DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

STUDENT HAND BOOK

2013-2014

K L University
u/s 3 of UGC Act, 1956
Koneru Lakshmaiah Education Foundation

Vaddeswaram – 522 502 (A.P) INDIA

ACADEMIC REGULATIONS FOR B.TECH. PROGRAM

(Applicable for students admitted from 2013-2014)

This document supplements the University's rules and regulations to provide assistance to all B.Tech students. It is required that every individual has to abide by these regulations.

TERMINOLOGY

Academic Council: The Academic Council is the highest academic body of the University and is responsible for the maintenance of standards of instruction, education and examination within the University. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises of two consecutive semesters i.e., Even and Odd semester.

Audited Course: It is a course of study which neither has evaluation component nor a grade.

Backlog Course: A course is considered to be a backlog course if the student has obtained a failure grade (F).

Basic Sciences : The courses of foundational nature in the areas of Mathematics, Physics, Chemistry, Biology etc., are offered in this category.

Betterment : Betterment is a way that contributes towards improving the students' grade in any course(s). It can be done by either (a) re-appearing or (b) re-registering for the course.

Board of Studies : Board of Studies (BOS) is an authority as defined in UGC regulations, constituted by Vice Chancellor for each of the department separately. They are responsible for curriculum design and update in respect of all the programs offered by a department.

Branch of Study: It is a branch of knowledge, an area of study or a specific program (like Civil Engineering, Mechanical Engineering, Electrical and Electronics Engineering etc.)

Certificate course : It is a course that makes a student gain hands-on expertise and skills required for holistic development. It is a mandatory, non-credited course for the award of degree.

Change of Branch : Change of branch means transfer from one's branch of study to other.

Compulsory course : Course required to be undertaken for the award of the degree as per the program.

Course : A course is a subject offered by the University for learning in a particular semester.

Course Handout : Course Handout is a document, which gives complete plan of the course. It contains the details of the course viz. Course title, Course code, Pre-requisite, Credit structure, team of instructors, Course objectives, Course rationale, Course Outcomes and the relevant syllabus, textbook(s) and reference books, Course delivery plan and session plan, evaluation method, chamber consultation hour, course notices and other course related aspects. In essence, course handout is an agreement between students (learners) and the instructor.

Course Outcomes : The essential skills that need to be acquired by every student through a course.

Credit : A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One

credit is equivalent to one lecture hour per week or two hours per week of tutorials/ self-learning/ practical/ field work during a semester.

Credit point : It is the product of grade point and number of credits for a course.

Credit Transfer : The procedure of granting credit(s) to a student for course(s) undertaken at another institution.

Cumulative Grade Point Average (CGPA) : It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum : Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Degree : A student who fulfills all the Program requirements is eligible to receive a degree.

Degree with Specialization : A student who fulfills all the Program requirements of her/his discipline and successfully completes a specified set of Professional elective courses in a specialized area is eligible to receive a degree with specialization.

Department : An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff and other resources.

Detention in a course : Student who does not obtain minimum prescribed marks in continuous in-semester evaluation and /or minimum prescribed attendance in a course shall be detained in that particular course.

Dropping from the Semester : A student who doesn't want to register for the semester should do so in writing in a prescribed format before commencement of the semester.

Elective Course : A course that can be chosen from a set of courses. An elective can be Professional Elective, Open Elective, Management Elective and Humanities Elective.

Engineering Sciences : The courses belonging to basic evolutionary aspects of engineering from Mechanical Sciences, Electrical Sciences and Computing like Engineering Mechanics, Data structures, Network Theory, Signal Analysis etc...

Evaluation : Evaluation is the process of judging the academic work done by the student in her/his courses. It is done through a combination of continuous in-semester assessment and semester end examinations.

Grade : It is an index of the performance of the students in a said course. Grades are denoted by alphabets.

Grade Point : It is a numerical weight allotted to each letter grade on a 10 - point scale.

Honors Degree : A student who fulfills the entire Program requirements of her/his discipline and successfully completes a specified set of additional courses within the same program is eligible to receive an Honors degree.

Humanities Elective : A course offered in the area of Liberal Arts.

Industrial Training : Training program undergone by the student as per the academic requirement in any company/firm. It is a credited course.

Industrial Visit : Visit to a company/firm as per the academic requirement.

In-Semester Evaluation : Summative assessments used to evaluate student learning, acquired skills, and academic attainment during a course.

Make-up Test : An additional test scheduled on a date other than the originally scheduled date.

Management elective: A course that develops managerial skills and inculcates entrepreneurial skills.

Mini project : Mini Project is a credit-based course that a student has to undergo during his/her academic term, which involves the student to explore in a discipline belonging to their research interest within their program area.

Minor Degree : A student who fulfills all the Program requirements of her/his discipline and successfully completes a specified set of courses from another discipline is eligible to receive a minor degree in that discipline.

Multi- Section Course : Course taught for more than one section.

Open Elective : This is a course of interdisciplinary nature. It is offered across the University for all programs.

Over loading : Registering for more number of credits than normally prescribed by the Program in a semester.

Practice School : It is a part of the total program and takes one full semester in a professional location, where the students and the faculty get involved in finding solutions to real-world problems. A student can choose Project/Practice School during his/her 7^{th} or 8^{th} semester of his/her Academic Year to meet the final requirements for a degree.

Pre-requisite : A course, the knowledge of which is required for registration into higher level course.

Professional Core : The courses that are essential constituents of each engineering discipline are categorized as Professional Core courses for that discipline.

Professional Elective : A course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program : A set of courses offered by the Department. A student can opt and complete the stipulated minimum credits to qualify for the award of a degree in that Program.

Program Educational Objectives : The broad career, professional, personal goals that every student will achieve through a strategic and sequential action plan.

Project : Course that a student has to undergo during his/her final year which involves the student to undertake a research or design, which is carefully planned to achieve a particular aim. It is a credit based course.

Project based laboratory : Project Based Laboratory is a student-centric learning methodology that involve students in design, problem-solving, decision making, and investigative activities; gives students the opportunity to work in teams, over extended periods of time; and culminate in realistic products or presentations

Re-Appearing : A student can reappear only in the semester end examination for the Theory component of a course, subject to the regulations contained herein.

Registration : Process of enrolling into a set of courses in a semester/ term of the Program.

Re-Registering : A student desiring to repeat a course is permitted to do so, subject to the regulations contained herein.

Semester : It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days including examination and preparation holidays. The odd Semester starts normally in July and even semester in December.

Semester End Examinations : It is an examination conducted at the end of a course of study.

Single Section Course : Course taught for a single section.

Social Service : An activity designed to promote *social* awareness and generate well-being; to improve the life and living conditions of the society.

Student Outcomes : The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

Substitution of Elective course : Replacing an elective course with another elective course as opted by the student.

Summer term : The term during which courses are offered from May to July. Summer term is not a student right and will be offered at the discretion of the University.

Term Paper : A 'term paper' is a research report written by students that evolves their course based knowledge, accounting for a grade. Term paper is a written original research work discussing a topic in detail. It is a credit based course.

Under-loading : Registering for lesser number of credits than normally prescribed by the Program in a semester.

Withdraw from a Course : Withdrawing from a Course means that a student can drop from a course within the first two weeks of the odd or even Semester (deadlines are different for summer sessions). However s/he can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

Degrees:

A student enrolling into the B.Tech Programs offered by various departments are eligible for the following degrees:

a) **B.Tech degree** in the respective departments : A general degree, obtained by taking courses offered by the department, and Five Professional Electives ; within from various Groups offered by the department, and taking up a Practice School / Project in his/ her chosen area within the domain of the department.

b) **B.Tech degree with Specialization** in domains: A degree, obtained by taking courses offered by the department, and taking the Five Professional Electives chosen from within the Specialized Streams offered by the department, and along with it taking up Practice School / Project preferably falling in the domain of the chosen Specialization only.

c) **B.Tech Honors Degree:** This is a flexibility offered only for the elite students of the Program, who opts for it and take up additional courses that foster their domain knowledge which are over and above the courses minimum required for any student to get a regular B.Tech degree. This degree will also be offered only within a duration of 4 years, and in between such students should not have any

discontinuities in terms of Re-registrations, back logs, failures, detentions etc in any one the courses registered by them.

d) **Dual Degree:** A B.Tech student can opt for a dual degree either in M.Tech or M.B.A at the end of 4th Semester. The required courses to be done and the program structure to obtain Dual degree in a minimum period of 5 years will be supplemented by the respective departments. At the end of four years the student will get his normal degree and after successful completion of 5 years the M.Tech./MBA degree will be awarded.

e) **B.Tech degree with a Minor in different discipline:** A student who completes all the B. Tech requirements of one discipline for which he/she is admitted (or took transfer of branch), is awarded with Major degree in that discipline. The University offers flexibility for a student to complete a smaller set of courses from another discipline and awards him/her a minor degree in a different discipline.

RULES AND REGULATIONS

This document supplements the University's rules and regulations to provide assistance to all undergraduate students. It is the responsibility of the student to comply with it, as it is the rule and the requirements of the University for the Conferment of degrees.

1.0 INTRODUCTION

K.L University will confer B. Tech degree to candidates who are admitted to the Bachelor of Technology (B. Tech) Programs and fulfill all the requirements for the award of the degree. The University offers four year full time programmes in specialized engineering disciplines that address the immediate national requirements by providing adequately trained manpower.

2.0 DETAILS OF B.TECH PROGRAMS ON OFFER

2.1 Electronics and Computer Engineering (ECM)

2.2 UG Engineering programs with Specialization

University offers courses for engineering program with specialization that are to be chosen by the students as part of their UG Engineering specialization program of:

a) The University permits a student to register for a minimum 5 specialization elective courses. A student will be awarded Degree with Specialization if she / he complete 5 courses of his choice from a particular stream within the discipline. However he has to do his project preferably in the particular domain of his/her chosen.

b) In situations where a student completes courses of two different specialization streams, he/she will be awarded the degree with specialization (optional) in any one stream of his/her choice, for which they need to make a representation to the concerned HOD at the end of 7th semester.

2.3 UG Engineering programs with a Minor in different discipline

a) A student who completes all the B. Tech requirements of one discipline for which he/she is admitted (or took transfer of branch), is awarded with Major degree in that discipline. The University offers flexibility for a student to complete a smaller set of courses from another discipline and awards him/her a minor degree in a different discipline.
b) For obtaining minor degree the student must complete 5 additional courses from the regular curriculum of his/her desired domain and as stipulated by the relevant BOS.
c) In situations where a student completes courses of two different minor degree programs by overloading himself or by attending summer term programs, he will be awarded with a minor degree in any single stream of his choice. However the courses successfully completed by him will be listed in the transcript.
d) Such students will be awarded only one degree by specifying the minor area they have done (Optional).

2.4 UG Engineering Program with Honors

The Honors programme is for those who wish to do more in their major branch of engineering. It is also recognition of excellence in that field of engineering. Thus, in order to earn the Honors in the major field of engineering, a student has to do 5 extra courses by overloading themselves and earn additional credits through course work in topics related to the major discipline and also maintain a Cumulative Grade Point Average (CGPA) of 8.5 or higher at the levels of Entry & Exit.

A student having a CGPA of 8.5 or higher at the end of 4^{th} semester can start taking additional course towards the Honors' programme. However if the aspirants are more than 10% in each programme opportunity will be provided on merit basis to the top 10%. Extra 5 courses done in specified focused areas will thus lead to earning an Honor in one's own discipline.

Starting from the fifth semester, students who have opted for Honors are permitted to take one or two courses in every semester, in addition to the prescribed courses for their degree and as mentioned earlier, it is subjected to offering of the course by the University. A student has to pre-register for the course, which she/he intends to take towards the end of the semester and seats will be allotted based on the academic performance of the student towards the basic requirement of his/her, degree. A student has to enter this extra course too in the course registration form, when permitted. One should note that there is no separate registration for Honors.

