNA, gDNA, cDNA.

MODULE III GENETICS 7

Genes – structure and functions – behavior, dominance and epigenetics, evolution – inheritance – reproduction and gene distribution – genome of living organisms – plants – bacteria and viruses – animals – humans, genetic engineering and cloning.

MODULE IV MICROBIOLOGY 8

Microbiology – basis of microbial existence – microbial diversity – classification and nomenclature of micro-organisms- impact of microorganisms in industry, agriculture and health, industrial microbiology – primary and secondary

screening of micro-organisms, fermentation processes, bioreactors, microbial ecology – microbial bio-remediation – epidemiology and public health.

MODULE V METABOLISM **7**

Metabolic processes – bio-membranes, diffusion, absorption, osmo-regulation, photosynthesis, respiration, digestion and excretion.

MODULE VI BIOLOGY AND ENGINEERS **8**

Application of biology in engineering– living things as the solutions (bionics) – living things as models (biometrics) – bio-technology – biomedical engineering – effect of human action on living things – right balance – bioinformatics – bionanotechnology – sensors, biosensors, biochips-ethics in biology.

Total Hours : 45

REFERENCES:

1. Johnson, Arthur T., “Biology for Engineers”, CRC Press, FL, 2011.
2. Campbell and Recee, “Biology”, Pearson, Benjamin Cummins Pub. 8th edition, 2008.
3. Scott Freeman, “Biological Sciences”, Prentice Hall, 2002.

OUTCOMES:

After finishing this course students will be able to

- understand basics of biological processes, composition of cell contents
- understand applications of microbes in industrial manufacturing of proteins, antibodies and antibiotics.
- understand cloning and genetic engineering
- identify the genes in different genome (plants, microbes, animals, human) and compare the genes by bioinformatics approaches

ENB2282	CONFIDENCE BUILDING AND BEHAVIORAL SKILL	L	T	P	C
		0	0	2	1

COMMON TO ALL B.Tech. PROGRAMMES

OBJECTIVES:

- To enable the students to develop communication skills for verbal communication in the work place.

TOPICS OUTLINE:

This course is practical oriented one and exercises will be given to the students group users /individually depending upon the aspect considered. The following aspect will form the broad outline content of the syllabi. The exercises will be designed by the faculty member and coordinated by the overall course coordinator.

LAB ACTIVITIES:

- Introduction: Soft skills definition, examples
- Verbal communication: Case study, communication and discussion
- Prepared speech
- Impromptu speech
- Debate: Case studies - Attitude and Behavior: role play and exploration
- Ability to ask for help - communication and team work
- Manners and etiquette
- Organization and Planning
- Time keeping
- Conduct in workplace
- Conscientiousness
- Work output
- Professionalism
- Motivation
- Ownership of tasks
- Adaptability/flexibility

ASSESSMENT:

The assessment will be continuous and portfolio based. The students must produce the record of the work done through the course of the semester in the individual classes. The portfolio may consist of a) the individual task outline and activities, b) worked out activities c) Pre-designed sheets which may be provided by the Faculty member. The portfolio will be used by the Faculty member for assessment. The course coordinator in consultation with the course committee shall decide at the beginning of the semester, the number of exercises, method of assessment of each and the weightage for the end semester assessment.

OUTCOMES:

The students should be able to:

- Develop verbal communication skills
- Debate with other students confidently
- Communicate effectively their ideas

ECB2215 DIGITAL ELECTRONICS LAB

L	T	P	C
0	0	3	1

OBJECTIVES:

- To design and implement the Combinational and Sequential circuits.

LIST OF EXPERIMENTS:

1. Design and implementation of Adders and Subtractor using logic gates.
2. Design and implementation of code converters using logic gates

   (i) BCD to excess-3 code and vice-versa (ii) Binary to gray and vice-versa
3. Design and implementation of 4 bit binary Adder/ subtractor and BCD adder using IC 7483.
4. Design and implementation of 2 Bit Magnitude Comparator using logic gates & 8 Bit.
5. Magnitude Comparator using IC 7485.
6. Design and implementation of 16 bit odd/even parity checker generator using IC74180.
7. Design and implementation of Multiplexer and De-multiplexer using logic gates.
8. Design and implementation of encoder and decoder using logic gates.
9. Study of SR,JK, D, T Flip Flops.
10. Construction and verification of Asynchronous counters.
11. Design and implementation of 3-bit synchronous counter.
12. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.
13. Design and implementation of sequential circuit using verilog HDL.
14. Design and implementation of combinational circuit using verilog HDL.

OUTCOMES:

On completion of this course the student will understand

- The design, implementation and operations of combinational circuits like adders, subtractors, code converters, multiplexer, de-multiplexer, encoder,decoder and Magnitude comparator.
- The design, implementation and operations of sequential circuits like flip flops, counters and shift registers.

ECB2216	ELECTRONIC CIRCUITS II LAB	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To design and verify the characteristics and operation of feedback amplifier and oscillator circuits.
- Simulation of feedback amplifier and oscillator circuits using PSPICE software.

LIST OF EXPERIMENTS:

1. Design and Analysis of Feedback Amplifiers
2. Design and Verification of Oscillators
3. Design of Class C Single Tuned Amplifier
4. Design of Collector Coupled Astable Multivibrator
5. Design of Collector Coupled Monostable Multivibrator
6. Design of Fixed Bias Bistable Multivibrator
7. Design of UJT Relaxation Oscillator
8. Characteristics of OpAmp.
9. Inverting and Non-Inverting Amplifiers and Voltage follower
10. Adder, Subtractor, Difference amplifier, Integrator, Differentiator
11. Instrumentation Amplifier
12. Active 2nd Order Butterworth Filters
13. Design of Multivibrators and Schmitt Trigger using opAmp
14. Design of Multivibrators using 555 timer.
15. Simulation using PSpice, Netlist of above experiments

OUTCOMES:

At the end of the course the student will be able to

- Construct, troubleshoot amplifier and oscillator circuits in the laboratory with proper use of test equipment.
- Carry out performance evaluations of electronic circuits using PSPICE simulation tool.

ECB2217 COMMUNICATION ENGINEERING LAB I

L	T	P	C
0	0	3	1

OBJECTIVES:

To enable the students

- To design and construct analog and digital transmitters and receivers.
- To analyze various pulse modulation techniques.

LIST OF EXPERIMENTS:

1. Generation of DSFC, DSSC& SSB AM Modulation and Demodulation.
2. FM modulator and demodulator.
3. Pulse modulation technique.
   a) Verification of Sampling theorem.
   b) PAM modulator and demodulator.
   c) PPM modulator and demodulator.
   d) PWM modulator and demodulator.
4. Multiplexing Technique.TDM, FDM.
5. AGC, VFC, FVC,AFC, mixer.
6. IF, RF Tuned circuit.
7. Performance of AM receiver and measurement of sensitivity, selectivity and fidelity.
8. Loud speaker characteristics.
9. Pre emphasis & De-emphasis in FM.
10. Study of spectrum analyzer.

OUTCOMES:

- On completion of this course the student will be familiar with the Design and construction of analog and digital modem.

SEMESTER V

ECB3101 DIGITAL SIGNAL PROCESSING

L	T	P	C
3	1	0	4

OBJECTIVES:

- To study various Fourier transforms and their application in Digital Filter design.
- To study the design of FIR and IIR Digital filters.
- To understand the concept of quantization noise and its effects in multi-rate signal processing.
- To study the architecture and features of various digital signal processors.

MODULE I DISCRETE FOURIER TRANSFORM 8

Introduction to Discrete Fourier Transform, Direct computation of DFT, Properties of DFT, Efficient computation of DFT- FFT algorithms - Radix-2FFT algorithms -Decimation in Time, Decimation in Frequency algorithms, Computing Inverse DFT.

MODULE II DESIGN AND IMPLEMENTATION OF IIR FILTERS 8

Design of Low Pass Butterworth filters, analog to analog transformation -Analog to digital transformation, Bilinear transformation - prewarping, Impulse invariant transformation.

MODULE III DESIGN AND IMPLEMENTATION OF FIR FILTERS 8

Amplitude and phase responses of FIR filters - symmetric and anti-symmetric impulse response, group delay and phase delay, Frequency response of FIR filters, Linear phase filters - Windowing techniques for design of Linear phase FIR filters - Rectangular, Hamming, Hanning and Blackmann windows, Frequency sampling techniques.

MODULE IV FINITE WORD LENGTH EFFECTS 8

Representation of numbers, - Fixed point and binary floating point number representation - comparison, errors due to truncation and rounding- off, Quantization noise - derivation for quantization noise power at the input and output of a digital filter , Co-efficient quantization error -product quantization error, Round-off effects in digital filters, Limit cycle oscillation - Over flow error-Signal scaling.

MODULE V MULTIRATE DIGITAL SIGNAL PROCESSING 8

Mathematical description of change of sampling rate - Interpolation and Decimation , Decimation by an integer factor, Interpolation by an integer factor, Sampling rate conversion by a rational factor, Time and frequency domain descriptions - Single, Multi stage, Polyphase structures - Quadrature Mirror Filter banks - Sub-band Coding, few applications using sub-band coding.

MODULE VI DIGITAL SIGNAL PROCESSORS 5

Introduction to DSP architecture - Harvard and Von Neumann architecture - Pipelining - Dedicated MAC unit - Advanced addressing modes, Architecture of TMS320C5X and C54X, Overview of instruction set of TMS320C5X and C54X.

Total Hours:60

TEXT BOOKS:

1. John G Proakis, Dimtris G Manolakis, "Digital Signal Processing Principles, Algorithms and Application", 4th Edition, PHI, 2009.
2. B.Venkataramani, M. Bhaskar, "Digital Signal Processor Architecture, Programming and Application", 2nd Edition, TMH 2002.

REFERENCES:

1. Alan V Oppenheim, Ronald W Schafer, John R Back, "Discrete Time Signal Processing", 2nd Edition, PHI, 2000.
2. Avtar Singh, S.Srinivasan, "DSP Implementation using DSP microprocessor with Examples from TMS32C54XX", 3rd Edition,Thomson / Brooks cole Publishers, 2003.
3. Johny R.Johnson, "Introduction to Digital Signal Processing", 2nd Edition, Prentice Hall, 2002.
4. S.K.Mitra, "Digital Signal Processing- A Computer based approach", 4th Edition, Tata McGraw-Hill, New Delhi, 2011.

OUTCOMES:

On completion of this course the student will be familiar with the

- Digital signal processing methods.
- Designing & analyzing of digital filters.
- Architecture and features of DSP Processors.

ECB3102 DIGITAL COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To give an overview of the design of digital communication systems.
- To introduce the basic concepts of digital modulation of baseband and passband signals.
- To give an exposure to information theory, source coding and error control coding.
- To discuss about the spread spectrum modulation schemes.

MODULE I SAMPLING PROCESS AND WAVEFORM CODING TECHNIQUES 9

Sampling theorem, Signal reconstruction in time domain, impulse and flat top sampling, interpolation formula, signal space interpretation, Sampling of Bandpass Signal.Pulse Code Modulation,Differential pulse code modulation, Delta modulation, Idling noise and slope overload, Adaptive delta modulation, DPCM, Comparison of PCM and DM.

MODULE II BASEBAND SIGNALING 7

Baseband data formats & their properties - Matched filter - ISI and Nyquist's criterion for distortionless transmission - Correlative coding - M-ary schemes- Eye-pattern, Equalization, Adaptive Equalization - Bit Synchronization.

MODULE III BAND PASS SIGNALING 8

Geometric Representation of signals - Generation, detection, PSD and BER of Coherent BPSK, BFSK, and QPSK - Principles of CPFSK (MSK, GMSK), and QAM - Carrier synchronization- Structure of Non-Coherent Receivers - Principle of DPSK.

MODULE IV INFORMATION THEORY 7

Entropy - Discrete memory less channels - Mutual information - Channel capacity - Channel transition matrices - Channel capacity for continuous channels -Hartley-Shannon law - Source coding theorem - Huffman and Shannon-Fano codes.

MODULE V ERROR CONTROL CODING 7

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes- Convolution codes - Viterbi Decoder - Trellis Coded Modulation.

MODULE VI SPREAD SPECTRUM TECHNIQUES 7

Spread Spectrum Codes - PN sequence - Auto correlation and Cross correlation properties - M Sequences - Direct Sequence Spread Spectrum - Code synchronization, Processing Gain - Jamming Resistance - CDMA - Frequency Hop Spread Spectrum.

Total Hours:45

TEXT BOOKS:

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons 2001.
2. Simon Haykin, "Digital Communications", 2nd Edition, John Wiley & Sons 2005.

REFERENCES:

1. Leon W. Couch, "Modern Communication Systems: Principles and Applications", 2nd Edition, Prentice Hall.1995
2. John G. Proakis, "Digital Communication", 4th Edition, McGraw Hill Higher Education, 2000.
3. Bernard Sklar, "Digital Communications: Fundamentals and Applications", 2nd Edition, Prentice Hall, 2001.
4. B. P. Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford University Press,1998.
5. Roger L. Peterson, David E. Borth and Rodger E. Ziemer, "Introduction to Spread Spectrum Communications", 1st Edition, Prentice Hall Inc, 1995.

OUTCOMES:

On completion of this course the student will understand

- Pulse modulation and the process of sampling, quantization and coding.
- Baseband pulse transmission.
- Error control coding which encompasses techniques for the encoding and decoding of digital data streams.

ECB3103 MICROPROCESSORS & MICROCONTROLLERS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce the architecture and programming of 8085 microprocessor.
- To introduce the architecture , programming and interfacing of 8086 microprocessor.
- To introduce the architecture, programming and interfacing of 8051 micro controller.

MODULE I INTRODUCTION TO 8 BIT PROCESSOR **5**

Introduction to Micro Computers, Microprocessors -8 bit MicroProcessor - 8085 Architecture, Instruction Classifications- Addressing modes - Timing diagrams - Interrupts - Memory interfacing - Interfacing I/O devices.

MODULE II 8086 ARCHITECTURE AND PROGRAMMING **9**

8086 - Hardware Architecture -External memory addressing, Bus cycles,- Maximum mode bus cycle, 8086 system configuration,8086 Addressing modes-Memory Interfacing, Interrupts- Interrupt processing, Direct memory access.- Instruction set- 8086 Assembly language Programming.

MODULE III 8086 PERIPHERALS INTERFACING **9**

Interfacing Serial I/O (8251)- parallel I/O (8255) -Keyboard and Display controller (8279) - ADC/DAC interfacing - Bus: RS232C-RS485-GPIB Introduction, Generation of I/O Ports, Sample-and-Hold Circuit and Multiplexer, Programmable Interval timer (8254).

MODULE IV 8051 MICROCONTROLLER **9**

8051 Micro controller hardware- I/O pins, ports and circuits- Memory organization- Special function registers -Counters and Timers- Serial Data I/O- Interrupts-8051 instruction set -Addressing modes- Operand types- Operand addressing - Assembly language programming - I/O port programming.

MODULE V 8051 APPLICATIONS **9**

Interfacing to external memory and 8255 Port Operation, Memory Interfacing, I/O Interfacing-Timer and counter programming - Serial Communication -8051 Interfacing: LCD, ADC, DAC,Stepper Motor, Keyboard - Traffic light control.

MODULE VI ADVANCED PROCESSORS & CONTROLLERS 4

Advanced Microprocessor Architectures- 286, 486, Pentium; Introduction to RISC Processors; ARM and PIC microcontrollers.

Total Hours:45

TEXT BOOKS:

1. Ramesh S Gaonkar, "Microprocessor Architecture, Programming and application with 8085", 4th Edition, Penram International Publishing, New Delhi, 2000.
2. John Uffenbeck, "The 80x86 Family, Design, Programming and Interfacing", 3rd Edition, Pearson Education, 2002.
3. Mohammed Ali Mazidi and Janice GillispieMazidi, "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Pearson Education Asia, New Delhi, 2003.

REFERENCES:

1. A.K. Ray and K.M.Burchandi, "Intel Microprocessors Architecture Programming and Interfacing", 2nd Edition, McGraw Hill International Edition, 2000
2. Kenneth J Ayala, "The 8051 Microcontroller Architecture Programming and Application", 2nd Edition, Penram International Publishers (India), New Delhi, 1996.
3. M. Rafi Quazzaman, "Microprocessors Theory and Applications: Intel and Motorola", Prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

OUTCOMES:

On the completion of the course, students will be:

- Write assumply language program using 8085 & 8086 processor.
- Interface with other peripherals.
- Understand atchitecture of advance micro process and micro controls

ECB3104 TRANSMISSION LINES AND ANTENNAS

L	T	P	C
3	1	0	4

OBJECTIVES:

- To become familiar with propagation of signals through lines and waveguides.
- To understand signal propagation at Radio frequencies.
- To understand the theory of antennas and their arrays.
- To study in detail various modes of radio propagation.

MODULE I BASICS OF ELECTROMAGNETIC WAVES **7**

Maxwell's Equation, Boundary conditions, Solution for Free-Space conditions, Uniform Plane Waves, Polarization, Reflections by a perfect conductor. Poynting theorem.

MODULE II TRANSMISSION LINE ANALYSIS **8**

Lumped and distributed element models of transmission lines, characteristic impedance, terminated transmission line - reflection coefficient, wavelength and velocities of propagation, Transfer Impedance, Standing waves, Impedance matching, Smith Chart - impedance and admittance chart, scattering matrix.

MODULE III WAVEGUIDES **7**

Planar waveguides, TE and TM waves - characteristics, velocities of propagation, Rectangular waveguides - dominant mode, cut-off wavelength, phase velocity, group velocity, characteristic impedances, Circular waveguides - Solution in cylindrical coordinates.

MODULE IV FUNDAMENTALS OF ANTENNAS **8**

Vector Potential, Radiation from a infinitesimal alternating current element, Half-wave dipole antenna - power radiated, Mono-pole antenna. Antenna Parameters, radiation resistance, radiation intensity, radiation pattern, directivity, gain, effective height and effective aperture. Reciprocity theorem, Self and Mutual impedance.

MODULE V ANTENNA ARRAYS AND APERTURE ANTENNAS **8**

Linear Arrays - Broadside and End-fire arrays, pattern multiplication, parasitic array elements, log-periodic and Yagi-Uda antenna. Loop antenna, Travelling wave antenna concepts.

MODULE VI RADIO WAVE PROPAGATION **7**

The three basic types of propagation; ground wave, space wave and sky wave propagation. Wave tilt of surface wave, Tropospheric wave, Structure of atmosphere, ionospheric propagation, virtual height, critical frequency, MUF, space wave propagation, ground wave propagation, forward scatter propagation.

Total Hours : 60

TEXT BOOKS:

1. Edward C. Jordan and Kenneth G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, Prentice Hall Int., 2009.
2. John D Ryder, "Networks, Lines and Fields", 2nd Edition, Prentice Hall India, 1994.
3. John D Kraus, Ronald J Marhefka, Ahmad S Khan, "Antennas and Wave Propagation", 3rd Edition, Tata McGraw Hill, 2006

REFERENCES:

1. Constantine A. Ballanis , "Antenna Theory ", 2nd Edition, John Wiley & Sons, 2003.
2. R. S. Elliot, "Antenna Theory and Design", Revised edition, Wiley-IEEE Press., 2003.
3. David M.Pozar: "Microwave Engineering", 4th Edition, John Wiley, 2013.60

OUTCOMES:

On completion of this course the student will understand

- Transmission line theory.
- Concept of characteristic impedance and impedance matching at high frequencies.
- The characteristics of an antenna and its array concept.
- Various types of antenna and its applications.
- Types of radio wave propagation and its characteristics.

MSB3181 MANAGEMENT OF BUSINESS ORGANIZATION **L T P C**
3 0 0 3

OBJECTIVES:

- To give an exposure to principles of management and organizational structures.
- To introduce concepts of operation and material management.
- To provide an understanding of management of human resources.
- To impart some basic knowledge on marketing, pricing and selling.
- To give an overview of accounting and management of finance.

MODULE I PRINCIPLES OF MANAGEMENT **7**

Functions of management - planning - organizing - staffing - direction - motivation - communication - coordination - control, organizational structures-line - line and staff - matrix type, functional relationships - span of control, Management by OBJECTIVESs (MBO) - Forms of Industrial ownership.

MODULE II OPERATIONS MANAGEMENT **8**

Introduction to operations management - functions of production/operations management - types of production, Overview of facility location - lay out planning, introduction to production planning and control, work study, quality assurance, lean manufacturing and six sigma, plant maintenance and management.

MODULE III MATERIALS MANAGEMENT **8**

Materials Planning - types of inventory, Purchasing function - source selection-negotiation - ordering, Stores management - functions - types of stores - overview of inventory control, Introduction to newer concepts: MRP-I - MRP-II-ERP - JIT.

MODULE IV HUMAN RESOURCE MANAGEMENT **7**

Human Resource Management - OBJECTIVESs - role of Human Resource Manager -manpower planning - selection and placement - training - motivation-performance assessment - Introduction to grievances handling and labour welfare.

MODULE V MARKETING MANAGEMENT **7**

Marketing - concept and definition - Elements of marketing mix - PLC - Steps

in new product development - Pricing OBJECTIVESs and methods - Advertising types/media - Steps in personal selling - Sales promotion methods - Distribution channels: functions, types.

MODULE VI FINANCIAL MANAGEMENT 8

Financial management functions - introduction to financial accounts, financial performance - profit and loss account statement - balance sheet, budgetary control - meaning - uses - limitations - types of costs - basics of depreciation methods -break-even analysis - meaning - assumption - uses and limitations, working capital - meaning and relevance - Use of operating ratios.

Total Hours:45

REFERENCES:

1. Bhushan Y.K., "Fundamentals of Business Organisation and Management", 12th Edition, Sultan Chand & Co., 2003.
2. Banga & Sharma "Industrial Engineering & Management", 11th Edition, Khanna Publications, 2007.
3. Khanna, O.P., "Industrial Engineering & Management", Dhanpat Rai Publications, 2004.
4. S.N.Maheswari "Principles of Management Accounting", 16th Edition, S.Chand & Company Ltd., 2007.

OUTCOMES:

After doing the course

- the students would have gained basic knowledge of the concepts of management and the functions of management.
- the students would have learnt fundamentals of the functional areas of management viz., operations management, materials management, marketing management, human resources management and financial management.

ENB3181	CAREER BUILDING & PEOPLE SKILLS Common to all B.Tech Programmes	L T P C 0 0 2 1

OBJECTIVES:

- To prepare the students for building their competencies and career building skills.

COURSE OUTLINE:

This course is practical oriented one and exercises will be given to the students group users /individually depending upon the aspect considered. The following aspect will form the broad outline content of the syllabi. The exercises will be designed by the faculty member and coordinated by the overall course coordinator.

LAB ACTIVITIES:

- Preparation for the placement
- Group discussions: Do's and Don'ts - handling of Group discussions - What evaluators look for.
- Interview - awareness of facing questions - Do's and Don'ts of personal interview.
- Selection of appropriate field vis-à-vis personality / interest.
- Preparation of Resume-OBJECTIVESs, profiles vis-à-vis companies requirement.
- Enabling students to prepare for different procedures / levels to enter into any company - books / websites to help for further preparation.
- Technical interview - how to prepare and face it.
- Workplace skills
- Presentation skills
- Oral presentations
- Technical presentations
- Business presentations
- Technical writing

- Interpersonal relationships - with colleagues - clients - understanding one's own behavior - perception by others.

ASSESSMENT:

As the course is practical one, it will be assessed using a portfolio based assessment. The students must in consultation with the Faculty member, plan a portfolio of evidence for the above mentioned activities. The students must develop a résumé or résumés that promote own ability to meet specific job requirements and plan their portfolio in a format appropriate to industry they wish to target. The case studies will contain direct observation of the candidate developing career plans, résumés and skills portfolio, reflect written or oral questioning to assess knowledge and problem-solving activities to assess ability to align career aspirations with realistic career goals. The course coordinator in consultation with the course committee will decide the number of exercises and mark to be awarded for each beside the weightage for the end semester assessment.

OUTCOMES:

The course will help the students to

- Develop team work skills.
- Take part effectively in various selection procedures followed by the recruiters.

ECB3105	DIGITAL SIGNAL PROCESSING LAB	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To introduce DSP design and analysis techniques.
- To emphasize the key DSP concepts, such as overview of discrete time signals and systems, sampling and reconstruction of analog signals, computation of Discrete Fourier transform and Fast Fourier transform FIR Filter design and IIR Filter Design etc.
- To provide an understanding of how to design signal processing systems and process data in a software simulation like using MATLAB.
- To introduce programming for real time DSP applications.

LIST OF EXPERIMENTS:
EXPERIMENTS USING MATLAB

1. Generation of Standard discrete time signal.
2. Generating a complex valued signal.
3. Generating even and odd composition of signal.
4. Step and impulse response of LTI systems.
5. Frequency response of LTI systems.
6. Discrete Fourier transform -Direct Computation & Using FFT.
7. Linear convolution.
8. Circular convolution.
9. Design of IIR filters -Butterworth using impulse invariance method.
10. Design of IIR filters - Chebyshev using bilinear transformation.
11. Design of FIR filters using windowing.
12. Sampling and Reconstruction.
13. Sampling rate conversion-interpolation & decimation.

EXPERIMENTS USING DSP PROCESSORS:

14. Linear convolution
15. Circular convolution
16. Discrete Fourier transform
17. Inverse Discrete Fourier transform.

OUTCOMES:

The students will be able

- To implement signal processing methods.
- Capable of executing design synthesis & analysis of digital filters using MATLAB software as well as using TMS320C54X.

ECB3106 COMMUNICATION ENGINEERING LAB- II

L	T	P	C
0	0	3	1

OBJECTIVES:

- To design and construct analog and digital transmitters and receivers.
- To analyze receiver performance and channel behavior.
- To generate PN sequence with its characteristics.
- To simulate error control coding and source coding using MATLAB.

LIST OF EXPERIMENTS:

1. Sample and hold circuit.
2. Digital Modulation and Demodulation - ASK, BPSK, BFSK and QPSK.
3. Delta Modulation and Demodulation.
4. PCM Modulation and Demodulation.
5. Generation of PN sequence and studying its characteristics.
6. Line coding and decoding.

EXPERIMENTS USING MATLAB:

7. Direct Sequence Spread Spectrum &frequency hop Techniques.
8. Analyze the performance of data transmission system using Eye pattern
9. Error controlling technique.
10. Source coding technique.
11. Performance analysis of AWGN, RAYLEIGH Channel.

OUTCOMES:

On completion of this course the student will be able to

- Design and construction of digital modem.
- Simulation of Spread Spectrum techniques using MATLAB.
- Analyze various channel behavior.
- Analyze the performance of data transmission system.

ECB3107	MICROPROCESSOR AND MICRO CONTROLLER LAB	L	T	P	C
		0	0	3	1

OBJECTIVES:

- Familiarize the architecture of 8086 processor, assembly language programming and interfacing with various modules.
- The student can also understand of 8051 Microcontroller concepts, architecture, programming and application of Microcontrollers.

LIST OF EXPERIMENTS:

1. Programs for 16 bit Arithmetic operation using 8085 and 8086.
2. Programs for 16 bit Sorting, Searching and String operations.
3. Programs for Digital clock, Interfacing ADC and DAC.
4. Interfacing and Programming 8279, 8259, and 8253.
5. Serial Communication between two Microprocessor Kits using 8251.
6. Interfacing of 8086 and 8051 with Stepper Motor, DC Motor for Speed control and Parallel Communication between two Mictro controller / Microprocessor Kits using Mode 1 and Mode 2 of 8255.
7. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051microcontroller.
8. Programming verifying Timer, Interrupts and UART operations in 8051microcontroller
9. Interfacing- DAC and ADC with 8051 for temperature measurement.
10. Interfacing -LED and LCD.
11. Interfacing - stepper motor traffic light control.
12. Communication between 8051 Microcontroller kit and PC.

OUTCOMES:

The students will be equipped with the basic knowledge of

- microprocessor and microcontroller interfacing and their applications.
- Comparing the various interface techniques.

SEMESTER VI

GEB3201 ENVIRONMENTAL SCIENCE AND ENGINEERING **L T P C**
3 0 0 3

OBJECTIVE:

- To impart the basic scientific knowledge on the environment and human impacts on various elements of environment and assessment tools.

MODULE I PHYSICAL ENVIRONMENT **8**

Earth's surface - the Interior of Earth - Plate Tectonics - Composition of the Crust: Rocks - formation and types, Soils - formation and components - soil profile.

Atmosphere - structure and composition - weather and climate - tropospheric airflow.

Hydrosphere - water budget - hydrological cycle - Rainwater and precipitation, River Water and solids, Lake Water and stratification, Seawater and solids, soil moisture and groundwater.

Bioelement cycling - The Oxygen cycles - the carbon cycle - the nitrogen cycle - the phosphorous cycle - the sulfur cycle sodium, potassium and magnesium cycles.

MODULE-II BIOLOGICAL ENVIRONMENT **7**

Cellular basis of life - prokaryotes and eukaryotes - cell respiration - photosynthesis - DNA and RNA - genetically modified life.

Population dynamics - population - population growth - survival and growth curves - population regulation - future of human population.

Biological communities - Five major interactions: competition, predation, parasitism, mutualism and commensalism - Concepts of habitat and niche - natural selection - species richness and species diversity - ecological succession and climax.

Ecosystem and Biomes - Food Chains and food webs - biomagnifications - ecological pyramids - Trophic levels - Energy flow in ecosystem - ecosystem stability - Terrestrial and aquatic biomes.

MODULE III IMPACTS ON NATURAL RESOURCES AND CONSERVATION 9

Biological resources - nature and importance - direct damage - introduced species - Habitat degradation, loss and fragmentation - Values of biodiversity- hotspots of biodiversity, threats to biodiversity- endangered and endemic species of India- conservation of biodiversity, in-situ and ex-situ conservation.

Land Utilization - past patterns of land use - Urban and Industrial development- deforestation, salinisation, soil erosion, and desertification - Modern Agriculture and Impacts.

Waste management - types of solid wastes: domestic, municipal, industrial and e-wastes - disposal options - reduce, recovery, reuse - waste minimization, cleaner production technology.