In any semester, a student cannot register for only those courses which form part of her/his additional learning component. There should at least be one course component that is specified as the minimum requirement of the degree. Moreover, a student cannot overstay in the programme once the minimum requirements prescribed for the degree are completed.

3.0 ELIGIBILITY CRITERIA FOR REGISTERING INTO UG ENGINEERING PROGRAMS

Admission to the University is open to qualified young men and women. Candidates seeking admission to the first semester of the eight semesters B. Tech. Degree Programme should have

passed the Intermediate Examination (10 +2) (Higher Secondary) of program of study with 60% of marks in Mathematics, Physics, and Chemistry in the case of Engineering programmes and Mathematics/Biology, Physics, and Chemistry in the case of Bio-Technology programmes approved by the Government of Andhra Pradesh **(AND / OR)** Should have passed the engineering entrance examination i.e., EAMCET, or AIEEE, or JEE (MAIN), or KLUEEE **(AND / OR)** To enter into the 3rd semester of B-Tech engineering programme directly, the students should possess the Diploma in Engineering / Technology awarded by the State Board of Technical Education, Andhra Pradesh (SBTET).

For foreign students who wish to study at the University, please refer to the "Foreign Student Admission Procedures" stated separately and comply with the study requirements of the Ministry of Education.

Transferees are accepted only if there are allotted slots in any departments. Should there be allotted slots, a transferee examination will be conducted for the enrollment of transfer students. Take note that a transferee must at least finish one full school year at his/her previous University and cannot transfer to the University if in his/her final year of study.

4.0 UG PROGRAM CURRICULUM DESIGN

For an academic programme the curriculum is the basic framework that will stipulate the credits, category, course code, course title, course delivery (Lectures / Tutorials / Lab / Project), in the credit based system

4.1 Program Structure

a) Each Academic Year is divided into two semesters, each of, approximately, 18 weeks duration:

- Odd Semester (July – December)
- Even Semester (January – May).
  (Summer Term (May – July))

b) All courses are categorized into three streams even, odd and dual semester courses.

c) Even semester courses are offered only during even semester i.e., January-May, Odd semester courses are offered only during odd semester i.e., July-December and dual semester courses are offered during both even & odd semesters.

d) Summer Term starts around the middle of May and ends around first week of July.

e) A Program is a set of courses offered by the University that a student can opt and complete certain credits to qualify for the award of a degree. First year courses are divided into two semesters. Students have independency to choose courses of their own choice prescribed by the University, subject to the maximum permissible limit in each course as specified by the University from time to time.

f) From second year onwards a student can register for a maximum of 24 credits or 7 credit courses(whichever is less) per semester (except while doing project work/practice school/Minor degree/Honors degree/Integrated program) of his/her choice from his entire curriculum, subject to the fulfillment of pre-requisites as defined for each course.

g) A student can choose project/practice school only during 7th or 8th semester.

4.2 Course Structure

a) All courses have a Lecture/Tutorial/Experiment/Design component (L-T-P) to indicate the contact hours. 'T' and 'P' components of a course may be void. Separate pure Laboratory course (0-0-P) may also be provided. All courses have a credit count. Teaching of courses would be reckoned in terms of credits. Every course has a list of courses (may be void) in certain cases as its pre-requisite.
b) For calculating credit, in general each lecture and tutorial hour per week will be considered as one credit and two practical hours as one credit. Project work will be treated as equivalent to twelve credits and Practice school will be treated as equivalent to twelve credits.
c) However, in situations where calculated value of credit is a fraction, it is rounded to the next number.
d) The curriculum for all the programmes in the first year shall be common for all disciplines (except Bio-Technology). However, slight deviations are permitted with prior approval from Board of Studies and Academic Council.
e) For all the Professional Core Courses, offered by various departments, the students have to necessarily undertake a Lab Course along with a Group based Project task, which must be allotted by the Course Coordinator and the Team of Instructors, ensuring the topic for each Group of students to be covering all major portions of the course. This is for making the students gain more Practical exposure / hands on, on the Core Courses and thus making them well versed and potentially strong in fundamentals of their respective departments.

4.3 Course Precedence

a) A student who has qualified in all the courses in the pre-requisite would be allowed to register in the course.
b) In any course if a student appears for final exam or is successfully promoted (through internals etc.) deemed to have met the prerequisite for next higher level course.
c) The Dean Academics after consulting with Department concerned has the prerogative to waive the prerequisite (if it is satisfied through a test) if the student has gained sufficient proficiency to take up the course.

4.4 Specialization through Elective Courses

a) If a student chooses any course outside the compulsory courses prescribed by the department is known as elective course.
b) The student is permitted to choose the elective courses of his/her choice within his/her own discipline.
c) The University offers five types of electives:
    (i) Specialization elective: An elective course offered by the Department for the fulfillment of degree with specialization is known as specialization elective.
    (ii) University/open elective: A course which is of interdisciplinary nature having no prerequisites is known as University elective. B. Tech degree student can register for these courses during 5^{th} semester or later.
    (iii) Management elective: An elective course offered to encourage managerial skills and to inculcate entrepreneurship skills for an undergraduate student is known as management elective. Management elective courses are offered at institutional level and are different from electives of management group.
    (iv) Professional Core Elective: Professional Core Elective course is deemed essential for an academic degree consists of all core courses that considered being essential and

consisting of the required core courses to meet a graduation requirement for a student. A student can register for these courses from 3rd year onwards.

(v) Humanities and Science Elective: The Humanities and Sciences elective offer a variety of academic choices for all students working toward an undergraduate Engineering degree. It is designed to provide the students with social, cultural, political and economic background crucial to fulfilling the College of Engineering's purpose of "preparing our graduates to begin a lifetime of technical and professional creativity and leadership in their chosen field". Students are responsible for determining their qualification for taking an H&S course, not limited to pre-requisites.

d) Specialization electives, discipline electives and compulsory discipline courses can be chosen by the students of the respective disciplines only. However, the students of a particular discipline can register for specialization/ discipline / interdisciplinary minor / compulsory discipline courses of other disciplines provided they have met the pre requisite or when pre requisite is waived by Dean Academics.

e) A student is not permitted to choose an open elective, if he has already done that course as a part of regular programme (or) a student is not permitted to choose an open elective course, if it covers more than 30% of content already done by him under regular programme.

f) An elective course is offered, only if there are a minimum 20 number of students registered for it.

g) A student shall take up minimum two certificate courses related to advanced topics/ areas as offered by their Department.

4.5 Summer Term and Evening Courses

The University may offer summer term and evening courses, as per the necessity from time to time. The course to be run during summer shall be decided on the basis of essential deficiencies made by group of students. Following conditions apply for students registering for summer term and evening courses.

(a) Students falling in any one of the following categories can register for summer term and evening courses, provided they have completed prerequisites for the courses offered:
   (i) Who have been allowed semester withdrawal on medical grounds
   (ii) Who have failed in the subjects in a regular semester (OR)
   (iii) Who have taken lesser load on advice/by choice (OR)
   (iv) Whose earned credits have fallen below the credits earned by a regular student of the same programme for some reason and who has taken courses as per advice of his/her faculty.

(b) A student can register only for a maximum of three courses in each summer term. Students registering for more than 1 summer course have to ensure that there is no clash in the time table. In case of clash immediately they have to approach Director, Registrations/Dean-Academics for time table adjustment. If the time table does not permit the fee paid by them will be refunded.

(c) For students who would like to register for evening courses can do so only if the timings do not clash with regular course work and the registration of such students is subjected to the approval of Dean-Academics.

(d) Any student who is registering for summer term or evening courses has to pay Requisite fee prescribed by the University.

(e) Summer course/evening course is not a student right and will be offered based on availability of faculty and other institute resources. If the course is not offered the fees paid will be refunded in to-to.

5.0 EVALUATION OF UG PROGRAMS

A student's academic progress is examined according to any one or combination of the following methods as decided by the Course Coordinator.

- Home Assignments and Assignment tests given by the faculty during the course of study
- Periodic internal Tests
- Quizzes
- Mid- Semester examinations in the middle of each semester
- Semester Project Report assigned by faculty upon requirement
- Final end examinations given at the end of the semester

a) The Mid-Semester and the End-semester examinations in respect of theory courses will be conducted centrally by the examination section as per the schedule.
b) Appearing in the end-semester examination in the theory and laboratory subjects is mandatory for a student.
c) Students will be permitted to appear in the examinations in only those subjects for which they have registered either for study or for Examination at the beginning of the semester.
d) Attending the Co-curricular activities like Seminars, Group discussion, Colloquia etc., are mandatory.
e) Supplementary examinations for the benefit of fail/detained/summer term students will be held only once in a year immediately after summer term classes.
f) Students may have to take more than one examination in a day either during regular/supplementary examination.

5.1 Internal evaluation

a) The process of evaluation should be continuous throughout the semester and involves components as decided by the course coordinator such as session tests, quizzes, surprise quiz, case analysis, assignments, attendance, Home assignments, open book tests, Seminars, project, term papers and practical examination constituting a total weightage of 40% of total marks. However for Miniproject, Industrial training, Term paper, final year project and Practice school, total weightage of 50% of total marks may be allotted for Internal evaluation.
b) The distribution of weightage will be decided and announced by the course coordinator, towards the beginning of the course, so that students are aware of the evaluation mechanism to be followed in the course. In general,the distribution of weightage among various components of a course for Combined Theory & Lab courses follow the proportion rule of credits as L+T : P
c) The Course Coordinator will display solution - key on the notice board and in e-learning site immediately after the evaluation component with evaluation scheme.

d) In order to maintain transparency in evaluation, the test and quiz answer sheets **including end exam will be shown to the students** within one week of conducting the exam. If a student is not convinced with the marks awarded he/she can request the course coordinator to re-check on request.

e) No correction is permitted once the course coordinator submits the marks/grades to the controller of examination.

5.2 Comprehensive evaluation

(1) All regular courses will be evaluated as per the L-T-P structure and graded as shown table 5.4B.

(2) All audited courses are evaluated and awarded satisfactory/not satisfactory grade. In case of award of non-satisfactory the student has to reappear the end comprehensive examination

(3) For non credit courses as per the L-T-P structure grading will be done and grades are awarded as X, A, B, C, D, E or F. In case of F grade the student has to re-appear the end Comprehensive examination

5.3 Betterment

a) A student may reappear for end comprehensive examination (theory part only) for improving the grade in any course/courses, through betterment subject to the following conditions:
   - The student has obtained the lowest pass grades in the course concerned, and
   - For improvement, their CGPA shall be ≤ 6.75. In the case of reappearing, the grade obtained in reappearance or the earlier grade whichever is better will be considered.

b) A Student having D or E grade and CGPA less than 6.75 can Re-register in a course at any time before the completion of his graduation program provided the University facility permits. However, a student who secured CGPA less than 5 should obtain prior permission of Dean-Academics, before he / she Re-registers for a course.

c) For Re-registering to a course / reappearing for comprehensive examination, the student has to pay the pre-requisite fee as prescribed by the University.

d) A student cannot Re-register/reappear for comprehensive examination in courses like Professional Practice in Industries, summer internship, courses having course Structure 0-0-P, Mini Project, Project Work, Practice School/Term Paper or any other courses which are conducted as vocational courses.

e) A student who has completed the formalities of graduation cannot Re-register a course / reappear for evaluation components.

f) A student Re-registering for comprehensive examination for improving the grade must ensure that the dates of evaluation components do not clash with any of his courses in the regular semester is not permitted to Re-register for comprehensive examination

g) Director (Registration) can counsel the student in Academic Counseling Board (ACB) to Re-register a course for evaluation components to improve his/her grade so that he/she can come out of ACB purview. However, decision taken by the student in this regard shall be final. Student who is advised to Re-register a course / semester does not extend his/her graduation period.

h) In case of Re-registration for betterment he/she is exempted from attending the course and the marks obtained by the student for attendance earlier for that course will be carried forward.

i) A student repeating a course after obtaining NA report has to attend all the classes
j) Further the student has to attend all the evaluation components and ensure that the dates don't clash with any of his regular course.
k) The grade obtained by the student while repeating will be final and in no case the grade obtained in previous attempt will be considered.
l) However such an improvement is not considered for the award of Rank or Gold medal.