MODULE IV IMPACTS ON WATER AND AIR AND CONSERVATION 8

Water pollution - organic oxygen demanding wastes - anthropogenic phosphate and eutrophication - Ground water contamination - Usage of fertilizer and pesticides- acid rain -acid mine discharges - toxic metals - organochlorines - endocrine disrupting substances- treatment process - Rain water harvesting and watershed management- manmade radionuclide's - thermal pollution.

Atmospheric pollution - primary and secondary pollutants - anthropogenic, xenobiotic, synergism, sources and sink, residence time, levels and impacts of major pollutants - processes leading to smog, acid rain, global warming, stratospheric ozone depletion - Noise pollution and abatement.

MODULE V IMPACTS ON ENERGY AND CONSERVATION, ENVIRONMENTAL CRISIS 8

Energy - Renewable and non renewable energy resources - thermal power plants - nuclear fuels, fossil fuels, solar energy, wind energy, wave energy, tidal energy, ocean thermal energy, hydropower, geothermal energy, biomass energy.

Environment crisis - state of environment in developed and developing countries- managing environmental challenges for future - disaster management, floods, earthquake, cyclone and landslides.

MODULE VI ENVIRONMENTAL IMPACT ASSESSMENT AND SUSTAINABILITY **5**

Environmental Impact Assessment - Impacts: magnitude and significance - steps in EIA - methods - precautionary principle and polluter pays principle - role of NGOs and Public - value education -Environment protection act (air, water, wild life) and forest Conservation act

Concept of Sustainability - Sustainable Development - Gaia Hypothesis - Traditional Knowledge for sustainability.

Total Hours: 45

TEXT BOOKS:

1. Andrew R. W. Jackson and Julie M. Jackson, "Environmental Science (The Natural Environment and Human Impact)", Pearson Education Limited, Harlow, Essex, England, 2000.
2. G Tyler Miller Jr, "Environmental Science (Working with the Earth)" Thomson Brooks/Cole, 2006.

REFERENCES:

1. David McGeary and Charles C Plummer," Physical Geology, Earth Revealed", WCB McGraw Hill, 1998.
2. Bryan G. Norton, "Sustainability: A Philosophy of Adaptive Ecosystem Management", 2005.
3. Larry W. Canter, "Environmental Impact Assessment" McGraw-Hill, 1996.
4. James Lovelock, "The Revenge of Gaia: Why the Earth is Fighting Back and How We Can Still Save Humanity", Penguin UK, 2007.

OUTCOME:

- Student should have gained basic scientific knowledge on the environment and human impacts on various elements of environment and assessment tools.

ECB3211 RF & MICROWAVE ENGINEERING L T P C
3 1 0 4

OBJECTIVES:

- To introduce various passive microwave components and semiconductor devices.
- To study various microwave sources, their principle of operation and measurement of various parameters.
- To study about microwave integrated circuits.

MODULE I TWO PORT RF NETWORKS-CIRCUIT REPRESENTATION 8

Low frequency parameters-impedance, admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Introduction to component basics, wire, resistor, capacitor and inductor, applications of RF

MODULE II RF TRANSISTOR AMPLIFIER DESIGN AND MATCHING NETWORKS 7

Amplifier power relation, stability considerations, gain considerations noise figure, impedance matching networks, frequency response, T and matching networks, microstrip line matching networks

MODULE III MICROWAVE WAVEGUIDES, COMPONENTS & DEVICES 10

Introduction, microwave Frequencies, Microwave Devices, Microwave Systems, Microwave Units of Measure, Microwave waveguides and Components: microwave Cavities, Microwave Hybrid Circuits ,Directional Couplers, Circulators and Isolators.

Transferred Electron Devices: Introduction, Gunn-Effect Diodes-GaAs Diode, Ridely-Watkins-Hilsun(RWH) Theory, Modes of Operation, LSA Diodes, InP Diodes, CdTe Diodes, Microwave Generation and Amplification.

Avalanche Transit-Time Devices: Introduction, Read Diode, IMPATT Diodes, TRAPATT Diodes, BARITT Diodes.

MODULE IV MICROWAVE TUBES (O TYPE & M TYPE) 7

Klystrons, Reentrant Cavities, Velocity-Modulation Process, Bunching Process, Output Power and Beam Loading, Multicavity Klystron amplifiers, Helix Traveling - Wave Tubes (TWTs) , Slow-Wave structures, Amplification Process, Convection Current, Axial Electric Field, Wave Modes, Gain Consideration.

MODULE V STRIPLINES & MONOLITHIC MICROWAVE INTEGRATED CIRCUITS 7

Introduction to Microstrip Lines, Parallel Strip Lines, Distributed Lines, Characteristic Impedance, Attenuation Losses, Coplanar Strip Lines, Shielded Strip Lines. Monolithic Microwave Integrated Circuits: Introduction, Materials, Substrate Materials, Conductor Materials, Dielectric Materials, Resistive Materials, Monolithic Microwave Integrated-Circuit Growth, MMIC Fabrication Techniques.

MODULE VI MICROWAVE MEASUREMENTS 6

Slotted line VSWR measurement, VSWR through return loss measurements, power measurement, impedance measurement insertion loss and attenuation measurements-measurement of scattering parameters- Measurement of dielectric constant of a solid using waveguide.

Total Hours:60

TEXT BOOKS:

1. Samuel Y Liao, "Microwave Devices & Circuits", Prentice Hall of India, 2006.
2. Reinhold. Ludwig and Pavel Bretshko, "RF Circuit Design", Pearson Education, 2006.
3. Annapurna Das and Sisir K.Das, "Microwave Engineering"-TMH, 2000.

REFERENCES:

1. R.E. Collin, "Foundations for Microwave Engineering", 2nd Edition, IEEE Press, 2002.
2. David M. Pozar, "Microwave Engineering", 2nd Edition, John Wiley & Sons, 2003.
3. Peter. A. Rizzi-"Microwave Engineering Passive Circuits", PH,1988.

4. M.M.Radmanesh, "RF & Microwave Electronics Illustrated", Pearson Education, 2007.

OUTCOMES:

On completing this course students will know

- how to apply Maxwell's equations to various canonical situations for free space, waveguides, and cavity resonators
- how to characterize microwave systems and components in terms of network theory (Scattering matrix, ABCD matrix, impedance matrix etc.)
- how to analyze and design tuning networks and matching transformers for microwave systems
- how to make fundamental measurements related to microwave engineering (VSWR, S-parameters, etc.)
- how to interpret and manipulate graphical representations of microwave Components and systems via the Smith chart.

ECB3212 VLSI DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To introduce MOS devices theory and Technology.
- To study NMOS and CMOS based combinational and sequential circuits.
- To study the Programmable Logic Devices and FPGAs.
- To gain knowledge about VHDL programming.

MODULE I BASIC DEVICE CHARACTERISTICS 8

NMOS, PMOS and CMOS devices - Characteristics, linear, saturation modes, Fabrication- (NMOS, PMOS, CMOS, BiCMOS) Technology - NMOS transistor current equation, latch-up.

MODULE II MOS INVERTER AND PHYSICAL LAYOUT 7

NMOS & CMOS inverter - Characteristics, Determination of pull up / pull down ratios, BiCMOS logic, other CMOS structures, Construction of Gates using NMOS and CMOS logic, pass transistor logic. Stick diagram , layout, lambda based rules.

MODULE III BUILDING BLOCKS OF DIGITAL SYSTEMS 8

Combinational Logic and Sequential logic circuits - Construction of Full adder, multiplexers, latches, flip-flops using transmission gates ,complex Data path circuits- Adder, Multiplier architectures and ALU design.

MODULE IV PROGRAMMABLE LOGIC DEVICES AND FPGAS 8

Introduction to Programmable Logic interconnect principles and types, Programmable logic elements and AND-OR arrays, Routing Procedures in FPGAs and CPLD, programming methods for FPGAs and CPLDs, Comparison of ACTEL, Altera and Xilinx FPGAs.

MODULE V PRINCIPLES OF HDL 7

Introduction to VHDL - sequential and concurrent descriptions. Signal, port and variable statements. Wait, case , sequential statements. Block, process component. Operators - Packages - Combinational and Sequential circuit coding- sub programs - Test benches.

MODULE VI CMOS SUBSYSTEM **7**

Semiconductor memories, memory chip organization, RAM Cells,dynamic memory cell. Architectural issues - Design examples - combinational logic. Clocked circuits.

Total Hours:45

TEXT BOOKS:

1. D.A. Pucknell, K.Eshraghian, "Basic VLSI Design", 3rd Edition, Prentice Hall of India, New Delhi, 2003.
2. Eugene D. Fabricius, "Introduction to VLSI Design", Tata McGraw Hill, 1990.
3. J. P. Uyemura, "Introduction to VLSI Circuits and System", Wiley, 2002.

REFERENCES:

1. N.H. Weste, "Principles of CMOS VLSI Design", Pearson Education, India, 2002.
2. Charles H. Roth, "Fundamentals of Logic Design", Jaico Publishing House, 1992.
3. Zainalabdin Navabi, "VHDL Analysis and Modeling of Digital Systems", 2nd Edition, Tata McGraw Hill, 1998.

OUTCOMES:

On completion of this course the student will understand

- MOS device's theory and characteristics.
- Programmable Logic Devices and FPGAs.
- VHDL programming.

ECB3213 OPTICAL COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce the principle and techniques of fiber optical communication.
- To learn various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
- To study about optical source and optical detectors and their application in optical communication system.

MODULE I INTRODUCTION TO OPTICAL FIBERS 7

Evolution of fiber Optic system - Element of an Optical Fiber Transmission link - Ray Optics - Optical Fiber Modes and Configurations - Mode theory of Circular Wave guides - Overview of Modes - Linearly Polarized Modes - Single Mode and Multimode mode Fibers - Graded Index fiber structure.

MODULE II SIGNAL DEGRADATION IN OPTICAL FIBERS 8

Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides - Information Capacity determination - Group Delay - Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers - Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers - Mode Coupling - Design Optimization of SM fibers.

MODULE III FIBER OPTICAL SOURCES 8

Direct and indirect Band gap materials - Light source materials - LED structures- Quantum efficiency and LED power, Modulation of a LED, Laser Diodes - Modes and Threshold condition - Rate equations - External Quantum efficiency Resonant frequencies - Laser Diodes structures and radiation patterns - Single Mode lasers - Modulation of Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers.

MODULE IV FIBER OPTICAL RECEIVERS 7

PIN and APD diodes - Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise - Comparison of Photo detectors - Fundamental Receiver Operation - Pre-amplifiers - Error Sources - Receiver Configuration - Probability of Error - The Quantum Limit.

MODULE V DIGITAL TRANMISSION SYSTEM 7

Point-to-Point links - System considerations - Fiber Splicing and connectors - Link Power budget - Rise-time budget - Noise Effects on System Performance- Line coding-Error correction.

MODULE VI OPTICAL NETWORKS 8

Introduction to optical networking components-Basic networks-Network Topologies, Performance of passive linear Buses, Performance of star Architectures- Operational Principles of WDM, Erbium-doped fiber, Solitons, Basic concepts of SONET/SDH-Optical CDMA-Measurements- optical power meter- optical time domain reflectometer (OTDR).

Total Hours : 45

TEXT BOOKS:

1. Gerd Keiser, "Optical Fiber Communication", 3rd Edition, McGraw-Hill International, Singapore, 2000.
2. J. Gowar, "Optical Communication System", Prentice Hall of India, 2001.

REFERENCES:

1. J. Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.
2. D. C. Agrawal , "Fiber Optic Communication", S.Chand & Co Ltd., 2005.
3. Rajiv Ramaswami and Kumar Sivarajan, "Optical Networks: A practical perspective", 2nd Edition, Morgan Kaufmann, 2001.

OUTCOMES:

On completion of this course the students will understand

- The basic elements of optical fiber transmission link, fiber modes and structures.
- The different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
- Design optimization of SM fiber, RI profile and cut - off wave length.
- The various optical sources, fiber amplifiers and receivers.
- The fiber slicing and connectors, noise effects on system performance, operational principles of WDM and solutions.

ECB3214	VLSI LAB	L T P C 0 0 3 1

OBJECTIVES:

- To study Simulation and synthesis tools.
- To simulate various combinational and sequential circuits using VHDL.
- To synthesize and verify digital circuits using FPGA.
- To interface DC motor, stepper motor and LEDs with FPGA kits.

LIST OF EXPERIMENTS:

1. Study of Simulation tools.
2. Study of Synthesis tools.
3. Study of development tool for FPGAs for schematic entry and VHDL.
4. Design of traffic light controller using VHDL and above tools.
5. Design and simulation of parallel adder to add/ subtract two 8 bits numbers.
6. Simulation and synthesis of VHDL files for multiplying two 8 bit numbers.
7. Simulation and synthesis of VHDL files for Shift register and Counters.
8. Verification of on board LEDs and switches of FPGA using VHDL codes.
9. Testing the traffic controller design developed in SI. NO.5 on the FPGA board.
10. Design of Real time Clock (2 digits, 7 segment LED displays each for Hour, Minute and Sec) and verification in the FPGA board.
11. Stepper motor and DC motor control using FPGA.

OUTCOMES:

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

- Simulation and synthesis of programs for various digital applications
- Design verification using FPGA

ECB3215	MICROWAVE AND OPTICAL COMMUNICATIONLAB	L T P C 0 0 3 1

OBJECTIVES:

- To study the characteristics of various microwave and optical sources.
- To determine S - matrices of various passive microwave components.
- To find the gain and radiation pattern of various microwave antennas.
- To measure various microwave parameters using network analyzer.

LIST OF EXPERIMENTS:

1. Characteristics of Gunn diode Oscillator.
2. Characteristics of Reflex Klystron.
3. Microwave Power Measurement.
4. Characteristics of Directional Coupler and Magic Tee.
5. Determine of guide wavelength, frequency measurement.
6. VSWR measurements.
7. Determination of impedance of microwave components.
8. Radiation Patten of Horns, parabolic antenna.
9. Measurement of Dielectric constants.
10. Measurement of Numerical aperture of optical fiber.
11. Measurement of losses in optical fiber.
12. Digital Transmission through fiber optic link.
13. Characteristics of LED.
14. Characteristics of LASER Diode.
15. Characteristics of APD
16. Characteristics of Photo Diode
17. Measurement of Link Characteristics using OTDR

OUTCOME:

The students will be able

- to design and test a microwave system and optical communication system for any given specification.

SEMESTER VII

ECB4101 CELLULAR MOBILE COMMUNICATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce the concepts of mobile communication
- To know about the various modulation techniques, propagation methods, coding and multi access techniques used in the mobile communication.
- To know various wireless network systems and standards.

MODULE I CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS **8**

Current wireless systems, Cellular Concept: Frequency reuse, channel assignment, hand-off, Interference and system capacity, trunking and grade of service, Improving coverage and capacity in Cellular systems.

MODULE II MOBILE RADIO PROPAGATION **8**

Free space propagation model, Two ray model , Knife edge diffraction model, path loss models , Elementary treatment of Outdoor and Indoor propagation models, Impulse model, Small scale Multipath measurements, parameters of Mobile multipath channels.

MODULE III MODULATION TECHNIQUES **7**

Modulation Techniques: BPSK, DPSK - p/4 QPSK - OQPSK, Minimum Shift Keying, Gaussian MSK, M-ary FSK, Orthogonal Frequency Division Multiplexing.

MODULE IV EQUALIZATION **7**

Equalization: Survey of Equalization Techniques, Linear Equalization, Non-linear Equalization, Diversity Techniques, RAKE receiver.

MODULE V CODING AND MULTIPLE ACCESS TECHNIQUES **7**

Coding: Vocoders, Linear Predictive Coders,. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA.

MODULE VI WIRELESS SYSTEMS AND STANDARDS **8**

Second Generation and Third Generation Wireless Networks and Standards, WLL, Blue Tooth. AMPS, GSM, IS-95 and DECT.

Total Hours :45

TEXT BOOK:

1. T.S.Rappaport, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.

REFERENCES:

1. R. Blake, "Wireless Communication Technology", Thomson Delmar, 2003.
2. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications", 2nd Edition, McGraw-Hill International, 1998.
3. Feher K. "Wireless Digital Communications", Pearson education.,1995.
4. Schiller, "Mobile Communication", Pearson Education Asia Ltd., 2000.

OUTCOMES:

The students will have knowledge about

- Mobile Communication fundamentals and physical layer issues.
- Various Multiple Access and modulation techniques.
- Wireless systems and standards.

ECB4102 EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To providing 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 COMPUTING PLATFORM 7

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

MODULE II COMPUTING PLATFORM AND DESIGN ANALYSIS 9

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

MODULE III REAL TIME OPERATING SYSTEMS (RTOS) 7

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

MODULE IV DISTRIBUTED EMBEDDED SYSTEMS 8

Communication buses - Shared memory communication - accelerated design- networks for embedded systems - networks based design - Internet enabled systems.

MODULE V EMBEDDED SOFTWARE DEVELOPMENT TOOLS 7

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

MODULE VI SOFTWARE TECHNOLOGY FOR EMBEDDED SYSTEMS 7

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

Total Hours:45

TEXT BOOKS:

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

REFERENCES:

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

OUTCOMES:

On completion of this course the student will be able to

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

ECB4103 COMPUTER NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To know about the concepts of Data communication and networks
- To impart knowledge on ISO-OSI model and different protocols.
- To understand different switching techniques.

MODULE I DATA COMMUNICATIONS 7

Components - Components and Categories - types of Connections - Topologies-Protocols and Standards - ISO / OSI model -Modems - RS232 Interfacing sequences.

MODULE II DATA LINK LAYER 10

Error - detection and correction - Parity - LRC - CRC - Hamming code - Flow Control and Error control: stop and wait - go back N ARQ - selective repeat ARQ- sliding window techniques LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5

MODULE III NETWORK LAYER 8

Packet Switching and Datagram approach - IP addressing methods - Sub netting - Routing - Distance Vector Routing - Link State Routing - Routers.

MODULE IV TRANSPORT LAYER 7

Duties of transport layer - Multiplexing - Demultiplexing - Sockets - User Datagram Protocol (UDP) - Transmission Control Protocol (TCP) - Congestion Control - Quality of services (QOS).

MODULE V APPLICATION LAYER 7

Domain Name Space(DNS)-SMTP,FDP,HTTP,WWW-Security - Cryptography.

MODULE VI PRACTICAL PERSPECTIVE OF COMPUTER NETWORKS: GIGABIT ETHERNET 6

Network Services, Network Service Primitives - Gigabit Ethernet reference model, Media access control sublayer group, LLC/MAC Service Primitives, Physical sublayer group.

Total Hours:45

TEXT BOOKS :

1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

2. David G. Cunningham & William G. Lane, "Gigabit Ethernet Networking", Macmillan Technology Series, Macmillan Technical Publishing,1999.

REFERENCES:

1. James .F. Kurouse& W. Rouse, "Computer Networking: A Topdown Approach Featuring", 2nd Edition, Pearson Education,2004.

2. Larry L.Peterson& Peter S. Davie, "Computer Networks", 3rd Edition, Harcourt Asia Pvt. Ltd., 2007.

3. Andrew S. Tanenbaum, "Computer Networks", 4th Edition, PHI, 2003.

4. William Stallings, "Data and Computer Communication", 6th Edition, Pearson Education, 2000.

OUTCOMES:

On completion of this course the students will understand

- The architecture, recent advances, current practices and trends in computer network.
- To analyze the networking protocols.
- The contemporary issues in computer networks.

ECB4104 MINI PROJECT - DESIGN & IMPLEMENTATION

L	T	P	C
0	0	3	1

OBJECTIVES:

To design, implement and test various electronic circuits like regulated power supply, Transmitter, Timer, MODEMs, Microprocessor & DSP based systems leading to the implementation of a Mini project.

OUTCOMES:

The student will be able to design, implement and test/trouble shoot simple electronic systems.

ECB4105	NETWORKS LAB	L T P C 0 0 3 1

OBJECTIVES:

- To analyze the communication networks characteristics.
- To analyze various MAC and Routing layer Protocols.

LIST OF EXPERIMENTS

1. Performance Study of ALOHA protocol.
2. Performance Study of CSMA - CD protocol.
3. Study of Token Bus.
4. Study of Token Ring.
5. Study of Stop-and-Wait protocol.
6. Study of Sliding window protocol - Go back N.
7. Distance Vector Routing Protocol.
8. Link State Routing Protocol.
9. Simulation Programme for PC to PC Serial Port (RS-232) Communication.
10. Shared and switched bandwidth utilization in LANs using Hub and switches.
11. Demonstration and performance measurement of routing protocols(R I P , OSPF).
12. WLAN realization and throughput measurement.

OUTCOMES:

On completion of this course the students will understand

- The communication network characteristics.

- Various protocols and its operation.
- Various MAC layer protocols.
- Ethernet LAN and Wireless LAN Protocols.
- Data encryption and decryption algorithms.

ECB4106	EMBEDDED SYSTEMS LAB	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To gain the working knowledge of various embedded tools.
- To develop the various samples program for the target processors like 8051 and PIC microcontroller.

LIST OF EXPERIMENTS

1. Design with 8051/PIC Microcontrollers -Data flash with erase, verify, fusing through ATMEL and INTEL tools -Simple application programs with kit and through assembler.
2. I/O Programming, Timers - with 8051/ PIC Microcontrollers - Assembly and C Programming .
3. Program for seven segments LED Interface - Character based LCD Interface.
4. Interrupts, Serial port programming with 8051/ PIC Microcontrollers - Assembly and C Programming.
5. Program for Analog to Digital conversion (with on chip ADC).
6. Program to rotate the stepper motor in clockwise and anticlockwise direction.
7. Program for simulation of traffic light using C language.
8. Implementation of Real Time Clock.
9. Study one type of Real Time Operating Systems.

OUTCOMES:

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

- program and test the working environment of Keil µvision and MPlab tools.

PROFESSIONAL ELECTIVES - RF COMMUNICATION

ECBX01 RF SYSTEM DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES:

- To know the importance and issues involved in RF design.
- To familiarize with the RF components and design techniques of filters, amplifiers and oscillators.

MODULE I RF ISSUES **6**

Importance of RF design, Electromagnetic Spectrum. Scattering and chain scattering matrices, Generalized scattering matrix, Analysis of two port networks, Smith Chart and applications.

MODULE II RF FILTER DESIGN **8**

Overview, Basic resonator and filter configuration, Special filter realizations, Filter implementations, Coupled filter.

MODULE III ACTIVE RF COMPONENTS & APPLICATIONS **9**

RF diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks, Impedance matching using discrete components, Microstripline matching networks.

MODULE IV RF AMPLIFIER DESIGN **9**

Characteristics, Amplifier power relations, Stability considerations, Constant gain circles, Constant VSWR circles, Low Noise circuits, Broadband , high power and multistage amplifiers.

MODULE V RF OSCILLATOR DESIGN **7**

One port and two port negative resistance oscillators. Oscillator configurations, Oscillator design using large signal measurements.

MODULE VI MIXERS & APPLICATIONS **6**

Basic characteristics of Mixers ;Phase Locked Loops ; RF directional couplers and hybrid couplers ; Detector and demodulator circuits.

Total Hours:45

TEXT BOOKS:

1. Reinhold Ludwig and Powel Bretchko, "RF Circuit Design - Theory and Applications", 1st Edition, Pearson Education Asia , 2001.
2. Mathew M. Radmanesh, "Radio Frequency & Microwave Electronics", 2nd Edition, Pearson Education Asia, 2002.
3. David.M.Pozar, "Microwave Engineering", 3rd Edition, John Wiley and Sons, 2005.

REFERENCES:

1. S.Y.Liao, "Microwave Amplifiers and Oscillators Design", Prentice Hall, New Jersey, 1999.
2. David.M.Pozar, "Microwave Engineering" 3rd Edition, John Wiley and Sons, 2005.
3. Roland E. Best, "Phase - Locked Loops : Design, simulation and applications", 5th Edition, McGraw Hill Publishers, 2003.
4. G.Gonzalez, "Microwave Transistors and Amplifiers: Analysis and Design", Prentice Hall, New Jersey 1999.
5. E.da Silva, Butterworth Heinmann,"High Frequency and Microwave Engineering", Oxford Publications, 2001.

OUTCOMES :

On completion of this course the student will be knowledgeable in

- The importance of RF design and specific issues involved.
- Realization and design of RF circuits.
- Characteristics of RF circuits and applications.

ECBX02 ELECTROMAGNETIC INTERFERENCE & COMPATIBILITY **L T P C 3 0 0 3**

OBJECTIVES:

- To introduce the concepts of electromagnetic interference and electromagnetic interference compatibility
- To study the electromagnetic interference coupling principles and control techniques
- To study electromagnetic compatibility design of PCBs
- To study electromagnetic interference measurements and standards

MODULE I EMI ENVIRONMENT **8**

Concepts of EMI and EMC and definitions - Sources of EMI - Celestial Electromagnetic noise- Lightning discharge-Electrostatic Discharge-Electromagnetic Pulse - Electromagnetic emissions - Noise from relays and Switches - Nonlinearities in Circuits.

MODULE II EMI COUPLING PRINCIPLES **8**

Capacitive coupling - Inductive coupling- Common impedance ground coupling-Ground loop coupling-Transients in power supply lines- Radiation coupling, Conduction coupling-Common - mode and Differential mode interferences-Conducted EM noise on power supply lines.

MODULE III EMI MEASUREMENTS **7**

Open area test site measurements-Measurement precautions - Open -area test site- Anechoic Chamber-TEM Reverberating TEM-GTEM cell - Comparisons.

MODULE IV EMI CONTROL TECHNIQUES **7**

EMC Technology- Grounding-Shielding-Electrical Bonding-Power line filter-CM filter - DM filter- EMI suppression Cables- EMC Connectors -Isolation transformer.

MODULE V EMI / EMC STANDARDS 7

Introduction- Standards for EMI/EMC- MIL-STD-461/462-IEEE/ANSI standard-CISPR/IEC standard- FCC regulations-British standards-VDE standards-Euro norms-Performance standards-some comparisons. 7

MODULE VI EMC DESIGN OF PCBS. 8

PCB Traces Cross Talk, Impedance Control, Power Distribution Decoupling, Zoning, Motherboard Designs and Propagation Delay Performance Models.

Total Hours:45

REFERENCES:

1. V.P.Kodali, "Engineering EMC Principles, Measurements and Technologies", IEEE Press, 1996.
2. Henry W.Ott, "Noise Reduction Techniques in Electronic Systems", John Wiley and Sons, New York,1988.
3. C.R.Paul, "Introduction to Electromagnetic Compatibility", John Wiley and Sons, Inc, 1992
4. Bernhard Keiser, "Principles of Electromagnetic Compatibility", 3rd Edition, Artech house, 1986.

OUTCOMES:

On completion of this course the student will know about:

- EMI Environment.
- EMI Coupling Principles.
- EMI Specification, Standards and Limits.
- EMI Measurements and Control Techniques.
- EMC Design of PCBs.

ECBX03 TELECOMMUNICATION SWITCHING NETWORKS L T P C
3 0 0 3

OBJECTIVES:

To make the student learn:

- The fundamental functions of a telecom switching office, namely, digital

multiplexing, digital switching and digital subscriber access.

- The concepts of Frequency and Time division multiplexing.
- The concepts of space switching, time switching and combination switching.
- The network synchronization and study synchronization issues.
- The ISDN, DSL / ADSL, and fiber optic systems in subscriber loop.
- The statistical modeling of telephone traffic, blocking system characteristics and queuing system characteristics.

MODULE I SPEECH DIGITIZATION AND TRANSMISSION 7

Quantization Noise, Companding, Differential Coding, Vocodors, Pulse Transmission, Line Coding, NRZ and RZ Codes, Manchester Coding, AMI Coding, Walsh Codes, TDM.

MODULE II DIGITAL SWITCHING 8

Switching Functions, Space Division Switching, Time Division Switching -Time Division space switching, Time Division Time Switching, Time multiplexed space switching, Time multiplexed Time Switching, Combination Switching Cross_bar switching-Touch tone dial telephone control of Switching Systems: Call processing functions, common control, stored program control

MODULE III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT 8

Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management.

MODULE IV TELECOMMUNICATION TRAFFIC 7

Introduction , unit of traffic, Congestion traffic measurement, A mathematical model, Lost call systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues.

MODULE V TELEPHONE NETWORKS AND SIGNALING 7

Introduction, Subscriber loops systems, Switching hierarchy, Routing,

Transmission plan, Transmission system, Numbering plans, Signaling techniques, Inchannel signaling, Common channel signaling, Cellular mobile telephony.

MODULE VI DIGITAL NETWORKS **8**

Data Networks: Data transmission in PSTNs, Switching Techniques for data transmission, Data communication architecture, Satellite based Data networks. ISDN: Network and protocol architecture, Transmission channels, User Network interface, Signaling, Numbering & Addressing, ISDN standards. High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop

Total Hours:45

TEXTBOOKS:

1. Bellamy John, "Digital Telephony", 3rd Edition, John Wiley & Sons Inc., 2000.
2. Viswanathan. T., "Telecommunication Switching System and Networks", Prentice Hall of India Ltd., 1994.

REFERENCE:

1. Flood J E, "Telecommunications Switching, Traffic and Networks" 1st Indian reprint, Pearson education Asia, 2001.

OUTCOMES:

On completion of this course the student will understand

- The fundamental functions of a telecom switching office, FDM, TDM.
- Concepts of space switching, time switching and combination switching.
- Network synchronization, network control and its issues.
- ISDN, DSL / ADSL, and fiber optic systems in subscriber loop, Traffic Modeling.

ECBX04 WIRELESS NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To understand the physical and wireless MAC layer for wireless networks
- To gain knowledge in various wireless applications like WAN, WLAN and WPAN.

MODULE I INTRODUCTION TO WIRELESS COMMUNICATION 7

Fundamentals of Wireless Communication Technology, Electromagnetic Spectrum, Radio Propagation Mechanisms, Characteristics of Wireless Channel, Multiple Access Techniques, Coding Techniques for Wireless Communication.