Re-appearing with Registration:

A student can repeat a course by re-registering for two reasons:

i) To improve the grade – i.e. betterment
ii) When he/she is detained in a course.

*Repeating a course implies that the student will re-register for the course.

Re-appearing without Registration:

A student can reappear and clear the course in which he/she failed by taking supplementary examinations. In such a case the marks obtained in internal components and all lab components earlier are carried forward.

5.4 Grading Process

a) The overall performance of the student is described by **Cumulative Grade Point Average (CGPA)** and is calculated taking into consideration grade obtained by the student in all credited courses and credits attached to it. It is the weighted average of the grade points of all the letter grades obtained in credited courses by the student from his entry into the University. CGPA is computed as follows:

$$CGPA = \frac{c_1 g_1 + c_2 g_2 + ... + c_n g_n}{c_1 + c_2 + ... + c_n}$$

where c_1, c_2 ….. c_g denotes credits associated with the course applied and g_1, g_2…denotes grades obtained by the student.

b) Absolute grading for 201314 admitted batch onwards vide amendment in XIII Academic Council meeting dated 26th February 2014.

Resolved to adopt the absolute grading system instead of the absolute-cum-relative grading system, by suitably amending the Academic Regulations of all programs for the batches of students admitted from the Academic year 201314 and onwards. The following modifications as given below.

GRADE	GRADE POINTS	**% OF MARKS = AICTE EQUATION (10XCGPA-7.5)**	**RANGE**		AVERAGE
O	10	92.5	85	100	92.5
X	9	82.5	80	<85	82
A	8	72.5	65	<80	72
B	7	62.5	60	<65	62
C	6	52.5	45	<60	52.5
D	5	42.5	40	<45	42.5
F	0	-----	<40	-	Failed

c) A student getting less than 40% of overall score and 40% in the comprehensive examination will be considered to have earned F grade. In combined theory and lab courses along with

overall 40% score, the student should get independently 40% in both theory and lab components else treated as failed in both.

d) A student who obtains 'F' grade has to reappear for the comprehensive examination. However, such a student need not attend the classes and marks obtained in session tests, surprise quiz, case analysis and attendance will be carried for the subsequent attempts of the student.
e) In case of a student who has earned F grade, after the student has fulfilled all the requirements for passing it will be converted into a valid grade by considering grade cutoffs of the batch in which he/she had appeared for the course for 1st time.
f) A non-credit course also will be evaluated as a regular course and grades will be allotted.
g) Audited courses are graded as satisfactory or Un-satisfactory only.
h) At the end of each semester the University issues grade sheet indicating the CGPA of the student. However, grade sheet will not be issued to the student if he/she has any outstanding dues.

To convert CGPA into equivalent marks the equation to be used is

% OF MARKS = (10 X CGPA – 7.5)

5.5 Reports/Grades

a) The Course Coordinator can award the following Reports/Grades depending on the cases:
   (i) **Grade** from O, **X, A, B, C, D** and **F** is awarded to the student if the student satisfies the corresponding requirements as specified in the section 5.4 (grading).
   (ii) **NA** (Not Attended) is awarded to the student if the student has shortage of attendance. When student is given NA he/she has to repeat the course. It should be noted here that NA is different from F grade. For a student with F grade his/her marks obtained in internal evaluation component will be carried forwarded. While for a student awarded with NA Report has to reregister for such a course and attend the classes.
   (iii) **GP** (Grade Pending) is awarded in situations where Course Coordinator cannot communicate the grade in time because of operational difficulties. The GP report has to be converted into valid grade by the Course Coordinator at a later stage.
   (iv) **RC** (Registration Cancelled) is awarded to a student for various reasons when the registration for the course is cancelled by the University. Such a student will have to re-register for the course in subsequent semesters/summer term whenever the course is offered.
   (v) **DIP** (Discontinued from Program) is awarded in situations where a student wants to discontinue from the program with the prior approval of University.
   (vi) **W** (Withdrawal from Program) awarded in situations where a student decided not to attend for the semester must cancel their classes before the first day of the semester to avoid having the classes be recorded on their transcript and being financially responsible.

6.0 CALENDAR MANAGEMENT FOR UG ENGINEERING PROGRAMS

a) The Academic Council approves the schedule of academic activities prescribed for an academic year.
b) Inclusive of dates for registration, class test and end-semester examinations etc. which shall be mentioned in the Academic Calendar of the year, there will be a total of about 90 working days in each semester excluding the period of Comprehensive examinations.

7.0 REGISTRATION DURING SEMESTERS

All courses are categorized into three streams even, odd and dual semester courses. Even semester courses offered only during Even Semester i.e., January-May, Odd Semester courses offered only during Odd Semester, i.e., July-December and Dual semester courses offered during both even and Odd Semesters.

Admission to all courses will be made in the Odd Semester of each session for the 1st and 2nd Semester levels based on the eligibility criteria specified in the section 3.0. A student who satisfies the University eligibility criteria should be present at the University on stated date for further admission procedures.

- Every student is required to be present and register at the commencement of each semester on the day(s) fixed for and notified in the Academic calendar.
- It is the responsibility of the individual student to register for either semester i.e., Even / Odd. Registration in the summer term is optional.
- The University has the right to refuse registration process if a student does not turn up on the day of registration.
- Normally, no late registration shall be permitted after the fifth working day from the scheduled date of commencement of classes, except in special cases such as serious medical problem, family calamity or participation in a national event, considering such compelling reason, a student may be permitted for late registration (within one week of commencement of semester) with prior approval from the Director, Academic Registration with payment of requisite fine as prescribed by the University.
- However, under no circumstances late registration after 15 calendar days from the scheduled date of registration is allowed.
- In the rare case of transfer from other universities after the semester commences, such a student must produce his/her attendance statement from the concerned institution in each course at the time of admission.

7.1 Registering for a course

a) A student either newly admitted or on rolls has to register for a course in each semester on the day of registration as notified in the Academic calendar. Students failing to register for the course will not be permitted to attend the corresponding classes.
b) The right of offering a particular course in a semester is only at the discretion of University authorities.
c) The students registering for the first semester and second semester have to choose the courses prescribed by the University subject to the maximum permissible limit as specified by the University.
d) Students registering for the second semester and fourth, sixth and eighth Semesters of their study will be permitted to register only if they have:
    - Cleared all the fees, outstanding dues of University and / or Hostel of previous semesters.
    - Paid all prescribed fees for the current semester.
    - Not been debarred from registering for a specified period on disciplinary or any other grounds
e) From third Semester onwards a student can choose a minimum of seven courses per semester of his choice (or) register for a maximum of 24 credits whichever is less from the

curriculum as prescribed by the University, subject to the fulfillment of pre-requisites as defined for each course.

f) A student shall not be allowed to withdraw from compulsory courses prescribed by the University.
g) Students, who have opted for minor degree, Honors program or dual degree, can register for more number of credits in a Semester over and above permitted on regular basis by obtaining written permission from Dean Academics, if the student timetable permits.
h) While doing project work or practice school a student is not permitted to register in any other course except in case of student opting for honors, minor, dual degree etc.
i) The following conditions apply for a student registering for elective courses
    (i) The student can register for an elective course within or across the disciplines only if he/she has completed prerequisite courses with eligible grade.
    (ii) The student is permitted to register for a particular elective course only if the total course load is within the limit decided by the Director Academic Registration.
j) The student has to register for one management elective course in either seventh (or) eighth Semester.
k) The University reserves the right to withdraw any elective course offered within one week of the commencement of the semester if sufficient number of students is not registered or for any other reasons.
l) In such cases, the students are permitted to register for any other elective course of their choice provided they have fulfilled the eligibility conditions.
m) The University reserves the right to cancel the registration of a student from a course or a semester or debar from the degree on disciplinary grounds.

7.2 Substituting a Registration

a) Within one week of the commencement of the semester, a student is permitted to substitute an elective course (substitution) subject to availability with prior approval of Dean-Academics.
b) However, a student is not permitted to withdraw from compulsory course and substitute the same with an elective course.

7.3 Withdrawing from a Registration

a) A Student is permitted to withdraw from an elective course within one week after the commencement of the semester with the approval of Dean-Academics.
b) Each application for semester withdrawal (through BOS Chairman) will be examined by the Dean-Academics and depending on the merit of the case an appropriate recommendation will be made to the Chairman Academic Council.
c) A Student is normally not permitted to withdraw from compulsory course(s) of the discipline.
d) If a student desires to withdraw from compulsory courses of the discipline, he/she must and should seek prior permission from Dean-Academics provided he/she must have to complete the course whenever the same course(s) are offered later in the academic curriculum before completing his/her graduation. This implies a student has to complete all the compulsory courses prescribed by the department for obtaining the degree of graduation.

7.4 Cancelation of a registration

A student is solely responsible to ensure that all conditions for proper registration are satisfied, and there are no timetable clashes. The registration may be cancelled for a course or the entire semester either by the student or by the University if any irregularity is found at a later stage. A student's registration for the semester may be cancelled, if he does not meet the statutory requirement of Minimum of number of credits or as part of disciplinary action Leave beyond permissible limits may also result in cancellation of registration for a semester.

8.0 TEACHING UG ENGINEERING PROGRAMS

a) Course(s) taught by a single instructor (theory) is referred to as single section course and course(s) taught by group of instructors in more than one section is referred to as multi- section courses.
b) The teacher for single section course or associated with multi-section courses are referred to as Instructor.
c) A team of instructors, under the leadership of Course Coordinator (shall be an instructor of any one the theory section) shall work together to meet all requirements of teaching, evaluation and administrative aspects of the course.
d) A course is conducted and evaluated by the course coordinator with the cooperation of all instructors as a team.
e) The internal evaluation pattern will be announced by the course coordinator well before the commencement of the class work with the prior approval from the Dean Academics.
f) Every course coordinator must specify the program outcomes, objectives, credits to be earned and issue of course handouts to the students either in soft copy or in hard copy.
g) All course handouts are posted in e-learning site one week in advance.
h) The solution key of internal examinations conducted during the semester will be displayed on the notice board and in the e-learning site immediately after the evaluation component with evaluation scheme by the course coordinator.

9.0 ATTENDANCE

a) It is mandatory for a student to attend all the classes, tutorials, laboratories and other evaluation components conducted by the University. A student may be detained from appearing for an examination on grounds of shortage of attendance.
b) Attending the Co-curricular activities like Seminars, Group discussion, Colloquia etc., are mandatory.
c) In each course attendance will be treated as evaluation component and marks are awarded as shown below:

% of Attendance in Theory & Practical classes	Marks awarded
≥ 95	5
≥ 90 and < 95	4
≥ 85 and < 90	3
≥ 80 and < 85	2
≥ 75 and < 80	1

d) Required minimum attendance is >= 75% attendance in all courses. On medical grounds a student can avail a condonation of Maximum 10% attendance. However to avail the condonation student has to submit a medical certificate from not below the Rank of Civil asst surgeon and to condone or not is at the sole discretion of Dean-Academics. The condonation list should be sent to the examination section duly signed by the Dean-Academics well in advance..

e) 75% attendance is mandatory to attain eligibility to appear for the comprehensive examination in a course. If a student fails to maintain 75% attendance and 40% internal marks in a course he/she will be awarded with NA Report in that course. In such cases, student will not be permitted to attend the comprehensive examination of that course(s) where he/she has obtained NA Report. He/she has to register and repeat the course whenever it is offered.

f) However, some relaxation to this rule is possible in the case of students participating in extra - curricular activities as identified below:

- One week for state level competitions.
- Two weeks for National level competitions and
- Three weeks for International events

Subjected to a maximum of two such participations in a Semester.

g) If the period of absence in a semester is for a short duration (of not more than one week) prior application for leave should be submitted to the Head of the Department clearly stating the reasons for absence along with supporting documents. The Head of the Department will grant such leave at his/her discretion.

h) He/ She may be allowed for makeup of Laboratory/workshop classes conducted during the period of absence.

i) If the student is continuously absent for more than 4 weeks, his name will be removed and registration stands cancelled.

j) Absence for a period not exceeding one week in a semester due to sickness or any other unavoidable reason for which prior application could not be made, may be condoned by the Dean of the School/College, provided he is satisfied with the explanation.

k) This request should be supported by medical certificate from a recognized medical officer not below the rank of Assistant civil surgeon.

l) This is also applicable in those cases who have attended for conferences, paper presentations and sports with permission from the authorities where the student has valid reason for absence.

m) In such cases the student can approach the course coordinator/ instructor for the makeup test or assignment immediately on rejoining.

n) No makeup examination will be conducted for End semester examinations under any circumstances.

o) If the period of absence is likely to exceed one week, a prior application for grant of leave should be submitted to the Head of the Department in all the cases.

p) If the valid period of absence (on medical grounds) is more than 20 continuous working days during the semester the student may apply for withdrawal from the entire semester at any time clearing all the fee dues of the entire course and no fee are refunded at any cost.

q) The Vice-Chancellor may relax above rules in special situations which arise due to extraordinary circumstances.

10.0 DETENTION

(i) A student getting less than 40% marks in internals and/ or 75% of attendance in each course will be treated as detained and will not be permitted to appear for the end examinations, he has to repeat the course whenever the University offers it.

11.0 ACADEMIC FLEXIBILITIES

University offers flexibility for B. Tech. Degree students in doing the courses. In addition to the prescribed courses a student can register for more electives, summer term courses, evening courses provided his/her timetable &University facility permits. He / she can either change from one branch to another branch or the transfer of credits from one branch to another branch for which the details are as follows

11.1 Change of Branch

A student admitted to a particular Branch of the B. Tech course will normally continue studying in that branch till the completion of the programme. However, in special cases the University may permit a student to change from one branch to another after the second semester.

a) Only those who have cleared all the first and second semester subjects of first year are eligible to apply for change of branch.
b) Change of branch shall be made strictly on the basis of merit of the applicants and availability of seats category wise subjected to the following conditions:
   (i) Top 1% students of the admitted students will be permitted to change their branch subject to availability of seats.
   (ii) For others, change will be permitted strictly on merit basis and category basis. Students without fail grades, backlogs and with CGPA ≥ 8 will be eligible to apply. Transfer may be allowed subject to availability of seats and strength of the department does not exceed 5% of intake strength. However a weak student having low CGPA requesting to transfer to other program may be permitted basing on recommendations of ACB.
   (iii) The request for change (in the order of merit) for student from department A to department B will be considered if:
      - Strength of department B does not exceed 5% of intake strength.
      - Number of students on rolls in the department A does not fall below 85% of the intake strength.
      - The request of student will be reconsidered (again in the order of merit) if student does not violate (b) above, due to another student getting transferred to department A.
      - In case of a tie the Grade and / or marks scored by the student in the course of the Department for which he is seeking transfer will be considered.
      - **Bio Technology students are also eligible for transfer to other Engineering** Programmes provided they are with the MPC background and satisfy the eligibility. However, other Engineering programme students are eligible for transfer to Bio Technology provided they complete the biology course by registering themselves.
   (iv) All changes of Branches made will be made effective from second year first semester. Change of branch shall not be permitted thereafter.
   (v) Change of branch once made will be final and binding on the student. No student will be permitted, under any circumstances, to refuse the change of branch offered.
   (vi) Change of branch is not applicable for post graduate programmes.

11.2 Credit Transfer

(i) Credit transfer from KL University to other University or vice versa is permitted only for under graduate programmes.

(ii) Credit transfer from KL University to other University: Student studying in KL University can take transfer to another University under the following conditions:

- KL University has signed MOU with the University.
- A student has to pay the fees for all the remaining years when he/she seeks transfer.
- However, a student, after seeking transfer from KL University can return to KL University after a semester or year. Based on courses done in the other University, equivalent credits shall be awarded to such students.

(iii) Credit transfer from another University to KL University: A student studying in another University can take transfer to KL University under the following conditions:

- When a student seeks transfer, equivalent credits will be assigned to the student based on the courses studied by the student.
- The student, when transferred from other Universities, has to stick to the rules and regulations of KL University.
- To graduate from KL University, a student must study at least half of the minimum duration prescribed for a program at KLU.

11.3 Overloading and Under Loading

a) When a student is permitted to register for more courses during regular semester than normally prescribed by the University, it is known as overloading.

b) In general overloading is permitted to those who have CGPA greater than 8, do not have any backlog course and/or registered for integrated program, Honors program, and Minor degree options etc.

c) However, registering in a summer term or vocational courses is not considered as overloading.

d) Synonymous to overloading, the University also permits a student to register for fewer courses than normally prescribed. Such cases are known as under-loading.

e) For both overloading and under-loading, a student has to seek permission from Dean-Academics and also Director Academic Registration, who gives permission on a case to case basis, based on the CGPA of the student.

f) The University reserves all rights to decelerate the degree program of the student at any time.

g) The student opting for deceleration of the degree programme will not be allowed to repeat the course in the same semester.

11.4 Academic Counseling Board (ACB)

A student will be put under Academic Counseling Board under the following circumstances:

(i) Has CGPA of less than 5.
(ii) Has ‘F’ grade in more than four courses.

The students under Academic Counseling Board may not be allowed to register for all regular courses in the semester based on the recommendation of Academic Council Board. The ACB will counsel and guide the students for proper registration of the courses

12.0 BACKLOG COURSES

A course is considered to be a backlog if the student has obtained 'F' grade / NA Report in the course; the following regulations apply to a student who has backlog(s):

a) A student having backlogs has to clear backlog courses first.
b) A student, who is having more number of backlog courses, shall come under all regulations mentioned in ACB.
c) A student can avail any number of chances to clear a backlog course, however the student may be asked to register for a regular course or to do a substitute course if the same course becomes obsolete and is not being offered anymore. Hours allocated for revision, extra learning are not accountable for credits.
d) A student must clear all backlog courses before he/she opts for Practice School (PS) programme, i.e. a student who has backlog course(s) is not eligible for PS.
e) Students who are doing their project work/ Practice school are not allowed to register for any other course.
f) A student detained due to lack of credits / more number of backlogs in a semester has to register only for that semester after acquiring the eligibility for promotion.
g) Under no circumstances he/she is allowed to register for next semester without registering for the detained one. This is applicable for those joined from Academic Year 2010-11 onwards.

13.0 GRADUATION REQUIREMENTS

A student must fulfill the following requirements for graduating in a course:

a) Must have cleared minimum of 170-180 credits for under graduate B. Tech programmes.
   For graduation with dual degree/ integrated B. Tech and M.Tech programmes student must have earned 256 – 270 credits, for B. Tech with MBA should earn 245-260 credits
   Must have cleared compulsory certificate, audited, non-credited courses including one in sports/yoga
b) Cleared all courses prescribed for him/her in the discipline.
c) Must have undergone industrial training programme (other than Practice School) for a period of not less than 4 weeks.
d) A Student shall complete 9 elective courses in the undergraduate program. (5 prof core+1 Management +3 open electives)
e) Must have obtained minimum number of 9 credits by choosing courses from University Electives/Open Electives category.
f) A Student shall complete all audited courses and Non-credit courses including one in sports/games/yoga and NCC/NSS/NSO as prescribed by their respective BOS.
g) Successful completion of Mini projects & term papers are mandatory as a part of their curriculum.
h) Obtained a minimum CGPA of 5.5 for undergraduate or dual degree/Programs.
i) Obtained a minimum CGPA of 8.5 for obtaining Honors degree.
j) Must have finished all the above mentioned requirements in less than twice the period mentioned in the Academic structure for each programme which includes deceleration period chosen by the student, deceleration imposed by University or debarred from the University.

k) Must successfully undertake specific trainings in focused areas that enable students to be successful in their chosen career tracks. The focused areas are : (a) Employment in MNCs, (b) Civil Services (c) Higher Studies (d) Research and (e) Entrepreneurship.

14.0 RUSTICATION

A student may be rusticated from the University on disciplinary grounds based on the recommendations of any committee or examination committee by the Vice Chancellor.

15.0 AWARD OF DEGREES

A student having cleared all the courses and met all the requirements for the award of degree with

1) CGPA < 6.75 will be awarded second class
2) CGPA ≥6.75 will be awarded first class and with
3) CGPA ≥7.5 will be awarded first class with distinction provided the student has cleared all the courses in first attempt (Regular) within the stipulated time.

16.0 AWARD OF MEDALS

University has instituted Gold and silver medals to the highest and second highest rank holders respectively as per CGPA and other academic conditions in each programme of specialization.

1. The grade obtained by betterment, will not be considered for the award.
2. He/she must be obtained minimum distinction for the award of Gold or silver medal.

UNIVERSITY

Vision

To be a globally renowned university.

Mission

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

DEPARTMENT

VISION

To promote innovation centric education and perform cutting edge research in interdisciplinary and multidisciplinary areas**.**

MISSION

To impart **value-based, state-of-art education** and motivate the students to become **socially committed professionals** for **overall development** of students

M1: Impart Value –Based Education

M2: Impart State of the art –education

M3: Motivate Students to become Socially Committed Professionals

M4: Overall Development of Students

PROGRAM EDUCATIONAL OBJECTIVES (PEOS) :

PEO1: Practice engineering in a broad range of industrial, societal and real world applications.

PEO2: Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.

PEO3: Conduct themselves in a responsible, professional, and ethical manner.

PEO4: Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

STUDENT OUTCOMES(SOs)

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) an ability to function on multidisciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PEOS VS MISSION MAPPING

	M1	**M2**	**M3**	**M4**
PEO1	**√**	**√**		**√**
PEO2		**√**		**√**
PEO3			**√**	**√**
PEO4			**√**	**√**

STUDENT OUTCOMES (SOS) VS PEOS MAPPING

SO'S	PEO1	PEO2	PEO3	PEO4
a	√	√		
b	√	√		
c	√	√		
d		√		√
e	√	√		
f			√	√
g		√	√	√
h		√	√	√
i	√	√	√	
j	√	√	√	√
k	√	√	√	

COURSE VS SOS MAPPING

Course Code	Course Title	L-T-P	CREDITS	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g	h	i	j	k
13-EM-430	ADVANCED EMBEDDED PROCESSOR ARCHITECTURE	3-0-0	3	CO1	Understand 3 and 5 stage pipelines of ARM and able to program the ARM processor.	1										
				CO2	Applying instructions set of ARM 7 processor using assembly language											2
				CO3	Understanding the AMBA bus architecture	1										
				CO4	Analyze different advanced ARM cores and their use in SoC applications											2
13EC206	CMOS VLSI Design	3-0-2	4	CO1	Understand semiconductor device fabrication process and Electrical Properties.					2						
				CO2	Analyze the characteristics of CMOS circuits Construction and the comparison between different state-of-the-art CMOS technologies and processes					2						
				CO3	Design schematic diagrams , stick diagrams and layouts for digital circuits using CMOS and n-MOS logic											3
				CO4	Analyze CMOS circuits in terms of area, speed and power dissipation by applying the techniques like transistor sizing & design rules.											2
				CO	Design and develop Digital CMOS circuits using											3