MODULE II WIRELESS LAN 7

Historical overviews of the LAN industry, evolution of the WLAN industry, wireless home networking, IEEE 802.11. The PHY Layer, MAC Layer, wireless ATM.

MODULE III WIRELESS WANS AND MANS 9

Cellular concepts, , cell fundamentals signal to interference ratio calculation, Channel Allocation Algorithms, Handoffs, capacity expansion techniques - cell splitting, use of directional antennas for cell sectoring, micro cell method, overlaid cells, Global System for mobile communication, Data over voice channel, CDMA 2000, GPRS and higher data rates, short messaging service in GPRS

MODULE IV WIRELESS INTERNET 7

Address Mobility, Mobile IP, Route Optimization TCP in Wireless Domain - Traditional TCP, TCP over wireless, Snoop TCP, Indirect TCP, Mobile TCP, Transaction Oriented TCP, Wireless Application Protocol (WAP), WAP Protocol Stack

MODULE V ADHOC WIRELESS NETWORKS 9

Introduction to Adhoc Networks, Issues in Adhoc Networks- Medium Access Scheme, Routing, Multicasting, Transport Layer Protocols, Pricing Scheme, QoS provisioning, Self Organization, Security, Energy management, Scalability,

Deployment Considerations, MAC protocols, Sensor Network Architecture.

MODULE VI RECENT ADVANCES IN WIRELESS NETWORKS 6

Ultra wide Band Radio(UWB) Communication Operation and Issues of UWB, Wireless Fidelity Systems, Service provider Models for WiFi systems, Interoperability of WiFi systems, Optical Wireless Networks.

Total Hours:45

REFERENCES

1. Kaveh Pahlavan, Prashant Krishnamoorthy, "Principles of Wireless Networks,-A unified approach", PHI, New Delhi, 2009.
2. C.Siva Ram Murthy, B S Manoj, "Ad hoc Wireless Networks, Architectures and Protocols", Pearson, 2004.
3. Jochen Schiller, "Mobile Communications", 2nd Edition, Person Education, 2003.
4. X.Wang and H.V.Poor, "Wireless Communication Systems", Pearson education, 2004.
5. M.Mallick, "Mobile and Wireless design essentials", Wiley Publishing Inc. 2003.
6. Nicopolitidis, M.S.Obaidat, G.I. Papadimitria, A.S. Pomportsis, "Wireless Networks", John Wiley & Sons, 2003.

OUTCOMES:

On completion of this course the student will have knowledge on

- Wireless networking concepts.
- Protocols used in wireless communications.
- Understand the architecture and functions of Adhoc and Wireless Sensor Network.
- Formulate data dissemination algorithms for wireless sensor network.

ECBX05 SATELLITE COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To study the satellite orbits.
- To study about the various subsystems and Earth stations.

- To study about the satellite link design.
- To study the multiple access techniques.
- To study the various applications of a satellite.

MODULE I SATELLITE ORBITS 9

Introduction - Frequency Allocations for Satellite Services - Intelsat - U.S.Domsats - Polar Orbiting Satellites - Problems - Kepler's First Law - Kepler's Second Law - Kepler's Third Law - Definitions of Terms for Earth-orbiting Satellites - Orbital Elements - Apogee and Perigee Heights - Orbital Perturbations - Effects of a Nonspherical Earth - Atmospheric Drag - Inclined Orbits - Calendars - Universal Time - Julian Dates - Sidereal Time - The Orbital Plane - The Geocentric-Equatorial Coordinate System - Earth Station Referred to the IJK Frame - The Topocentric-Horizon Co-ordinate System - The Sub-satellite Point - Predicting Satellite Position.

MODULE II GEOSTATIONARY ORBIT & SPACE LINK 10

Introduction - Antenna Look Angels - The Polar Mount Antenna - Limits of Visibility - Near Geostationary Orbits - Earth Eclipse of Satellite - Sun Transit Outage - Launching Orbits - Problems.Equivalent Isotropic Radiated Power - Transmission Losses - Free-Space Transmission - Feeder Losses - Antenna Misalignment Losses - Fixed Atmospheric and Ionospheric Losses - Link Power Budget Equation - System Noise - Antenna Noise - Amplifier Noise Temperature- Amplifiers in Cascade - Noise Factor - Noise Temperature of Absorptive Networks - Overall System Noise Temperature - Carrier-to-Noise Ratio - Uplink-Saturation Flux Density - Input Back Off - The Earth Station HPA - Downlink - Output Back off - Satellite TWTA Output - Effects of Rain - Uplink rain-fade margin - Downlink rain-fade margin - Combined Uplink and Downlink C/N Ratio- Intermodulation Noise

MODULE III EARTH SEGMENT & SPACE SEGMENT 7

Introduction - Receive-Only Home TV Systems - Outdoor Unit - Indoor Unit for Analog (FM) TV - Master Antenna TV System - Community Antenna TV System- Transmit-Receive Earth Stations.Power Supply - Attitude Control - Spinning Satellite Stabilization - Momentum Wheel Stabilization - Station Keeping - Thermal Control - TT&C Subsystem - Transponders - Wideband Receiver - Input Demultiplexer - Power Amplifier - Antenna Subsystem

MODULE IV SATELLITE ACCESS 9

FDMA: Single Access - Preassigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis.

TDMA : Reference Burst; Preamble and Postamble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission. Comparison of uplink Power requirements for FDMA & TDMA. On-board signal Processing for FDMA/TDM operation, Satellite switched TDMA.

CDMA: Direct-Sequence spread spectrum - code signal c(t) - autocorrelation function for c(t) - Acquisition and trackling - Spectrum spreading and dispreading - CDMA throughput - Problems.

MODULE V SATELLITES IN NETWORKS 6

Asynchronous Transfer Mode (ATM)-ATM over satellite-The Internet-Internet layers - TCP Link - Satellite Links and TCP - Enhancing TCP Over Satellite Channels Using Standard Mechanisms (RFC-2488) - Requests for comment-Split TCP connections - Asymmetric Channels.

MODULE VI DBS TELEVISION, SATELLITE MOBILE AND SPECIALIZED SERVICES 4

Introduction - Orbital Spacing - Power Rating and Number of Transponders - Frequencies and Polarization - Transponder Capacity - Bit Rates for Digital Television - MPEG Compression Standards - Forward Error Correction - Home Receiver Outdoor Unit (ODU) - Home Receiver Indoor Unit (IDU) - Downlink Analysis - Uplink -High Definition television. Satellite Mobile Services - VSATs - Radarsat - Global Positioning Satellite System(GPS)-Orbcomm-Iridium.

Total Hours:45

REFERENCES:

1. Dennis Roddy, "Satellite Communications", 3rd Edition, McGraw-Hill Publication, 2001.
2. Timothy Pratt, Charles Bostian, Jeremy Allmuti, "Satellite Communications", John Wiley &Sons (Asia) Pvt. Ltd. 2004.
3. Wilbur L. Pritchard, Henri G.Suyder, Hond Robert A.Nelson, "Satellite Communication Systems Engineering", 2nd Edition, Pearson Education Ltd., 2003.
4. M.Richharia,"Satellite Communication Systems (Design Principles)", 2nd Edition, Macmillan Press Ltd, 2003.

OUTCOMES :

Students completing this course will be able to:

- Identify the fundamentals of orbital mechanics, the characteristics of common orbits used by communications and other satellites
- Understand the systems required by a communications satellite to function and the trade-offs and limitations encountered in the design of a communications satellite system.
- Understand the radio propagation channel for Earth station to satellite and the basics of designing antenna systems to accommodate the needs of a particular satellite system.
- Calculate an accurate link budget for a satellite or other wireless

communications link.

- Understand how analog and digital technologies are used for satellite communications networks and the topologies and applications of those networks.

ECBX06 MULTIMEDIA COMMUNICATION SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the components of Multimedia Communication.
- To introduce the different compression techniques for text, image, audio and video signals.
- To understand VoIP technology.

MODULE I MULTIMEDIA COMPONENTS **4**

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

MODULE II TEXT COMPRESSION **9**

Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding -source encoding-Huffman coding-Adaptive Huffman coding - arithmetic coding - Shannon-Fano coding - LZW algorithms.

MODULE III IMAGE COMPRESSION **8**

DPCM-Adaptive PCM -adaptive predictive coding-linear Predictive coding-code excited LPC - Transform coding - DCT - JPEG.

MODULE IV AUDIO COMPRESSION **8**

Audio compression - A law and μ law companding - Basic sub-band coding - Application to speech coding - G.722.

MODULE V VIDEO COMPRESSION **8**

Video compression principles - H.261 - H.263 - MPEG 1, 2, 4.DVI technology-Packet Video.

MODULE VI VOIP TECHNOLOGY **8**

Basics of IP transport, VoIP challenges, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods-VOIP applicability

Total Hours:45

TEXT BOOKS:

1. K.R. Rao, Z S Bojkovic, D A Milovanovic, "Multimedia Communication System", Standards, and Networks", Pearson Education, 2007.
2. Khalid Sayood, "Introduction to Data Compression", Morgan Kauffman Harcourt India, 2nd Edition, 2000.
3. Yun Q. Shi, Huifang Sun, "Image and video compression for Multimedia Engineering", CRC Press,1999.
4. Marcus goncalves "Voice over IP Networks", McGraw Hill, 1998.

REFERENCES:

1. Fred Halshall "Multimedia communication - applications, networks, protocols and standards", Pearson education, 2007
2. R. Steimnetz, K. Nahrstedt, "Multimedia Computing, Communications and Applications", Pearson Education,2002.
3. Ranjan Parekh, "Principles of Multimedia", TMH 2006

OUTCOMES:

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

- Describe the various components of multimedia communication.
- Analyze different compression techniques.
- Understand the new multimedia technologies such as VoIP.

ECBX07 ADVANCED MICROWAVE SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To analyze transmission-line circuits at RF and microwave frequencies
- Use the Smith chart for solving transmission-line problems
- Perform Scattering parameter analysis of RF networks.
- Describe the operation and analyze the performance of basic microwave components
- Design basic microwave components to meet certain specifications
- To analyze microwave systems and assess the impact of microwave component performances on overall system performance
- Assess qualitatively and quantitatively the role of microwave components in the application areas of MIC, MEMS, wireless systems and UWB systems

MODULE I FIELD ANALYSIS OF TRANSMISSION LINES 9

Microstrip Transmission lines-Low Frequency Solutions-Microstrip Attenuation-High Frequency Properties of Microstrip Lines. Coupled Microstrip Lines. Strip transmission. Coupled Strip Lines. Coplanar Transmission lines.

MODULE II CIRCUIT THEORY FOR WAVEGUIDE SYSTEMS 9

Equivalent voltages and current. Impedance description of waveguide elements and circuits-One port circuit. Foster's Reactance theorem. N-Port Circuits. Two port junctions. Excitation of waveguide-Probe coupling in a rectangular waveguide-Radiation from linear current elements and current loops. Waveguide coupling by apertures-Aperture in a transverse wall-Aperture in broad wall of a waveguide.

MODULE III PERIODIC STRUCTURES 5

Wave analysis of periodic structures. Periodic structures composed of Unsymmetrical two port networks. Terminated periodic structures. Matching of periodic structures. Floquet's Theorem and spatial harmonics.

MODULE IV MICROWAVE FILTERS 4

Microwave filters- Image parameter method. Filter design by insertion loss method. Low pass filter design. Microstrip parallel coupled filter.

MODULE V MICROWAVE SOLID STATE AMPLIFIERS 9

S-parameters - Unilateral design of amplifiers - simultaneous conjugate match.

Bilateral design of amplifiers. Amplifier stability. Conditional and unconditional stability criteria. Amplifier power gain. Constant gain circles. Noise temperature concept. Noise factor and noise figure. Noise temperature for cascaded stages. Constant noise figure circles. Design of single stage microwave amplifiers.

MODULE VI MICROWAVES AND OPTICS 9

Geometrical optics as a limiting case of wave optics. Ray matrices for paraxial ray optics. Gaussian beams. Generation of Gaussian beams at microwave frequencies. The beam waist. Propagation of Gaussian beams in Homogeneous medium. Transformation of Gaussian beams with lenses

Total Hours:45

TEXT BOOK:

1. R.E.Collin, "Foundations of Microwave Engineering", McGraw-Hill, 1992.

REFERENCES:

1. Ramo, Whinnery and Van Duzer , "Fields and Waves in Communication Electronics", 3rd Edition, Wiley, 1997.
2. Pozar, David "Microwave and RF System Design", Wiley, 2001 .
3. W.Tomasi, "Advanced Microwave Communication Systems", 2nd Edition, PHI, 2002.

OUTCOMES:

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

- Describe the various components of multimedia communication.
- Analyze different compression techniques.
- Understand the new multimedia technologies such as VoIP.

ECBX08 RADAR AND NAVIGATIONAL AIDS L T P C
3 0 0 3

OBJECTIVES:

- To understand the Principle of Radar.
- To become familiar with different types of Radars.
- To understand the application of Radar including Navigational systems.

MODULE I INTRODUCTION TO RADAR 9

Basic Radar -The simple form of the Radar Equation- Radar Block Diagram- Radar Frequencies -Applications of Radar - The Origins of Radar.

MODULE II THE RADAR EQUATION 9

PROFESSIONAL ELECTIVES
VLSI & EMBEDDED SYSTEMS

		L	T	P	C
ECBX09	ADVANCED MICROPROCESSOR AND MICROCONTROLLERS	3	0	0	3

OBJECTIVES:

- To familiarize the student with programming knowledge and Design of various advanced Microprocessor and Microcontrollers.

MODULE I MICROPROCESSORS ARCHITECTURE 8

Introduction - Concepts of CISC- RISC-multi-processing - multi-user - multi-tasking - Segmentation- Cache Memory - Pipelining- pipeline hazards.

MODULE II HIGH PERFORMANCE CISC ARCHITECTURE - PENTIUM 7

CPU Architecture - Bus Operations - Pipelining - Branch prediction - floating point unit - Pentium memory management.

MODULE III OPERATING MODES OF PENTIUM AND PROGRAMMING 8

Operating Modes - Multitasking - Exception and Interrupts - Instruction set - addressing modes Basic programming the Pentium Processor.

MODULE IV PIC MICROCONTROLLER 7

CPU Architecture - Instruction set - interrupts - Assembly language programming and introduction to C-Compilers.

MODULE V PIC COMMUNICATION INTERFACE 7

Timers- I2C Interfacing -UART- A/D Converter -PWM and Introduction to C-Compilers.

MODULE VI HIGH PERFORMANCE RISC ARCHITECTURE - ARM 8

Organization of CPU - Bus architecture -Memory management unit - ARM instruction sets -addressing modes.

Total Hours:45

TEXT BOOKS:

1. Daniel Tabak , " Advanced Microprocessors", McGraw Hill.Inc., 1995.

2. B.B.Brey, "The Intel Microprocessor 8086/8088, 80186/80188, 80286, 80386, 80486, PENTIUM, PENTIUM Pro, PII, PIII & IV Architecture, Programming & Interfacing", 7th Edition, Prentice-Hall of India, 2006.

3. John .B.Peatman, "Design with PIC Microcontroller", Prentice hall, 1997. Steave Furber, "ARM system - on - chip architecture", Addison Wesley, 2000.