				5	Microwind											
13EM201	**Computer Organization**	3-0-2	4	CO1	Understand the logical gates to construct combinational & sequential circuits to perform different µ-operations and design of basic computer					1						
				CO2	Develop micro Programs for design of Control Unit, CPU					1						
				CO3	Apply and realize operations like Multiplication, Floating Point algorithms using supporting modern engineering tools.											2
				CO4	Understand Memory Hierarchy, mapping procedures and the Peripherals, I/O interface and Direct Memory Access.					1						
				CO5	Design and Simulation of System Design using Logisim Tool											2
13-EM-E32	**Embedded Networking**	3-0-0	3	CO1	Understanding the concepts of Embedded Networking Communication Standard protocols: RS 232, RS 485, SPI, I2C bus protocols.								1			
				CO2	Analyze the US B& CAN based synchronization Techniques								1			
				CO3	Applying Ethernet communication protocols for Embedded Systems								1			
				CO4	Apply different wireless sensor networks used in embedded systems.											2
11 EM 401	**EMBEDDED SYSTEMS**	3-0-2	4	CO1	Analyze embedded systems,											
				CO2	Analyze and program on chip peripherals and off chip peripherals for a single purpose controller					2						
				CO3	Analyze the basic interfacing and communication protocols used in embedded systems.											2

				CO4	Analyze and select appropriate software architecture and analyze the features real time operating systems.					2						
				CO5	Develop and demonstrate a small embedded system for a real time application.					2						
13 EM 431	**ENTERPRISE PROGRAMMING**	3-0-0	3	CO1	Create and Deploy web application										3	3
				CO2	Understand and Apply JSF and JDBC										2	2
				CO3	Apply EJB technologies to Real Life applications										2	2
				CO4	Understand middleware technologies										1	1
13 EM 433	**SEMANTIC WEB**	3-0-0	3	CO1	Understand the basics of knowledge representation using ontologies & architecture of semantic web										1	
				CO2	Understand the fundamentals of various ontology markup languages										1	
				CO3	Understand the need for ontology management and tools.											2
				CO4	Understand the applications of semantic web specifically web services through a case study										1	
11OE432	**DATA WAREHOUSING AND MINING**	3-0-0	3	CO1	Understand types of database, need for data mining and data warehouse Architecture.										1	
				CO2	Understand the data Pre-processing techniques, and apply association rule mining on transactional data										1, 2	
				CO3	Apply classification & prediction techniques on various data sets											2
				CO	Apply clustering techniques on large data sets										2	

				4												
13 AC 301	ADVANCED EMPLOYABILITY SKILLS			CO1	Understand and adopt appropriate behavior patterns											
				CO2	Understand ,remember and apply lexical, syntactic skills related to grammar, usage and composition											
				CO3	Analyze and apply various interpersonal skills in day-to-day communication											
				CO4	Understand, learn and apply .the principles of various types of GDs and Personal Interviews											
13 EC 312	**Design with PLDs and FPGAs**	3-0-2	4	CO1	Understand the basics of Full custom, Semicustom and PLD design methodologies		1									
				CO2	Study and analysis of various combinational & sequential logic realizations using PLEs & PLDs		2									
				CO3	Compare and analysis of architectures of different FPGAs		2									
				CO4	Memorize and analysis of various sequential logic realizations using new generation PLDs		2									
				CO5	Create and Analysis of digital modules through project oriented approach											3
11EC311	**MICROPROCESSOR & MICROCONTROLLER**	3-0-2	4	CO1	Understand the working of Microcontroller 8051 and Instruction Set		1									
				CO2	Apply Interfacing concepts of few I/O Peripherals to 8051 through programming.		2									
				CO3	Apply the Programming concepts of 8086		2									
				CO4	Understand the working model of ARM Processor		1									
				CO	Applying the knowledge of											3

				5	8051 and working through peripherals											
13 EM 332	**PCB DESIGN.**	3-0-0	3	CO1	Understand the active and passive components, characteristics and the materials used along with their properties, mounting components on PCB , classification of PCB boards					1						
				CO2	Understand different copper clad laminates and their properties, Soldering techniques.					1						
				CO3	Apply the knowledge of schematic and layout to design a PCB					2						
				CO4	Understand the basics of PCB Fabrication and generate foot print for library, etc					1						
11EM330	**Real Time Operating Systems**	3-0-0	3	CO1	Understand the basic principles of operating systems structures, design and implementation of processes and introduction to distributed operating systems.					1						
				CO2	Understand task state, process synchronization and analyze various synchronization and deadlock problems					1						
				CO3	Apply different real time models, languages and scheduling.					2						
				CO4	Apply RTOS in various application domains.											2
13-CS-301	**SOFTWARE ENGINEERING**	3-0-2	4	CO1	Understand traditional and modern software process models used in the development of software systems.									1		
				CO2	Understand the traditional and modern trends in system									1		

					modeling											
				CO3	Design the architecture and UI for an application using the principles and concepts of software design and golden rules of UI.											3
				CO4	Understand various software Quality concepts and testing strategies for development of quality software.											1
				CO5	Apply various types of UML Diagrams for given case study using rational rose.											3
13EM333	**VISUAL PROGRAMMING**	3-0-0	3	CO1	Understand the building blocks of .NET framework					1						
				CO2	Understand C# Language Fundamentals					1						
				CO3	Apply Object Oriented Programming Concepts through C#										2	
				CO4	Apply Interfaces, and collections through C# and understand .NET assemblies										2	
13EM331	**WEB PROGRAMMING**	3-0-0	3	CO1	Create static web pages using basic HTML and CSS.											3
				CO2	Apply the fundamental components of the JavaScript programming language to a interactive web page.											2
				CO3	Understand the concepts of Document Object Model and Event handling mechanisms in JavaScript.										1	
				CO4	Create dynamic web pages using PHP and MYSQL.											3
11OE432	**DATA WAREHOUSING AND MINING**	3-0-0	3	CO1	Understand types of database, need for data mining and data warehouse Architecture.										1	
				CO	Understand the data Pre-processing techniques, and										1,	

				2	apply association rule mining on transactional data									2	
				CO3	Apply classification & prediction techniques on various data sets										2
				CO4	Apply clustering techniques on large data sets									2	
13EC 205	**Analog Electronic Circuits**	3-0-2	4	CO1	Designdifferent types of feed-back amplifiers and provide general solution for real time problems					3					
				CO2	Design different types of Oscillators and provide general solution for real time problems, and Design active filters using OPAMPs					3					
				CO3	Design other non-linear applications of OPAMPs such as precision rectifier, zero crossing detector, etc…, Design the applications of 555timer					3					
				CO4	Analyze different types of Power amplifiers					2					
13 EC 203	**Basics of Digital Systems**	3-0-2	4	CO1	Understand the representation of data using different codes and the principles of Boolean algebra to manipulate and minimize logic expressions	1									
				CO2	Examine the functioning of different combinational logic circuits built with logic gates and the design procedure for developing circuits like adders, decoders, code converters, etc.					2					
				CO3	Analyze the behavior of flip-flops and the operation of sequential circuits using flip-flops					2					
				CO4	Implement the design approach for creating sequential circuits like counters, shift registers, etc., and the concept of ASM charts in describing the digital systems					2					
				CO5	Implement different combinational and sequential circuits with NI MyDaq and										3

					Labview										
13 CS 205	**Computer Networks**	3-0-2	4	CO1	Understand OSI and TCP/IP Models and basics of physical layer and their issues	1									
				CO2	Demonstrate Data Link layer issues and medium access control sub layers concepts					2					
				CO3	Analyze and implement the algorithms of network, transport layers and concerned services	2				2					
				CO4	Implement the concepts of TCP ,UDP and the application layer conceptions					2					
				CO5	Demonstrate the basic concepts of protocols and their design including client/server models, connection oriented and connection-less models	3				3					
13CS204	**Data Base Management System**	3-0-2	4	CO1	Understand advantages of DBMS and its characteristics, concepts & ER model.	1									
				CO2	Demonstrate Relational Database using SQL detailing the role of Relational Algebra and Relational Calculus.		2								
				CO3	Examine storing data, File organizations, Indexing and Illustrates Normal Forms.	2									
				CO4	Interpret Transaction Management and Concurrency control techniques.	2									
				CO5	Create database for a given case study.		2								
13ES204	**DATA STRUCTURES**	3-0-2	4	CO1	Student will be able to apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	2			2						
				CO2	Student will be able to analyze and compare linear data structures and analyze different searching and hashing techniques.	2			2						
				CO3	Student will be able toanalyze and compare various non – linear data structures like Trees	2			2						

					and Graphs.										
				CO4	Student will be able to analyze and compare varioussorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	2			2						
				CO5	Studentwill be able to understand and execute lab experiments and develop a project along with his/her team members.		2								
13-BS 206	**Discrete Mathematics**	3-0-2	4	CO1	Apply various Set Operations and Logical Inferences for solving problems and the principle of Mathematical Induction.	2				2					
				CO2	Analyze Combinatorial and Permute Analysis, Binomial theorem, Multinomial theorem and Principle of Inclusion and Exclusion.					2					
				CO3	Analyzedifferent types of Graphs,Lattices, Sorting and Searchingtechniques and Applications of Graphs	2									
				CO4	Applyprocedure for solving Spanning Trees and different methods for solving Recurrence Relations.					2					
13AC201	**Energy and Society**	2-0-0	2	CO1	Understand the various forms of available energy and energy related aspects.							1		1	
				CO2	Apply energy auditing methodology to estimate energy conservation of different case studies.							2		2	
				CO3	Understand the environmental and geological impacts on the energy vice versa.							1		1	
				CO4	Apply the planning and controlling aspects for economical energy usage.							2		2	

13ES203	**Network Theory**	3-0-2	4	CO1	Understand the VI characteristics of electrical elements, solution of complex problems of DC circuits using transformations, nodal, mesh analysis and theorems.	1									1
				CO2	Understand the fundamentals and interconnection relations of 3 – phase circuits.	1									1
				CO3	Analyze the series and parallel resonance and magnetic circuits.	2									2
				CO4	Analyze the transient analysis of DC / AC circuits, two port networks and solve complex networks using topology.	2									2
				CO5	Develop a circuit model for a given practical case, apply the basic tools of circuit analysis for getting desired response and refine the circuit model if necessary based on obtained response.	3	3								3
13EM202	**Communication Systems**	3-0-2	4	CO1	Understand the basics of Modulation and demodulation techniques, Different types of filtering techniques and Radio Receiver characteristics										1
				CO2	Understand the sampling techniques and signal to noise ratio of different pulse modulation schemes		2								2
				CO3	Design and understand the Digital Modulation schemes, bandwidth estimation and clock recovery					2					2
				CO4	Understanding the source coding techniques and estimate the error detection and correction of different block codes.										2
11EM301	**Internet Programming**	3-0-2	4	CO1	Students demonstrate an understanding of basic HTML tags related to text, hyperlinks, Images and ordered/unordered lists.						1				1

				CO2	Students will be able to Apply inline, internal, external CSS to define look and feel (style) of single/multiple web pages.											2
				CO3	Students will be able to Apply basic Object Oriented programming concepts like Encapsulation, Inheritance and polymorphism to solve various computing problems.	2				2						
				CO4	Students demonstrate an understanding of Servlets/JSP concepts to process data from HTML forms.					3						3
13EC201	**Design of Electronic Systems**	3-0-2	4	CO1	Design Basic Electronics Systems and circuits	1										2
				CO2	Design Basic amplifiers	1	2			2						
				CO3	Design linear amplifiers using op-amps	1	2			2						
				CO4	Design basic applications of diode, BJT and JFET	2	1			2						
13ES205	**Signal Processing**	3-0-2	4	CO1	Understand the representation, manipulation and processing operations of DT signals and systems	1	1		1							
				CO2	Interpret the analysis of DT systems using Z.T.				2	2						2
				CO3	Apply the Fourier Transformation techniques for DT sequences and their applications		2		2	2						
				CO4	Ability to design, Implementation and realization of digital filters.				2	2						2
13ES202	**Object Oriented Programming**	3-0-2	4	CO1	The student will be able to understand basic Concepts of OOP, fundamentals of java and apply the concepts of classes and objects through Java Language.					2						
				CO2	The student will be able to apply constructors, Overloading, parameter	2				2						

					passing, access control in Java programming.											
				CO3	The student will be able to apply Inheritance, Packages, Interfaces.	2				2						
				CO4	The student will be able to apply Exception Handling, I/O Streams and understand Basic Concepts of MultiThreading	2				2						
				CO5	Students will be able to develop programs and projects in java.	2				2						
11EM334	**Micro controllers Interfacing & System Design**	3-0-0	3	CO1	Understand and remember the fundamentals of the microcontrollers like architecture, memory organization.					1						
				CO2	Apply the instructions in writing basic assembly language programming.					2						
				CO3	Apply the concepts of interrupts, timers in applications where required.					2						
				CO4	Analyze the differences in architectures of 8051 and PIC µc's and Analyze Different I/O devices and their interfacing to 8051 µc											2
13HS101	**ENGLISH**	2-0-2	3	CO1	Kinesics: To enable the students with the study of body language as it is an essential component of soft skills.	1										
				CO2	Lexis: Vocabulary building	1										
				CO3	English usage and mechanics: Grammar and verbal reasoning					2						
				CO4	Office communication to improve learning skills					2						
13HS102	LANGUAGE AND REASONING SKILLS	2-0-2	3	CO1	Understand the method of identifying the meaning of words and apply them in contexts.							2				
				CO2	Understand and analyze different cultures and the importance of empathy in cross-cultural communication.						2					
				C	Understand and analyze seven							2				

				O 3	techniques of reading and improve reading speed.											
				C O 4	Understand and apply writing strategies in office/ formal communication						2					
11BS105	ECOLOGY AND ENVIRONMENT	2-0-0	2	C O 1	Understand the importance of Environmental education and conservation of natural resources							1				
				C O 2	Understand the importance of ecosystems and biodiversity.								1			
				C O 3	Understand the knowledge on solid waste management									1		
				C O 4	Understand the knowledge on disaster management and EIA process									1		
13HS104	HUMAN VALUES	2-0-0	2	C O 1	realize and understand the basic aspiration, harmony in the human being.						1			1		
				C O 2	envisage the roadmap to fulfill the basic aspiration of human beings.	2				2						
				C O 3	Aanalyze the profession and his role in this existence.						2			2		
				C O 4	Develops holistic perception by understanding harmony in nature						2			2		
13BS101	LINEAR ALGEBRA AND MULTIVARIATE CALCULUS	3-0-2	4	C O 1	Perform elementary operations on matrices including determination of rank and inverse, demonstrate mastery in using matrix algebra to find the solution to a linear system equations, iterative methods: Jacobi's method and Gauss - Seidal method .Determine the eigen values and eigen vectors, Cayley-Hamilton theorem and its applications, nature of the quadratic forms	2	2			2						
				C O 2	Interpret and apply differential calculus on problems involving rate of change. Explain the geometrical interpretation and applications of Rolle's theorem and mean value theorems.Analyze the	2	1			2						

					maximization and minimization problems.										
				CO3	Illustrate the applications of integral calculus in solving problems on area, volume, displacement, work, etc. Computing improper integrals, Beta, Gamma functions and their properties. Compute multiple integrals by changing the order of integration and change of variables such as polar, spherical and cylindrical coordinates.	2	2			2					
				CO4	Determine gradient, divergence and curl of vector point functions with their properties. Calculate the line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems and their applications.	2	2			2					
13BS102	DIFFERENTIAL EQUATIONS	3-1-0	4	CO1	Describe different situations required to model differential equations. Classify the differential equations and identify suitable solution techniques	2	2								
				CO2	Illustrate modeling an engineering problem as a first order ordinary differential equation (ODE) and solving it using numerical methods available viz. Taylor, Euler, modified Euler and Runge-Kutta method	2	1								
				CO3	Analyze engineering problem solutions in particular electric circuits, deflection of beams, free oscillations, forced oscillations and resonance through differential equations	2	2								
				CO3	Illustrate to model an engineering problem second order PDEs namely one dimensional wave and heat equations, two dimensional Laplace equation into PDEs and find their general solutions using C.F and P.I.	2	2								

13BS103	ENGINEERING PHYSICS	3-0-2	4	CO1	Explain how ultrasonic waves are produced and detected,	1										
					Determine flaws present inside a material using NDT techniques.											
				CO2	Compute the magnetic induction produced by current carrying conductors by using Biot-Savart law & Ampere's law, Compute the Lorentz force experienced by a charged particle.	1										
				CO3	Understand different aberrations in lenses and their corrections, phenomenon of interference in thin films of uniform thickness	1										
				CO4	Explain the working of optoelectronic devices like LED, photodiode, photo transistor and solar cells, Explain the phenomenon of superconductivity and its applications	1										
11BS104	ENGINEERING CHEMISTRY	3-0-2	4	CO1	Examine water quality and select appropriate purification technique for intended problem		2	2								
				CO2	Predict potential complications from combining various chemicals or metals in an engineering setting		2	2								
				CO3	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena		2	2								
				CO4	Apply phase rule, polymers, conducting polymers and nano chemistry to engineering processes			2								
				CO5	An ability to analyze & generate experimental skills		2	2								
13BS201	MATHEMATICAL METHODS	3-0-2	4	CO1	Identify different mathematical problems and reformulate them to facilitate numerical treatment using an appropriate technique.	2										
				CO2	Apply Fourier series, Fourier transforms and Z-transforms to analyze various signals.	2										

				CO3	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance and to estimate unknown parameters of populations and apply the tests of hypotheses.	2									
13ES103	ENGINEERING MATERIALS	3-0-2	4	CO1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.	1									
				CO2	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.	1									
				CO3	Understands role of molecular vibrations in determining thermal properties of materials and deformation of materials in response to action of load, for identification of materials having specific engineering applications.	1									
				CO4	Understands spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.	1									
13ES102	MEASURMENTS	3-0-2	4	CO1	Understand and apply the fundamentals of a measurement system, characteristics, transducers and metrology using simulation and experimentation tools.	2	2								
				CO2	Understand various electrical & computer parameters, and apply different measuring techniques on various electrical parameters using simulation and experimentation tools.	2	2								
				CO	Understand electronic & electro-physiological	2	2								

				3	parameters, and apply measuring techniques on electronic parameters using simulation and experimentation tools.											
				CO4	Understand and apply different measuring techniques on civil and mechanical parameters using simulation and experimentation tools.	2	2									
11ES104	ENGINEERING GRAPHICS WITH CAD	0-0-4	2	CO1	Draft Orthographic views, projections of planes and , solidsmanually and by using CAD software Tool (AutoCAD)					2						
				CO2	Drafting Sectional views , Isometric views manually and by using AutoCAD					2						
				CO3	Development of surfaces and perspectives views manually and by using AutoCAD					2						
13ES105	WORKSHOP PRACTICE	0-0-4	2	CO1	Project based workshop to prepare different models with the aid of workshop trades i.e., Carpentry and Tin smithy											2
				CO2	Project based workshop to prepare different models with the aid of workshop trades i.e.,House wiring and Fitting											2
				CO3	Project based workshop to prepare different models with the aid of workshop trades i.e.,Fitting											2
13ES101	PROBLEM SOLVING THROUGH PROGRAMMING	3-0-2	4	CO1	Illustrate how problems are solved using computers and programming.	2				2						
				CO2	Interpret & Illustrate user defined C functions and different operations on list of data.	2				2						
				CO3	Implement Linear Data Structures and compare them.		2									
				CO4	Implement Binary Trees.		2									
13ES106	ENGINEERING MECHANICS	3-0-2	4	CO1	Understand the concept of forces and apply the static equilibrium equations.	1				2						
				CO	Analyze co-planar and non co-planar system of forces.	2				2						

				2												
				CO3	Apply the concept of centroid & centre of gravity to determine moment of inertia.	2				2						
				CO4	Analyze the rigid bodies under translation and rotation with and without considering forces.	2				2						
13ES201	THERMODYNAMICS	3-0-2	4	CO1	Apply first law of thermodynamics to non flow systems	2				2						
				CO2	Apply steady flow energy equation and second law of thermodynamics to various processes and engineering devices	2				2						
				CO3	apply principle of entropy and thermodynamic relations to thermodynamic system and process	2				2						
				CO4	Evaluate the performance of Otto, Diesel, Dual cycles and Refrigeration cycles	2				2						
13BS103	ENGINEERING PHYSICS	3-0-2	4	CO1	Explain how ultrasonic waves are produced and detected,	1										
					Determine flaws present inside a material using NDT techniques.											
				CO2	Compute the magnetic induction produced by current carrying conductors by using Biot-Savart law & Ampere's law, Compute the Lorentz force experienced by a charged particle.	1										
				CO3	Understand different aberrations in lenses and their corrections, phenomenon of interference in thin films of uniform thickness	1										
				CO4	Explain the working of optoelectronic devices like LED, photodiode, photo transistor and solar cells, Explain the phenomenon of superconductivity and its applications	1										

SYLLABUS

HUMANITIES & SOCIAL SCIENCES

ENGLISH

Course Code:13HS101 **L –T – P: 2-0-2**

Prerequisite: Nil **Credits: 3**

Kinesics

Body language--Postures –Gestures---Eye Contact

How they work in social context

Kinesics -- The Psychological aspect

Personality traits

Self-awareness---Self-confidence-----Self-esteem---Self-image----Hubris

Evaluation Components : i) Case Studies involving application of concepts

ii) Quiz questions

LEXIS & LANGUAGE PROFICIENCY

GRE word list

800 words and 200 foreign expressions

Synonyms

Analogies

Antonyms

One word substitutes

Idioms and Phrases

English Usage and Mechanics.

Correction of sentences

Sentence completion (GRE model : each blank should be filled with two synonyms out of six choices)

Jumbled sentences

Office communication

Letter writing

Formats of letter writing – full block and semi block models----Types of letters – formal and informal letters----Personal, business, Sales, collection, regret letters.

ROUTINE FORMS OF COMMUNICATION

Writing Circulars --------- Writing product and process descriptions -------- Brochures and handouts ---------- Writing/ designing User manuals

Memo writing-------- Office memos----Routing slips

Note making and note taking

Reading skills

Reading comprehension

- Reading for information

- Reading for specifics
- Skimming and scanning.

Reading speed – Practice and tests

Reading recall

TEXT BOOKS:

1.ENGLISH : an ESP curriculum 201314

2.Business Communication : Lesikar

REFERENCE:

1. Common Mistakes in English : T J Fitikides Longman Group Ltd. 1986

2.Harrap's Dictionary of English Idioms : John O.E.Clark Harrap, London 1990

3. How to read faster and better: Norman Lewis

LANGUAGE AND REASONING SKILLS

Course Code:13HS102 **L –T – P: 2-0-2**

Prerequisite: Nil **Credits: 3**

INTERPERSONAL SKILLS

The team concept – Team work processes --- Building effective teams---Stages of team formation ---- Team player styles --- Outbound training --- Objectives of outbound ---Leadership : duties and skills

CRITICAL REASONING (GRE, GMAT,CAT, NDA)

Definition --- methods and classification ---- the weak sense critical thinker --- the strong sense critical thinker

Skills: Observation--- interpretation --- analysis --- inference --- evaluation --- explanation--- metacognition

Critical thinking ---a learning paradigm --- training in ----Independent judgement----Critical thinking-----Ethical reasoning

Three types of thinking: 1. Receptive 2. Appreciative 3. Critical

Practice sessions: Analytical reasoning tests -----Situation Reaction Tests ----Verbal Reasoning Tests-----Situation Analysis tests (Problem solving and case studies)

a) Writing thematic analysis b) Structuring arguments

ENGLISH FOR THE MEDIA

Writing headlines ------ Caption writing ---- cutlines---- taglines

Writing agenda--- writing minutes---- preparing pressnotes--- briefing and debriefing

ADVANCED GRAMMAR

1.Parallelism

2. Dangling Modifiers

3. Tautology

4. Ambiguity

5. Needless shifts in tense, voice and mood.

COMPOSITION SKILLS

1.Writing Paragraphs

Topic sentence--- linkers---- transitions---- kernels, coordinates and subordinates --- sequencing ideas.
2.Writing essays--- connecting and organizing paragraphs --- Introduction--- development--- conclusion--- editing and revising
3. Precis writing
4. Writing summaries and abstracts.