REFERENCES:

1. K. Ray and K.M.Bhurchandani, "Advanced Microprocessors and Peripherals", TMH, 2nd edition 2006.

2. James L. Antonakos, " The Pentium Microprocessor" Pearson Education , 1997.

3. John Paul Shen, Mikko H.Lipasti, "Modern Processor Design", Tata McGraw Hill, 2006.

OUTCOMES:

On completion of this course the students will be able to

- Understand the functionality of advanced Microprocessors and Microcontrollers.
- Write programs in PENTIUM, PIC and ARM.

ECBX10 REAL TIME OPERATING SYSTEMS **L T P C**
3 0 0 3

OBJECTIVES:

- To provide the students with an understanding of the aspects of the Operating systems and Real-time Operating Systems
- To introduce the unique issues in the design and analysis of computer systems for real-time applications.
- To Introduce Resource management, time-constrained communication, scheduling and imprecise computations, real-time kernels and case studies.

MODULE I REVIEW OF OPERATING SYSTEMS **7**

Basic Principles - System Calls - Files - Processes - Design and Implementation of processes - Communication between processes - Operating System structures - System Boot.

MODULE II PROCESS MANAGEMENT **8**

Process Concept - Process Scheduling - Operation on Process - Co-operating on Process -Inter Process Communication - Synchronization - The Critical-Section Problem.

MODULE III DISTRIBUTED OPERATING SYSTEMS **7**

Topology - Network types - Communication - RPC - Client server model - Distributed file system - Design strategies.

MODULE IV OVERVIEW OF RTOS **8**

RTOS - Tasks and Task states - Semaphores - Shared data - Message queues, Mail boxes and pipes - Critical section - Semaphores - Classical synchronization problem - Deadlocks- Memory management

MODULE V REAL TIME KERNEL **8**

Principles - Design issues - Polled Loop Systems - RTOS Porting to a Target - Comparison and study of various RTOS like QNX - VX works - C Executive - Case studies.

MODULE VI RTOS APPLICATION DOMAINS 7

RTOS for Image Processing - Embedded RTOS for voice over IP - RTOS for fault Tolerant Applications - RTOS for Control Systems.

Total Hours:45

REFERENCES:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 6th Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2003.
2. Herma K., "Real Time Systems - Design for distributed Embedded Applications", Kluwer Academic, 1997.
3. Charles Crowley, "Operating Systems-A Design Oriented approach", McGraw Hill 1997.
4. Raymond J.A.Bhur, Donald L.Bailey, "An Introduction to Real Time Systems", PHI 1999.
5. Mukesh Sighal and N. G. Shi, "Advanced Concepts in Operating System", McGraw Hill 2000.

OUTCOMES:

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

- Understand the Embedded Real Time software that is needed to run embedded systems.
- Illustrate the differences between various types of system software (real-time, information systems, fault tolerant).
- Describe the common types of faults that occur in embedded systems.

ECBX11 DIGITAL VLSI TESTING

L	T	P	C
3	0	0	3

OBJECTIVES:

To Learn

- Different techniques for detection of faults in digital circuits.
- Generation of test vectors for combinational and sequential circuits
- Self testing

MODULE I BASICS OF TESTING **7**

Introduction to Testing - Role of testing - VLSI Realisation process- VLSI Technology Trends Affecting Testing-Types of Testing -ATE -AC and DC parameters testing and yield.

MODULE II FAULT MODELLING AND SIMULATION **8**

Functional Versus Structural Testing-Faults in digital circuits - Modelling of faults- Fault detection - Fault location - Fault dominance - Logic Simulation - Types of simulation

MODULE III TESTING OF COMBINATIONAL CIRCUITS **8**

Combinational logic circuits -test generation, Testable combinational logic circuit design

MODULE IV TESTING OF SEQUENTIAL CIRCUITS **8**

Test generation for sequential circuits - design of testable sequential circuits.

MODULE V DESIGN FOR TESTABILITY **7**

Design for Testability - Ad-hoc design - scan based design.

MODULE VI SELF TESTING **7**

Built-In Self Test - Test pattern generation for BIST - Circular BIST - BIST Architectures 7

Total Hours:45

REFERENCES:

1. M.L. Bushnell and V.D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwer Academic Publishers, 2002.

2. A.L. Crouch, "Design Test for Digital ICs and Embedded Core Systems", Prentice Hall International, 2002.

OUTCOMES:

On completion of the course, students will be knowledgeable in

- Principles of testing digital systems.
- Modelling of faults.
- Design for testability in combinational and sequential circuits.
- Basics of self test.

ECBX12 COMPUTER ARCHITECTURE L T P C
3 0 0 3

OBJECTIVES :

- To understand the basic architecture and operation of a digital computer.
- To study the operation of arithmetic unit including the algorithms & implementation of fixed-point and floating-point arithmetic operations.
- To understand the concept of pipelining.
- To study the hierarchical memory system including cache memories and virtual memory.
- To impart knowledge on I/O devices and standard I/O interfaces.

MODULE I BASIC STRUCTURE OF COMPUTERS 8

Functional units- Basic Operational Concepts, Bus Structures, Software Performance - Memory locations & addresses - Memory operations - Instruction and instruction sequencing - Addressing modes - Assembly language - Basic I/O operations - Stacks and queues.

MODULE II ARITHMETIC OPERATIONS 9

Addition and subtraction of signed numbers - Design of fast adders - Multiplication of positive numbers- Signed operand multiplication and fast multiplication - Integer division - floating point numbers and operations.

MODULE III BASIC PROCESSING UNIT 6

Fundamental concepts - Execution of a complete Instruction - Multiple bus organization - Hardwired control - Microprogrammed control- Nano Programming.

MODULE IV PIPE LINE CONCEPTS 6

Pipelining - Basic concepts - Data hazards - Instruction hazards - Influence on Instruction sets - Data path and control consideration - Superscalar operation.

MODULE V MEMORY SYSTEM 9

Basic concepts - Semiconductor RAMs, ROMs - Speed, size and cost - Associative memory - Cache memories - Performance consideration - Virtual memory- Memory Management requirements - Secondary storage.

MODULE VI I/O ORGANIZATION 7

Accessing I/O devices - Interrupts - Interrupt Priority- Data transfer Schemes- Buses - Interface Circuits - Standard I/O Interfaces (PCI and USB).

Total Hours:45

TEXT BOOKS:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization" 5th Edition, McGraw Hill, 2002.
2. Morris Mano, "Computer System Architecture", 3rd Edition, PHI, 2001.

REFERENCES:

1. William Stallings, "Computer Organization & Architecture - Designing for Performance", 6th Edition, Pearson Education, 2003 reprint.
2. David A.Patterson and John L.Hennessy, "Computer Organization & Design, the hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002 reprint.
3. John P.Hayes, "Computer Architecture & Organization", 3rd Edition, McGraw-Hill, 1998.

OUTCOMES:

On completion of this course the students will understand the

- concepts involved in design, working and internal connections of ALU, CPU and control units.
- design of Memory and its function.
- organization of I/O devices and buses.

ECBX13 ADVANCED DIGITAL SYSTEM DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES:

The students will gain knowledge in the design of asynchronous sequential circuits, fault modeling and simulation

MODULE I ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN 7

Flow Table Reduction -State Assignment - Problem and the Transition Table - Design of ASC - Static and Dynamic Hazards - Essential Hazards -Designing Vending Machine Controller .

MODULE II STATE MACHINE CHARTS 8

SM Chart - derivation of SM Chart- SM chart for Binary Multiplier, Realization of SM Chart.

MODULE III DIGITAL SYSTEM DESIGN USING PLD 8

PROM, EPROM, EEPROM, PLE, Sequential circuit realization using PLEs.

MODULE IV LOGIC CELL ARRAY 8

Logic block, I/O block, programmable interconnect, memory configuration - XC2000 series, XC 3000 series, Logic design using cell array, state machine design using cell array.

MODULE V FAULT MODELING 7

Logical fault model, Fault detection & Redundancy in combinational, sequential circuits, Fault Equivalence and Fault location in Combinational & sequential Circuits. Single stuck fault model, Multiple stuck fault model.

MODULE VI FAULT TESTING 7

Basic issues, Automatic test generator for single stuck fault in combinational circuits, D Algorithm, Path oriented Decision Making Algorithm, ATG systems, Test set compaction

Total Hours:45

REFERENCES:

1. Donald G. Givone,"Digital principles and Design", Tata McGraw Hill 2002.
2. John M Yarbrough, "Digital Logic appns. and Design", Thomson Learning, 2001
3. Charles H. Roth Jr., "Fundamentals of Logic design", Thomson Learning, 2004.
4. Stephen Brown and Zvonk Vranesic,"Fundamentals of Digital Logic with VHDL Design", Tata McGraw Hill, 2002.
5. Navabi.Z. "VHDL Analysis and Modeling of Digital Systems", McGraw Hill,1998.
6. Parag K Lala, "Digital System design using PLD", BS Publications, 2003 .

OUTCOMES:

At the end of the course students will be able to

- design sequential circuits.
- use programmable devices for the design of digital circuits.
- perform fault modeling and testing of digital circuits.

ECBX14 VLSI SIGNAL PROCESSING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn different algorithms used for DSP processors and fundamentals of pipelining and parallel processing on FIR filters.
- To study the concepts of retiming, unfolding, transforms and rank order filters.
- To understand different fast convolution algorithms and pipelining/parallel processing techniques for IIR filters.
- To study different bit level architectures and their complexities.
- To study the general architectures of programmable Digital signal processors.

MODULE I INTRODUCTION TO DSP SYSTEMS 5

Typical DSP algorithms: Convolution, correlation, Digital filters, Adaptive filters,Discrete cosine transform Decimators and Expanders, wavelets and filter banks,DSP application demands and scaled CMOS technologies, Representation of DSP Algorithms.

MODULE II PIPELINING AND PARALLEL PROCESSING 9

Data flow graph representations, loop bound and iteration bound, Algorithms for computing iteration bound: Longest path Matrix algorithm, Iteration bound for multirated data flow graphs Pipelining and parallel processing - Pipelining of FIR digital filters, parallel processing, pipelining and parallel processing for low power.

MODULE III RETIMING, UNFOLDING AND FOLDING 9

Definitions and properties of retiming, an algorithm for unfolding, properties of unfolding, Applications of unfolding: sample period reduction , parallel processing, folding transformation, Register minimization techniques, Register minimization in folded architectures, Folding of multirated systems

MODULE IV FAST CONVOLUTION AND ALGORITHMIC STRENGTH REDUCTION IN FILTERS AND TRANSFORMS 9

Cook Toom algorithm, modified Cook-Took algorithm, parallel FIR filter, 2-parallel fast FIR filter, DCT algorithm architecture transformation, parallel architectures for rank-order filters, odd- even merge- sort architecture, parallel rank-order filters, low power rank order filters.

MODULE V BIT LEVEL ARITHEMATIC ARCHITECTURES 9

Parallel multipliers with sign extension, parallel carry-ripple array multipliers,parallel carry-save multiplier, bit Baugh-Wooley multipliers, parallel multipliers with modified booth recoding, Bit serial multipliers, Bit serial filter design and implementation multipliers using Horner's rule, bit-serial FIR filter, CSD representation, CSD multiplication using Horner's rule for precision improvement.

MODULE VI PROGRAMMABLE DIGITAL SIGNAL PROCESSORS 4

Introduction, evolution of programmable DSP, important features of DSP processors, DSP processors for mobile and wireless communication, processors for multimedia signal processing

Total Hours:45

REFERENCES:

1. Keshab K.Parhi, "VLSI Digital Signal Processing systems, Design and implementation", Wiley, Inter Science, 1999.
2. Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing ", McGraw-Hill, 1994.
3. S.Y. Kung, H.J.White House,T.Kailath,"VLSI and Modern Signal Processing ", Prentice Hall,1985.

OUTCOMES:

On completion of the course, students will

- Understand various algorithms that can be designed and applied on application specific VLSI architecture
- Have knowledge on fast convolution algorithms and high speed multipliers
- Analyze different number representations, arithmetic based binary representations and complexities involved in it.
- Gain minimum knowledge to find solution for any research queries on DSP processors.

ECBX15	ASIC DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

To learn

- The concept of semicustom and programmable ASIC types.
- The fundamentals of digital logic design and the physical features of each ASIC.
- ASIC logic design, partitioning, floor planning, placement, and routing.

MODULE I INTRODUCTION TO CMOS **6**

CMOS transistors- process, CMOS current equation- CMOS inverter characteristics and Design rules.

MODULE II INTRODUCTION TO ASICs **7**

ASIC introduction - advantages- Types of ASICs - Full Custom, Semi custom and programmable ASICs- ASIC Design flow.

MODULE III CMOS LOGIC DESIGN AND ASIC LIBRARY DESIGN **8**

CMOS Combinational Logic Cell - Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance.

MODULE IV PROGRAMMABLE ASICs AND LOGIC CELLS **8**

Anti fuse - static RAM - EPROM and EEPROM technology - PREP benchmarks- Actel ACT - Xilinx LCA -Altera FLEX - Altera MAX.

MODULE V PROGRAMMABLE ASIC INTERCONNECT **8**

Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 - Altera FLEX.

MODULE VI PARTITIONING, FLOOR PLANNING, PLACEMENT & ROUTING **8**

Partitioning methods - floor planning - placement - global routing - detailed routing .

Total Hours:45

REFERENCES:

1. M.J.S .Smith, "Application Specific Integrated Circuits", Addison -Wesley Longman Inc., 1997.
2. Andrew Brown, "VLSI Circuits and Systems in Silicon", McGraw Hill, 1991
3. S.D. Brown, R.J. Francis, J. Rox, Z.G. Vranesic, "Field Programmable Gate Arrays", Kluwer Academic Publishers, 1992.
4. Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing", McGraw Hill, 1994.
5. S. Y. Kung, H. J. White House, T. Kailath, "VLSI and Modern Signal Processing", Prentice Hall, 1985.
6. Jose E. France, Yannis Tsividis, "Design of Analog & Digital VLSI Circuits for Telecommunication and Signal Processing", Prentice Hall, 1994.

OUTCOMES:

On completion of the course, students will be knowledgeable in

- The ASIC Design Flow and its Architecture.
- The Logic Synthesis and Testing methodologies.
- Floor Planning and Physical Design Flows.

ECBX16 RECONFIGURABLE COMPUTING **L T P C**
3 0 0 3

OBJECTIVES:

To learn

- Basic concepts of Reconfigurable computing
- Modeling and programming various reconfigurable systems
- Design and development of Various Reconfigurable architectures.
- Applications of reconfigurable systems.

MODULE I RECONFIGURABLE COMPUTING HARDWARE 9

Device Architecture- The Computational Fabric- Array and Interconnect- Extending Logic-Configuration-Reconfigurable Processing Fabric Architectures- -RPF Integration into Traditional Computing Systems- Reconfigurable Computing Systems - Configuration Architectures- Managing the Reconfiguration Process- Reducing Configuration Transfer Time.

MODULE II PROGRAMMING RECONFIGURABLE SYSTEMS 6

Compute Models and System Architectures- Hardware Compilation Flow- Overview of How C Code Runs on Spatial Hardware- Automatic Compilation- Uses and Variations of C Compilation to Hardware.