TEXT BOOK:

1.Technical Communication Skills KL University 201314

REFERENCE BOOKS:

1.The Winner's Manual : Essential Life and Work Skills Dorling Kindersley London New York
2.Writing Effectively : Beth S. Neman Charles E. Merril Publishing company, Ohio
3. Smart's Handbook of Effective Writing: Harper& Brothers 1963
4.Effective Writing : Christopher Turk and John Kirkman Spon press , London New York

ECOLOGY AND ENVIRONMENT

Code: 11 BS 105 **L –T – P: 2-0-0**
Prerequisite: Nil **Credits: 2**

The Multidisciplinary nature of Environmental Studies Environment: Definition – scope – importance – Need for public awareness. Institutions and people in Environment;

Natural Resources: Renewable and Non- Renewable Resources: **Forest resources**: Use – over exploitation – deforestation – case studies- mining, dams and their effects on forests and tribal people. **Water resources**: Use – over utilization of surface and ground water – floods – drought – conflicts over water, dams- benefits and problems, Water conservation – rain water harvesting – watershed management, Cloud seeding **Mineral resources**: Use – exploitation – environmental effects – case studies. **Food resources**: World food problems – changes caused by agriculture and overgrazing – effects of modern agriculture – fertilizer-pesticide problems – water logging – salinity – case studies. **Energy resources**: Growing energy needs – renewable and non renewable energy sources – case studies. **Land resources**: Land as a resource – land degradation – man induced landslides – soil erosion and desertification. Role of an individual in conservation of natural resources.

Ecosystems: Concept of an ecosystem: Structure and function of an ecosystem -Producers – consumers – decomposers, Energy flow in the ecosystem – Ecological succession – Food chains – food webs and ecological pyramids. Types of ecosystem.

Biodiversity and its Conservation: Introduction – Definition, Levels, Values of biodiversity: India as a mega diversity nation. Hotspots of biodiversity. Threats to biodiversity: Endangered and endemic species of India. Conservation of biodiversity: Assessment of Biodiversity and its impact on Environment.

Environnemental Pollution: Définition – Causes – effects – control measures of Air pollution – Water pollution – Soil pollution – Marine pollution – Noise pollution – Thermal pollution – Nuclear hazards. **Soil waste management**. Role of an individual in prevention of pollution - case studies. **Disaster management**: floods – earthquake – cyclone – landslides. Climate change – global warming – acid rain

– ozone layer depletion – case studies. **Environmental Legislation** and objectives of 1. Environment Protection Act, 2. Air (Prevention and Control of Pollution) Act, 3.Water (Prevention and control of Pollution) Act, 4. Wildlife protection Act, 5. Forest conservation Act, 6. Biodiversity Act – Public awareness. **Environmental Impact Assessment** - overview.

TEXT BOOK

1.Deeksha Deve and P.UdayBhaskar, 2011"Environmental studies", CENGAGE Learning, Delhi

2.Erach Bharucha, 2010 "Text Book of Environmental Studies", United Grants Commission, Universities Press (India) Pvt Ltd., Hyderabad

REFERENCE BOOKS

1. Anubha Kaushik, C.P. Kaushik, 2011, Environmental Studies, New Age International
2. Benny Joseph,2009 Environmental Studies, The McGraw-Hill companies, New Delhi
3. P. Ananadam and R. Kumaravelam, Environmental Science and Engineering, SciTech Publications India, Chennai
4. G.Tyler Miller Jr,2006 CENGAGE learning, Environmental Science and Engineering
5. Mukkanti. K, 2010, Environmental Studies, S.Chand & Co, New Delhi.
6. S.V.S. Rana, 2010, Essentials of Ecology and Environmental Science,
7. P.D. Sharma, 2005. Environmental Biology, Rastogi Publications, Meerut.
8. R.Rajagopalan, 2005. Environmental Studies, Oxford University.

HUMAN VALUES

Code: 13HS 104 **L –T – P: 2-0-0**

Prerequisite: Nil **Credits: 2**

Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity - The Basic Human Aspirations, Right Understanding, Relationship and Physical Facilities, Happiness and Prosperity – Current Scenario, Method to fulfill the Basic Human Aspirations.

Harmony in the Human Being: Understanding the Human Being as Co-existence of Self ('I') and Body, Discriminating between the Needs of the Self and the Body, The Body as an Instrument of 'I', Understand Harmony in the Self ('I'), Harmony of the Self ('I') with the Body, Program to Ensure Sanyam and Svasthya.

Harmony in the Family and Society: Harmony in the Family - the Basic Unit of Human Interaction, Values in Human-to-Human Relationships, 'Trust' – the Foundational Value in Relationships, 'Respect' – as the Right Evaluation, Understand Harmony in the Society, Vision for the Universal Human Order.

Harmony in the Nature (Existence): Understand Harmony in the Nature, Interconnectedness, Self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing 'Existence is Co-existence' at All Levels, The Holistic Perception of Harmony in Existence.

Implications of the Right Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models - Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

TEXT BOOK

1. A Foundation Course in Human Values and Professional Ethics - R R Gaur, R Sangal and G P Bagaria, First Edition, Excel Books.

REFERENCE BOOKS

1. Ivan Illich, Energy & Equity , The Trinity Press, Worcester and Harper Collins, USA.
2. E F Schumacher, 1973, small is beautiful: A study of Economics as if People Mattered, Blond & Briggs, Britain
3. Sussan George, 1976, How the Other Half Dies, Penguin press, reprinted 1986, 1991.
4. Donella H. Measows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972,
5. Limits to GrowthClub of Rome's report, Universe Books.
6. P.L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publisher
7. A.N. Tripathy,2003, Human Values, New Age International Publishers
8. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow, Reprinted 2008.

BASIC SCIENCES

LINEAR ALGEBRA AND MULTIVARIATE CALCULUS

Code: 13BS101 **L –T – P: 3-0-2**

Prerequisite: Nil **Credits: 4**

Linear Algebra: Rank of a matrix, solving linear system of homogeneous & non-homogeneous simultaneous equations using elementary methods, iterative methods: Jacobi's method and Gauss - Seidal method, orthogonal, symmetric, skew-symmetric, Hermitian, Skew-Hermitian and unitary matrices, Eigen values, Eigen vectors and their properties, Cayley -Hamilton theorem (without proof), quadratic forms, Electrical circuit problems, eigen value problems.

Differential calculus: Limit, continuity, differentiability, Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem (without proofs) and their applications, Taylor's series and Maclaurin's series, Partial derivatives, Jacobian, total differentiation and their applications, chain rule, Taylor's series for function of two variables, maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

Integral Calculus: Improper integrals, Beta, Gamma functions and their relationship. Line integrals-length of the arc, double and triple integrals and applications to area, volume, mass & moment of inertia. Change of order of integration, change of variables in polar, cylindrical and spherical polar coordinates.

Vector Calculus: Scalar, vector, differentiation of vectors, gradient, divergence, curl of vector point functions. Line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems and their applications.

TEXT BOOKS

1. Advanced Engineering Mathematics (second edition), Michael Greenberg.
2. Advanced Engineering Mathematics (Tenth Edition), Erwin Kreyszig.

REFERENCE BOOKS

1. Higher Engineering Mathematics, By Dr. B.S. Grewal. Publisher: Khanna, New Delhi.
2. Elementary Differential Equations, By W.E.Boyce and R.Diprima
3. Differential equations and their applications, ZAFAR AHSAN, PHI, second edition.
4. Advanced engineering mathematics, RK Jain, SRK Iyengar, Narosa publishers, second edition.

DIFFERENTIAL EQUATIONS

Code:13BS102 **L –T – P: 3-1-0**

Prerequisite: Nil **Credits: 4**

Ordinary Differential Equations and its applications : Practical approach to differential equations, First order differential equations, Variable separable method, linear equations, Bernoulli's equation and exact differential equations. Models for the real world problems: Newton's Law of Cooling, Law of natural growth and decay. **Numerical solutions of first order ODE :** Taylor's series method, Euler's method, modified Eulers's method, Runge-Kutta method of fourth order

Second and High order differential Equations : Linear differential equations of higher order with constant coefficients, complimentary function, particular integral, method of variation of parameters, Higher order linear differential equations with variables coefficients (Cauchy's and Legendre's differential equations). Applications such as LCR electric circuits with and without e.m.f., deflection of beams, free and forced oscillations and resonance.

Laplace Transforms and its applications: Motivation, Definition, Linearity property, Laplace transforms of elementary functions, Shifting theorem, Laplace transforms of periodic, Unit step and Impulse functions. Inverse Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace transforms in solving ordinary differential equations and Simultaneous linear differential equations.

Partial Differential Equations and their applications: Formation of Partial differential equations, direct integration method, models of first order partial differential equations. Solutions of first order linear PDE: Lagrange's multiplier method, nonlinear equations of standard forms, Charpit's method. Second order linear partial differential equations with constant coefficients, complementary functions, particular integrals, homogeneous/non homogeneous linear partial differential equations. Engineering Applications dimensional wave and heat equations, two dimensional Laplace equations and their general solutions

TEXT BOOKS

1. Differential equations and their applications, ZAFAR AHSAN, PHI, Second edition.
2. Advanced Engineering Mathematics (Tenth Edition), Erwin Kreyszig.

REFERENCE BOOKS

1. Higher Engineering Mathematics, By Dr. B.S. Grewal. Publisher: Khanna, New Delhi.
2. Elementry Differential Equations, By W.E.Boyce and R. Diprima
3. Advanced Engineering Mathematics (second edition), Michael Greenberg.
4. Applied numerical methods with MATLAB for engineers and scientists, Steven C. Chapra, third edition, Tata McGraw-hill edition, New Delhi.

ENGINEERING PHYSICS

Code: 13BS103 **L –T – P: 3-0-2**

Prerequisite: Nil **Credits: 4**

ELECTROMAGNETISM: Coulomb's law, Gauss's law, Electric current and equation of continuity, motion of charged particles in electric and magnetic fields, Lorentz force, Hall effect, Cyclotron, Biot-Savart's law, Ampere's law, Faraday's law of induction, Generalization of Ampere's law.

OPTO ELECTRONIC DEVICES: Introduction – working of PN junction diode, light emitters – LED; light detectors – Photo diode, Photo transistor, photovoltaic effect, solar cells – principle and its applications.

OPTICS: Ray Optics – Lens aberrations (chromatic, achromatic, spherical, distortion, astigmatism, coma), measures of correct aberrations. Interference – coherence (spatial, temporal) in thin films of uniform thickness (derivation); Newton's rings, Application – wavelength, refractive index; Fiber Optics including Introduction, Optical fiber as a dielectric wave guide- total internal reflection,

Numerical aperture and various fiber parameters, losses associated with optical fibers, step index and graded index fibers, application of optical fibers. **Infrared principles and devices (Thermal Imaging) and Night vision devices.**

SUPERCONDUCTIVITY: Introduction, properties, Experimental facts – Resistance Vs Temperature, Meissner effect, Josephson Effect, critical parameters, type I and II superconductors, HTS, applications.

ULTRASONICS: Properties, phenomenon of Magnetostriction, production – Piezoelectric methods, detection – piezoelectric detector, acoustic grating, Kundt's tube method. Applications – Industrial (drilling, welding, soldering, cleaning, SONAR), NDT (pulse echo, transmission, resonance technique), Medical (echo cardiogram, ultrasonic imaging).