MODULE III MAPPING DESIGNS TO RECONFIGURABLE PLATFORMS 9

Technology Mapping- Structural Mapping Algorithms- Integrated Mapping Algorithms- Mapping Algorithms for Heterogeneous Resources- FPGA Placement- Placement Problem- Clustering- Partition-based Placement- Analytic Placement- Datapath Composition- Fundamentals- The Impact of Device Architecture- The Interface to Module Generators- Mapping_Placement- Compaction.

MODULE IV RETIMING AND FAST COMPILATION 7

Retiming: Concepts, Algorithm, and Restrictions- Re-pipelining and C-slow Retiming- Implementations of Retiming- Retiming on Fixed-frequency FPGAs- C-slowing as Multi-threading- Fast Compilation Techniques- Accelerating Classical Techniques- Alternative Algorithms- Effect of Architecture.

MODULE V APPLICATION DEVELOPMENT 8

Implementing Applications with FPGAs- Strengths and Weaknesses of FPGAs- Application Characteristics and Performance- General Implementation Strategies for FPGA-based Systems- Implementing Arithmetic in FPGAs- Instance-specific Design- Partial Evaluation- Distributed Arithmetic- FPGA Implementation of CORDIC Processors- Hardware/Software Partitioning

MODULE VI CASE STUDIES OF FPGA APPLICATIONS 6

SPIHT Image Compression- Automatic Target Recognition Systems- Multi-FPGA Systems: Logic Emulation

Total Hours:45

TEXTBOOK:

1. Scott Hauck and Andr´e DeHon, "Reconfigurable Computing :The Theory And Practice of FPGA-Based Computation". Morgan Kaufmann Publishers, 2008.

REFERENCES:

1. M.Gokhale and P.Graham, "Reconfigurable Computing: Accelerating Computation with Field Programmable Gate Arrays", Springer Publications, 2005

2. C.Bobda," Introduction to Reconfigurable Computing: Architectures, Algorithms and Applications", Springer Publications, 2007.

OUTCOMES:

On completion of the course, students will be knowledgeable in

- Various RC architectures and its characteristics
- FPGA design and programming reconfigurable systems
- Development of reconfigurable systems.

PROFESSIONAL ELECTIVES - SIGNAL PROCESSING

ECBX17 ADVANCED DIGITAL SIGNAL PROCESSING

L	T	P	C
3	0	0	3

OBJECTIVES:

To study

- the use of various transforms in digital signals & systems analysis.
- Spectrum estimation of discrete random signals.
- Optimum filters & adaptive filters.
- Multirate digital signal processing.

MODULE I TRANSFORMS AND THEIR APPLICATIONS **8**

Review of Z Transform, Discrete Fourier Transform, Discrete Time Fourier Transform, Discrete Fourier Series. Introduction to Discrete Wavelet Transform- Haar wavelet . Application of transforms to discrete signals.

MODULE II DISCRETE TIME RANDOM PROCESSES **7**

Deterministic process - Stochastic(random) process - Auto correlation & auto covariance of random processes - Cross correlation of random variables- Ergodic random process - Gaussian random process - Stationary & WSS random process.

MODULE III SPECTRUM ESTIMATION **8**

Power spectrum - Parseval's theorem - Wiener-Khintchine theorem - Spectral factorization - Periodogram - Modified periodograms using Bartlett , Welch, Blackman & Tukey windows - AR , MA , ARMA model based spectral estimation- Yule-Walker Equations - Durbin's algorithm.

MODULE IV SIGNAL MODELING AND OPTIMUM FILTERS **7**

Least square method model - Prony's pole-zero model - Prony's all pole model- Levinson-Durbin's recursion - Lattice filters - Forward & backward linear prediction filters.

MODULE V ADAPTIVE FILTERS **8**

FIR adaptive filters - Steepest descent method - Widrow-Hoff LMS algorithm - Normalized LMS method - Adaptive channel equalization - Adaptive noise cancellation - IIR adaptive filters - RLS filters.

MODULE VI MULTIRATE DIGITAL SIGNAL PROCESSING 7

Need for multirate sampling - Decimation - Interpolation - Poly-phase filters - Multistage implementation -Phase shifters - Sub-band coders - Trans-multiplexers - Quadrature mirror filters.

Total Hours : 45

REFERENCES:

1. Monson H.Hayes," Statistical digital signal processing and modeling", John-Wiley & Sons, 2005.
2. John G.Proakis, Dimitris G.Maolakis, "DSP principles, algorithms & applications", 4th Edition, Pearson Education, 2007.

OUTCOMES:

The students will be able to:

- Estimate the power spectrum of signals
- Design & analyze digital filtes based on signal modeling.

ECXB18 IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:

To study

- the concepts of image processing and related transforms.
- the image processing techniques for enhancement, restoration and compression.

MODULE I DIGITAL IMAGE FUNDAMENTALS 8

Components of Image Processing System. , Elements of Visual Perception, MTF of Visual System, Image Sensing and Acquisition, Image formation model, Image Sampling & Quantization Spatial and Gray Level Resolution, Basic Relationships between Pixels. Statistical parameters, Measures and their significance, Mean, standard deviation, variance, SNR, PSNR.

MODULE II IMAGE ENHANCEMENT 7

Enhancement in Spatial Domain: basic gray level transformations, histogram processing, equalization, Arithmetic and logical operations between images, Basics of spatial filtering, smoothening and sharpening spatial filters. Image Enhancement in frequency Domain: smoothening and sharpening frequency domain filters. Fundamental of color image processing: color models, RGB, CMY, YIQ, HIS. Pseudo Color Image processing: Intensity filtering, gray level to color transformation, Basics of full color image processing.

MODULE III IMAGE TRANSFORMS 7

2D-DFT, FFT, DCT, the KL Transform, Walsh/Hadamard Transform, Haar Transform.

MODULE IV IMAGE CODING AND COMPRESSION 7

Image Coding Fundamentals, Image Compression Model, fundamentals-redundancy: coding, interpixel, psychovisual, fidelity criteria, elements of information theory. Error Free Compression - variable length, bit plane, Lossless Predictive, Lossy Compression- Lossy Predictive. Fundamentals of JPEG, MPEG, fractals.

MODULE V IMAGE ANALYSIS 7

Edge detection, spatial feature and boundary extraction, boundary representation by chain codes and B splines, Hough Transform. Morphological Image Processing: Dilation, Erosion, Opening, Closing on Binary Images, Segmentation: Point, line. Edge detection, Boundary detection and Thersholding.

MODULE VI IMAGE RESTORATION AND IMAGE PROCESSING APPLICATIONS 9

Image Degradation Mode, Noise Models, and Restoration in Presence c Noise in spatial Domain, Linear Filtering, Applications: Character Recognition, Fingerprint Recognition, Remote Sensing. Applications using different Imaging modalities such as acoustic Imaging, Medical imaging, electron microscopy etc.

Total Hours:45

TEXT BOOKS:

1. Gonzalez and Woods, "Digital Image Processing", Pearson Education, 2009.
2. Arthur Weeks Jr., "Fundamentals of Digital Image Processing", PHI, 2006.

REFERENCES

1. A. K. Jain, "Fundamentals of Digital Image Processing"; PHI, 2006
2. Pratt William, "Digital Image Processing", John Wiley & Sons, 2007.

OUTCOMES:

On completion of this course the student will be knowledgeable in

- Mathematical representation of images and digital image processing methods.
- Enhancing and restoring the images in time and frequency domains.
- Lossy and lossless compression of digital images.

ECBX19 DSP ARCHITECTURE AND PROGRAMMING **L T P C**
3 0 0 3

OBJECTIVES:

- To know the importance of Digital signal-processing system.
- To understand the basic architectural features of DSP processors.
- To analyze and design DSP Systems using MATLAB

MODULE I INTRODUCTION TO DIGITAL SIGNAL PROCESSING 6

Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences, Discrete Fourier Transform(DFT) and Fast Fourier Transform(FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB,DSP using MATLAB.

MODULE II COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS 8

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter

MODULE III ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES 9

Basic Architectural features, DSP computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed issues Features for External interfacing.

MODULE IV EXECUTION CONTROL AND PIPELINING 9

Hardware looping, Interrupts, Stacks, Relative Branch Support, Pipelining and performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline programming models.

MODULE V PROGRAMMABLE DIGITAL SIGNAL PROCESSORS 7

Commercial Digital signal-processing Devices, TMS320C54XX DSP: Data Addressing mode, Memory space, Program Control, Instructions and Programming, On-Chip peripherals, Interrupts, Pipeline Operation.

MODULE VI IMPLEMENTATION OF BASIC DSP ALGORITHMS 6

The Q-notation, FIR Filters, IIR Filters, interpolation Filters, Decimation filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

Total Hours:45

TEXT BOOKS:

1. B. Venkataramani, M. Bhaskar "Digital Signal Processors: Architecture, Programming and Applications", Tata McGraw-Hill Education, 2002
2. Sen-Maw Kuo, Woon-Seng Gan,"Digital signal processors architectures, implementations, and applications", Pearson Prentice Hall, 2005 .

REFERENCES:

1. Alan S. Willsky, Ian T. Young, "Signals and systems", Prentice-Hall, 2002.
2. Alan V. Oppenheim ,"Discrete-Time Signal Processing", Pearson Education India, 2006.

OUTCOMES:

On completion of this course the student will be knowledgeable in

- The architectural features of DSP processors.
- analysis and design DSP Systems using MATLAB.

ECBX12 COMPUTER ARCHITECTURE L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic architecture and operation of a digital computer.
- To study the operation of arithmetic unit including the algorithms & implementation of fixed-point and floating-point arithmetic operations.
- To understand the concept of pipelining.
- To study the hierarchical memory system including cache memories and virtual memory.
- To impart knowledge on I/O devices and standard I/O interfaces.

MODULE I BASIC STRUCTURE OF COMPUTERS 8

Functional units- Basic Operational Concepts, Bus Structures, Software Performance - Memory locations & addresses - Memory operations - Instruction and instruction sequencing - Addressing modes - Assembly language - Basic I/O operations - Stacks and queues.

MODULE II ARITHMETIC 9

Addition and subtraction of signed numbers - Design of fast adders - Multiplication of positive numbers- Signed operand multiplication and fast multiplication - Integer division - floating point numbers and operations.

MODULE III BASIC PROCESSING UNIT 6

Fundamental concepts - Execution of a complete Instruction - Multiple bus organization - Hardwired control - Micro programmed control- Nano Programming.

MODULE IV PIPE LINE CONCEPTS 6

Pipelining - Basic concepts - Data hazards - Instruction hazards - Influence on Instruction sets - Data path and control consideration - Superscalar operation.

MODULE V MEMORY SYSTEM 9

Basic concepts - Semiconductor RAMs, ROMs - Speed, size and cost - Associative memory - Cache memories - Performance consideration - Virtual memory- Memory Management requirements - Secondary storage.

MODULE VI I/O ORGANIZATION **7**

Accessing I/O devices - Interrupts - Interrupt Priority- Data transfer Schemes- Buses - Interface Circuits - Standard I/O Interfaces (PCI and USB).

Total Hours:45

TEXT BOOKS:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", 5th Edition, McGraw Hill, 2002.
2. Morris Mano, "Computer System Architecture", 3rd Edition, PHI, 2001.

REFERENCES:

1. William Stallings, "Computer Organization & Architecture - Designing for Performance", 6th Edition., Pearson Education, 2003..
2. David A.Patterson and John L.Hennessy, "Computer Organization & Design, the hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002.
3. John P.Hayes, "Computer Architecture & Organization", 3rd Edition, McGraw-Hill, 1998.

OUTCOMES:

On completion of this course the student will understand the

- Concepts involved in design, working and internal connections of ALU, CPU and control units.
- Design of Memory and its Function.
- Organization of I/O devices and buses.

ECBX20 BIOMEDICAL SIGNAL PROCESSING

L	T	P	C
3	0	0	3

OBJECTIVES:

- The methods of recording various bio-potentials.
- The processing techniques of biomedical signals and parameter detection.
- The recent techniques in modern hospital.

MODULE I INTRODUCTION TO BIOMEDICAL SIGNALS 6

The origin of Bio-potentials-Bio-potential Electrodes-Biological amplifiers-ECG, EEG, EMG, PCG, EOG- Lead systems and Recording Methods- Typical waveforms and signal characteristics.

MODULE II PROCESSING OF BIOMEDICAL SIGNAL 8

Review of linear systems -Time Frequency Analysis of biomedical signals-Processing of Random & Stochastic signals - spectral estimation - Properties and effects of noise in biomedical instruments - Filtering in biomedical instruments- -Modeling of Biomedical signals - Detection of biomedical signals in noise.

MODULE III ANALYSIS OF ECG 9

ECG parameters estimation-Multi-Scale analysis for parameter estimation of ECG waveforms-Arrhythmia Analysis Monitoring-Continuous ECG recording-Direct data compression techniques- Direct ECG data compression techniques- Transformation compression techniques-MATLAB Simulation of analyzing ECG.

MODULE IV NEUROLOGICAL APPLICATIONS 9

EEG rhythms & waveform - categorization of EEG activity - recording techniques - EEG applications-Epilepsy-sleep disorders-brain computer interface-Modeling EEG- linear, stochastic models - Non linear modeling of EEG - artifacts in EEG & their characteristics and processing - Model based spectral analysis - EEG segmentation - Joint Time-Frequency analysis - correlation analysis of EEG channels - coherence analysis of EEG channels.

MODULE V BIO-TELEMETRY 7

Telemetry principles- Frequency selection- Bio-telemetry- Radio-pill and Tele-stimulation.

MODULE VI MODERN INDUSTRIAL BIOMEDICAL APPLICATIONS 6

Case Study HL7 Protocol- Patient Monitoring System - Nano medicine and application.

Total Hours:45

TEXT BOOK:

1. D.C.Reddy, "Biomedical Signal Processing: Principles and techniques", Tata McGraw Hill, New Delhi, 2005

REFERENCES:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 1997.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 1997.
3. Leislie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2002.

OUTCOMES:

On completion of the course the students will understand

- The parameters used to describe biomedical signals and their analysis.
- The recent trends such as biotelemetry and modern technology in hospital application.

ECBX14 VLSI SIGNAL PROCESSING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn different algorithms used for DSP processors and fundamentals of pipelining and parallel processing on FIR filters
- To study the concepts of retiming, unfolding, transforms and rank order filters.
- To understand different fast convolution algorithms and pipelining/parallel processing techniques for IIR filters
- To study different bit level architectures and their complexities
- To study the general architectures of programmable Digital signal processors

MODULE I INTRODUCTION TO DSP SYSTEMS 5

Typical DSP algorithms: Convolution, correlation, Digital filters, Adaptive filters, Discrete cosine transform, Decimators and Expanders, wavelets and filter banks, DSP application demands and scaled CMOS technologies, Representation of DSP Algorithms.

MODULE II PIPELINING AND PARALLEL PROCESSING 9

Data flow graph representations, loop bound and iteration bound, Algorithms for computing iteration bound: Longest path Matrix algorithm, Iteration bound for multi-rated data flow graphs Pipelining and parallel processing - Pipelining of FIR digital filters, parallel processing, pipelining and parallel processing for low power.

MODULE III RETIMING, UNFOLDING AND FOLDING 9

Definitions and properties of retiming, an algorithm for unfolding, properties of unfolding, Applications of unfolding :sample period reduction , parallel processing, folding transformation, Register minimization techniques, Register minimization in folded architectures, Folding of multi-rated systems

MODULE IV FAST CONVOLUTION AND ALGORITHMIC STRENGTH REDUCTION IN FILTERS AND TRANSFORMS 9

Cook Toom algorithm, modified Cook-Took algorithm, parallel FIR filter, 2-parallel fast FIR filter, DCT algorithm architecture transformation, parallel architectures for rank-order filters, odd- even merge- sort architecture, parallel rank-order filters, low power rank order filters.

MODULE V BIT LEVEL ARITHEMETIC ARCHITECTURES 9

Parallel multipliers with sign extension, parallel carry-ripple array multipliers, parallel carry-save multiplier, bit Baugh-Wooley multipliers, parallel multipliers with modified booth recoding, Bit serial multipliers, Bit serial filter design and implementation multipliers using Horner's rule, bit-serial FIR filter, CSD representation, CSD multiplication using Horner's rule for precision improvement.

MODULE VI PROGRAMMABLE DIGITAL SIGNAL PROCESSORS 4

Introduction, evolution of programmable DSP, important features of DSP processors, DSP processors for mobile and wireless communication, processors for multimedia signal processing.

Total Hours:45

TEXT BOOKS:

1. Keshab K.Parhi, "VLSI Digital Signal Processing systems, Design and implementation", Wiley Inter Science, 1999.
2. Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing", McGraw-Hill, 1994.
3. S.Y. Kung, H.J. White House, T. Kailath, " VLSI and Modern Signal Processing", Prentice Hall, 1985.

OUTCOMES:

On completion of the course, students will

- Understand various algorithms that can be designed and applied on application specific VLSI architecture
- Have knowledge on fast convolution algorithms and high speed multipliers
- Analyze different number representations, arithmetic based binary representations and complexities involved in it.
- Gain minimum knowledge to find solution for any research queries on DSP processors.

CSBX52 SOFT COMPUTING L T P C
3 0 0 3

OBJECTIVES:

- To learn soft computing algorithms.
- To introduce new ideas of neural networks, fuzzy logic and use of heuristics based on human experience.
- To understand the concepts of Genetic algorithm and its applications.

MODULE I NEURAL NETWORK 7

Introduction - Machine Learning Basics - Fundamental concept - Evolution of Neural Networks - Basic Models of Artificial Neural Networks - Important Terminologies of ANNs - McCulloch-Pitts Neuron - Supervised Learning Network:- Multiple Adaptive Linear Neurons - Back-Propagation Network - Radial Basis Function Network.

MODULE II ARTIFICIAL NEURAL NETWORK- II 7

Associative Memory Networks: Training Algorithms for Pattern Association - Auto associative Memory Network - Hetero associative Memory Network - Bidirectional Associative Memory - Hopfield Networks - Iterative Auto associative Memory Networks - Temporal Associative Memory Network. Unsupervised Learning Networks: Fixed weight Competitive Nets - Kohonen Self-Organizing Feature Maps - Learning Vector Quantization - Counter propagation Networks- Adaptive Resonance Theory Networks - Special Networks.

MODULE III FUZZY SET THEORY 7

Introduction to Classical Sets and Fuzzy sets - Classical Relations and Fuzzy Relations - Tolerance and Equivalence Relations -Membership Functions: Fuzzification - Methods of Membership Value Assignments - Defuzzification - Lambda-Cuts for Fuzzy sets and Fuzzy Relations - Defuzzification Methods.

MODULE IV FUZZY SET THEORY 7

Fuzzy Arithmetic and Fuzzy Measures: Fuzzy Rule Base and Approximate Reasoning: Truth values and Tables in Fuzzy logic - Fuzzy Propositions - Formation of Rules - Decomposition and Aggregation of rules - Fuzzy Reasoning - Fuzzy Inference Systems (FIS) - Fuzzy Decision Making - Fuzzy Logic Control Systems.

MODULE V GENETIC ALGORITHM 8

Introduction - Basic Operators and Terminologies in GAs - Traditional Algorithm vs. Genetic Algorithm - Simple GA - General Genetic Algorithm - The Scheme Theorem - Classification of Genetic Algorithm - Holland Classifier Systems - Genetic Programming.

MODULE VI APPLICATIONS OF SOFT COMPUTING 9

A Fusion Approach of Multispectral Images with SAR Image for Flood Area Analysis - Optimization of Travelling Salesman Problem using Genetic Algorithm Approach - Genetic Algorithm based Internet Search Technique - Soft Computing based Hybrid Fuzzy Controllers - Soft Computing based Rocket Engine - Control.

Total Hours: 45

REFERENCES:

1. S.N. Sivanandan and S.N. Deepa, "Principles of Soft Computing", Wiley India, 2007.
2. S.N.Sivanandam, S.Sumathi and S.N.Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer, 2007.
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004.
5. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", 2nd Edition, Pearson Publications, 2003.

OUTCOMES:

- To obtain the theoretical and practical knowledge for design and development of basic intelligent systems.
- Develop an application using various soft computing algorithms.
- Solving various real world problems using soft computing algorithms.

GENERAL ELECTIVES

GEBX01 DISASTER MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVES:

- To give an exposure to various environmental hazards and disasters: and various concepts and principles to manage 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

- achieve sufficient knowledge on the disaster prevention strategy, early warning system, disaster preparedness, response and human resource development.
- be familiar with the National Policy on Disaster Management.

GEBX02 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.

Total Hours: 45

TEXTBOOKS:

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.

GEBX03 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.

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.

GEBX04 GREEN DESIGN AND SUSTAINABILITY

L	T	P	C
3	0	0	3

OBJECTIVE:

- To impart knowledge to face challenges, the technology poses for water, energy, and climate change by implementing sustainable design.

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 BOOK:

1. Kirby, J., Okeefe, P., and Timber lake, “Sustainable Development”, Earthscan Publication, London, 1995.

REFERENCE:

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 relationship between sustainability and emergence of green building practices.
- address the economic, environmental, and social concerns.

GEBX05 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.

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

GEBX06 APPROPRIATE TECHNOLOGY

L	T	P	C
3	0	0	3

OBJECTIVE:

- To impart students knowledge about the basics and applications of various appropriate technologies in the field of civil engineering.

MODULE I BASICS CONCEPTS **9**

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 **9**

Appropriate Building Materials, Appropriate Energy Saving Techniques, Water Conservation (Indoor), Rain Water Harvesting.

MODULE III WATER, HEALTH AND SANITATION MANAGEMENT **9**

Water Storage: Designing Dams and Pipelines, Appropriate Selection for Sanitation Technique, Sewerage, Communal Health and Waste Water Recycling.

MODULE IV WASTE MANAGEMENT **9**

Types of Waste - Sources - Collections and On-Site Processing -Transferring Stations - Disposal Systems - Recycling.

MODULE V ENERGY EFFICIENT TECHNIQUES **9**

Green building concepts-renewable energy sources- Solar – Steam and wind-Biofuels - Biogas – Electricity.

MODULE VI TECHNOLOGY POLICY **9**

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.

OUTCOME:

- At the end of the course, the students will be able to use suitable technologies for various conditions for sustainable development.

GEBX07 SYSTEM ANALYSIS AND DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic principles of systems engineering
- To understand the systems engineering methodology
- To provide a systems viewpoint

MODULE I INTERDICTION TO SYSTEMS ENGINEERING 8

Concept of Systems Engineering – Origin – Systems Approach – Advantages of systems approach – Examples.

The building blocks of modern systems – Systems and environment – Interfaces – Complexity of Modern Systems.

MODULE II SYSTEM DEVELOPMENT PROCESS AND MANAGEMENT 8

System life cycle – the systems engineering method – Role of Testing – Management of system development – Risk Management – Organisation.

MODULE III CONCEPT DEVELOPMENT 8

Need Analysis – Concept Exploration – Performance requirement and validation - Concept selection and validation – systems architecture – Decision making.

MODULE IV ESTABLISHING ENGINEERING SYSTEMS 8

Risk Analysis – Risk Mitigation –System performance Analysis – Simulation Techniques in System Analysis – Validation Methods..

MODULE V DECISION SUPPORT TOOLS IN SYSTEMS ENGINEERING 7

Analytical decision support – Statistical influences on system design – System performance analysis – System Reliability, Availability and Maintainability (RAM) – Analysis of Alternatives.

MODULE VI CASE STUDIES 6

Case studies in Software Systems Engineering – Systems for Product Design - Manufacturing Systems.

Total Hours: 45

REFERENCES:

1. Charles S. Wasson, “System Analysis, Design, and Development: Concepts, Principles, and Practices”, Wiley Series in Systems Engineering and Management, 2006.

2. Kossiakoff Alexander and William N. Sweet A, “Systems Engineering: Principles And Practice”, Wiley Student Edition, 2009.

OUTCOMES:

At the end of the course the student will have the

- ability to have systems of view of problems and issues at hand.
- ability to comprehend systems in their totality and specific.
- ability to design, build and evaluate simple systems for industrial requirement.
- ability to analyze systems and strengthen them for performance enhancement.

GEBX08 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.

Total Hours: 45

TEXTBOOKS:

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.

OUTCOME:

- The student will be able to realize the value of products, processes and implement value analysis to achieve productivity improvement.

GEBX09 OPTIMIZATION TECHNIQUES

L	T	P	C
3	0	0	3

OBJECTIVES:

- Introduce methods of optimization to engineering students, including linear programming, network flow algorithms, integer programming, interior point methods, quadratic programming, nonlinear programming, and heuristic methods.
- The goal is to maintain a balance between theory, numerical computation, problem setup for solution by optimization techniques, and applications to engineering systems.

MODULE I INTRODUCTION **7**

Overview of Optimization techniques for Civil Engineering Problems - Introduction to methods of optimization - Classification of Optimization problems - optimality and convexity - General optimization algorithm - necessary and sufficient conditions for optimality.

MODULE II LINEAR PROGRAMMING **8**

Introduction to linear programming - a geometric perspective - Standard form in linear programming; basic solutions; fundamental theorem of linear programming - Simplex Algorithm for Solving Linear Programs - Duality; complementary slackness; economic interpretation of the dual;

MODULE III DYNAMIC PROGRAMMING **8**

Sequential optimization; Representation of multistage decision process; Types of multistage decision problems; Concept of sub optimization and the principle of optimality; Recursive equations – Forward and backward recursions; Computational procedure in dynamic programming (DP); Discrete versus continuous dynamic programming; Multiple state variables; curse of dimensionality in DP.

MODULE IV APPLICATIONS **8**

Regression modeling in engineering; industrial blending problems; dynamic optimal control of engineering systems; optimal estimation in environmental engineering - Water resources; production planning in industrial engineering; transportation problem - Heuristic optimization methods: genetic algorithms;

ecological engineering application; Minimum cost network flow algorithms; out-of-kilter method; primal-dual methods; Dynamic Programming Applications - Water allocation as a sequential process - Capacity expansion and Reservoir operation.

MODULE V INTEGER PROGRAMMING 8

Integer programming - applications in optimal irrigation scheduling in agricultural engineering - Interior point optimization methods - affine scaling method.

MODULE VI NON-LINEAR PROGRAMMING 6

Non-linear programming - Kuhn-Tucker conditions for constrained nonlinear programming problems; necessary and sufficient conditions; quadratic programming; applications.

Total Hours: 45

REFERENCES:

1. Taha, H.A., “Operations Research - An Introduction", 9th Edition, Pearson Prentice Hall, 2011.
2. Winston.W.L. “Operations Research”, 4th Edition, Thomson – Brooks/Cole, 2003.
3. Kreyszig .E., “Advanced Engineering Mathematics“,10th Edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.

OUTCOMES:

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

- basic theoretical principles in optimization.
- formulation of optimization models.
- solution methods in optimization.
- methods of sensitivity analysis and post processing of results.
- applications to a wide range of engineering problems.

GEBX10	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**

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.

GEBX11 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 9

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 9

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 9

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 SOURCING AND TRANSPORTATION 9

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 V INFORMATION TECHNOLOGY IN A SUPPLY CHAIN 9

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.

Total Hours: 45

REFERENCES:

1. Sunil Chopra and Peter Meindl, “Supply Chain Management-Strategy Planning and Operation”, Pearson Education, 4th Indian Reprint, 2010.
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.

GEBX12 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 BOOK:

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.

GEBX13 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 equipments. 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 ENRGY 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.

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.

GEBX14 ROBOTICS L T P C
3 0 0 3

OBJECTIVE:

- To learn about the robots, various components, of Robots, programming and their applications.

MODULE I INTRODUCTION 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.

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.

GEBX15 CYBER SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the basics of Cyber Security Standards and Laws.
- To know the legal, ethical and professional issues in Cyber security.
- To understand Cyber Frauds and Abuse and its Security Measures.
- To know the technological aspects of Cyber Security.

MODULE I FUNDAMENTALS OF CYBER SECURITY 8

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

MODULE II TYPES OF THREATS AND SECURITY MEASURES 8

Security Programs – Non-malicious program Errors – Virus and other Malicious Code – Targeted Malicious Code – Control against program threats – Web Attacks – DOS – Online Security Resources.

MODULE III APPLICATION SECURITY 8

Introduction to Databases - Database Security Requirements – Reliability & Integrity – Multilevel Databases - E-Mail and Internet Security – SQL Injection – Cross Site Scripting – Local File Inclusion – Intrusion Detection Software"s.

MODULE IV PHYSICAL SECURITY AND FORENSICS 7

Firewalls – Benefits and Limitations – Firewall Types - Components – Server Room Design and Temperature Maintenance – Cyber Terrorism and Military Operation Attacks- Introduction to Forensics – Finding evidence on PC and Evidence on System Logs – Windows and Linux logs.

MODULE V CYBER STALKING & FRAUD 7

Introduction – Internet Frauds – Auction Frauds – Identity theft – Phishing – Pharming- Cyber Stalking – Laws about Internet Fraud – Protecting against Cyber Crime – Secure Browser settings – Industry Espionage.

MODULE VI CYBER SECURITY STANDARDS AND POLICIES 7

Introduction– ISO 27001– ISO 27002 - PCI DSS – Compliance - IT ACT – Copyright ACT, Patents. Definition of Policy – Types- User Policies- Administrative Policies – Access control – Developmental Policies.

Total Hours: 45

TEXT BOOK:

1. Chuck Easttom, “Computer Security Fundamentals”, 2nd Edition, Pearson Education, 2012.

REFERENCES:

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

OUTCOMES:

Upon completion of this course, attendees should be able to satisfy the critical need for ensuring Cyber Security in Organizations.

- The students attending this course will be able to analyse the attacks and threats.
- They can also provide solutions with Intrusion Detection systems and Softwares.
- They will have knowledge about Cyber Frauds and Cyber Laws.

GEBX16 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.

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.

GEBX17	INDUSTRIAL SAFETY	L	T	P	C
		3	0	0	3

OBJECTIVE:

- 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.

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.