LASERS: Fundamentals of LASER- absorption of light, spontaneous emission of light, Stimulated emission of light – population of energy levels, Einstein A and B coefficients, Metastable state, population inversion, resonant cavity, excitation mechanisms, Lasing action; Properties of laser, characteristics of different types of laser; Types of laser- Solid State Laser: Ruby Laser, Gas Laser – He-Ne, Semiconductor Laser: GaAs Laser; Applications of Laser in Engineering – drilling, welding, cutting, measurement of long distances, in Medicine as a surgical tool (blood less surgery).

TEXT BOOKS

1. Physics Volume II 5th Edition, Resnick, Halliday and Krane.
2. Laud B.B., Lasers and Non-Linear Optics, New Age Publications.
3. Engineering Physics, M R Srinivasan, New Age Publications.
4. Engineering Physics, 2nd edition, P. K Palanisamy, Sci Tech publications (India) Pvt.Ltd, Chennai.

REFERENCE BOOKS

1. University Physics, 6th edition, Francis W.Sears, Mark W Zemansky, Hugh D Young, Norsa Publishing House.
2. Solid State Physics, 6th Edition, S.O.Pillai, Newage International Publishers.
3. Optics, 2nd Edition by Ajay Ghatak, Tata Mc Grahill Publications.
4. Applied Physics, P.K.Palanisamy, Scitech publications (India) Pvt.Ltd, Chennai.
5. Engineering Physics, 8th Edition, R K Gaur and S L Gupta, Dhanpat Rai Publications.

ENGINEERING CHEMISTRY

Code: 11BS104 **L –T – P: 3-0-2**

Prerequisite: Nil **Credits: 4**

Electrochemical energy systems: Basics, electrode potential, emf of a cell, reference electrodes (calomel, glass), determination of pH. Concentration cell. **Conversion and storage** of electrochemical energy: Zn-C dry cell, lead acid, nickel-cadmium, Lithium cells. Chemistry of H_2, H_2-O_2 fuel cell, future water powered car and solar cell. **Corrosion Science:** Definition, atmospheric corrosion-mechanism, electrochemical corrosion-mechanism, microscopic galvanic cell corrosion, concentration galvanic cells, galvanic cells created by differences in composition, structure and stress, factors affecting corrosion, Corrosion control-material selection, design, alteration of environment, cathodic and

anodic protection, Electroplating of Cu. **Water Technology:** Sources, impurities, hardness, types of hardness, estimation of hardness by EDTA, alkalinity – numericals, ill effects of water in steam generation, preventive measures - internal and external treatments (cold and hot lime soda processes, numericals and ion exchange process), Quality standards and treatment for drinking water desalination methods: Electrodialysis and reverse osmosis. **Polymers:** Polymers – definition - polymerisation – types - addition and condensation polymerization-free radical and coordination polymerisation mechanisms – plastics, classification – preparation, properties and uses of PVC, Teflon, Bakelite, UF resin and PET. Chemistry and applications of conducting polymers (poly acetylene and poly aniline), FRP composites and abrasives – classification, properties and uses. **Phase Rule**: Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic system (Pb-Ag).

TEXT BOOK

1.Applied Chemistry – A text book for Engineers and Technologists; Roussak, Hymand.Gesser

REFERENCE BOOKS

1.Industrial Chemistry by Helen Njeri Njenga, African Virtual University.

2.Engineering Chemistry by Mary Jain Shultz

3.Chemistry in Engineering and Technology, Volume 2, J C Kuriacose & J Rajaram, The Tata McGraw Hill, New Delhi.

BASIC MATHEMATICS

Code: 13BS104 **L –T – P: 3-1-0**

Prerequisite: Nil **Credits: 4**

Ordinary Differential Equations and its Applications : Practical approach to differential equations, First order differential equations, Variable separable method, linear equations, Bernoulli's equation. Models for the real world problems: Newton's Law of Cooling, Law of natural growth and decay. System of first order differential equations (Prey-Predator models). Applications on Chemical reactions. **Numerical solutions of first order ODE :** Taylor's series method, Euler's method, Runge-Kutta method of fourth order. **Second and High order differential Equations :**Linear differential equations of higher order with constant coefficients, complimentary function, particular integral, method of variation of parameters, **Laplace Transforms and its applications**: Motivation, Definition, Linearity property, Laplace transforms of elementary functions, Shifting theorem, Laplace transforms of periodic,. Inverse Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace Transforms in solving ordinary differential equations. **Partial Differential Equations:** Formation of Partial differential equations, direct integration method, models of first order partial differential equations.

Text Books:

1. Differential equations and their applications, ZAFAR AHSAN, PHI, Second edition.

2. Advanced Engineering Mathematics (Tenth Edition), Erwin Kreyszig,John-Wiley publications

Reference Books:

1. Higher Engineering Mathematics, By Dr. B.S. Grewal. Publisher: Khanna, New Delhi.
2. Elementry Differential Equations, By W.E.Boyce and R. Diprima.
3. Applied numerical methods with MATLAB for engineers and scientists, Steven C. Chapra,third edition, Tata McGraw-hill edition, New Delhi.
4. Differential equations and Mathematical Biology by D.S.Johns,Michael plank,B.D.Sleeman: C.R.C press

MATHEMATICAL METHODS

Code:13BS201 **L –T – P: 3-0-0**

Prerequisite: Nil **Credits: 3**

Numerical Methods: The Bisection Method, Regula-falsi method, Newton-Raphson Method, Newton's forward and backward interpolations, Lagrange's Interpolation, Newton's divided difference formula, Numerical Differentiation: first and second order derivatives by Newton's forward and backward interpolations. Numerical Integration: Trapezoidal rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule and applications.

Fourier series and transforms: Determination of Fourier coefficients, Fourier series, even and odd functions, Fourier series in an arbitrary interval, half-range Fourier sine and cosine series, Parseval's identities, Fourier integral theorem (without proof)– Fourier sine and cosine integrals. Fourier transforms, Fourier sine and cosine transforms and its properties, inverse transforms, finite Fourier transforms, discrete Fourier transforms

Z-transforms: Introduction, definition, some standard Z-transforms, initial and final value theorems, Z-transforms properties, inverse Z-transforms, convolution theorem, solution of difference equations using Z-transforms

Probability and distributions: Random variables, probability function, mathematical expectation, geometric, exponential and normal distributions.

Correlation and regression: Bivariate data, simple correlation and regression coefficients and their relations, least square's method for linear, curve linear and polynomial curve fitting

Statistical testing of hypothesis: Sampling distribution of mean and standard error, large tests (Test for an assumed mean and equality of two population means with known SD), small sample tests (t-test for an assumed mean and equality of means of two populations when observations are independent), Chi-square test - independence of attributes, goodness of fit

TEXT BOOKS

1. Advanced Engineering Mathematics (Second edition), Michael Greenberg.
2. Advanced Engineering Mathematics (Tenth Edition), Erwin Kreyszig.

REFERENCE BOOKS

1. Higher Engineering Mathematics, By Dr. B.S. Grewal. Publisher: Khanna, New Delhi.
2. Applied numerical methods with MATLAB for engineers and scientists, Steven C Chapra, third edition, Tata McGraw-hill edition.
3. Advanced engineering mathematics, RK Jain, SRK Iyengar, Narosa publishers, second edition.

COMPLEX VARIABLES & DISCRETE MATHEMATICS

Code:13BS202 **L –T – P: 3-0-0**

Prerequisite: Nil **Credits: 3**

Complex variables: Analyticity functions, Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions, Milne – Thompson method. Line integral, Cauchy's integral theorem, Cauchy's integral formula, generalized integral formula. Expansion in Taylor's series, Maclaurin's series and Laurent series. Types of singularities. Residue, Cauchy's residue theorem, evaluation of integrals by using residues, bilinear transformation and its applications. (13)

Special functions: Bessel functions, recurrence relations for $J_n(x)$, orthogonality of Bessel functions, generating function for $J_n(x)$, integral form of Bessel's function, Jacobi's series, Legendre's equation, Rodrigues's formula, Legendre polynomials, generating function for $P_n(x)$, recurrence relation for $P_n(x)$, orthogonality of Legendre polynomials. (10)

Difference equations: introduction, definition, difference equation of first and second order, formation of difference equation, linear difference equation, rules for finding C.F and P.I, Simultaneous difference equation with constant coefficients, application to deflection of a loaded string.(9)

Graph theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, multi-graphs, (Problems and Theorems without proofs) ,Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number,(Problems and Theorems without proofs)Trees, Directed trees, Binary Trees, Decision Trees,Spanning Trees: Properties, Algorithms for Spanning trees and Minimum Spanning Tree.(13)

TEXT BOOKS

1. Advanced Engineering Mathematics (Tenth Edition), Erwin Kreyszig.
2. Discrete Mathematical Structures with Applications to computer science J.P Tremblery, R.Manohar, TMH
3. Discrete Mathematical for computer Scientists & Mathematicians " J.L. Molt, A.Kandel T.P.Baker, PHI

REFERENCE BOOKS

1. Higher Engineering Mathematics, By Dr. B.S. Grewal. Publisher: Khanna, New Delhi.
2. Discrete Mathematics, Malik, Sen, 6th ed., Cengage Learning, 2004
3. Discrete Mathematics for computer science, Bogart, Stein and Drysdale, Springer, 2005

DISCRETE MATHEMATICS

Code:13BS206 **L –T – P: 3-0-0**

Prerequisite: Nil **Credits: 3**

Foundations: Basics, Sets and Operations of Sets, Relations and Functions, Some methods of Proofs and Problem Solving Strategies, Fundamentals of Logic, Logical Inferences, Methods of Proof of an Implication, First order logic and Other methods of Proof, Rules of Inference for Quantified Propositions, Mathematical Induction. **Elementary Combinatorics:** Basics of Counting, Combinations and

Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutations with constrained repetitions, Binomial Coefficients, The binomial and multinomial theorems, The principle of inclusion - exclusion. **Recurrence Relations:** Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence relations by Substituting and Generating Functions, The Method of Characteristic Roots, Solution of Inhomogeneous Recurrence Relations **Relations and Digraphs:** Relations and Directed Graphs, Special Properties of Binary Relations, Equivalence Relations, Ordering Relations, Lattices, and Enumerations, Operations on Relations, Paths and Closures, Directed Graphs and Adjacency Matrices, **Applications:** Sorting and Searching, Topological Sorting. **Graphs:** Basic Concepts, Isomorphism's and Sub graphs, trees and their Properties, Spanning Trees, Directed Trees, Binary trees, Planar Graphs, Euler's Formula, Multi graphs and Euler Circuits,Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:

1. Joe L. Mott, Abraham Kandel, Theodare P.Baker "Discrete mathematics for Computer Scientists and mathematicians" 2007, Second Edition, PHI,.

REFERENCES:

1. Kenneth H Rosen, "Discrete Mathematics and its Applications", 2007,Tata McGraw
1. Hill Publishing Company Limited, New Delhi, Sixth Edition,.
2. Tremblay J P and Manohar R, "Discrete Mathematical Structures with Applications to
3. Computer Science", 2007, Tata McGraw Hill Publishing Company Limited, New Delhi,

PROBABILITY AND STATISTICS

Code:13BS204 **L –T – P: 3-0-0**

Prerequisite: Nil **Credits: 3**

Descriptive Statistics: Frequency distribution, graphical presentation of data by histogram, frequency curve and cumulative frequency curves. Mean medium, mode and their simple properties (without derivation) and calculation of median by graphs, range, mean deviation, standard deviation and coefficient of variation.

Correlation and Regression: Bivariate data, simple correlation and regression coefficients and their relations. Limits of correlation coefficients, effect of change of origin and scale on correlation coefficient, linear regression and equations of line of regression.

Probability measure and sampling distributions: Random experiments, events exhaustive, mutually exclusive and equally likely. Definition of probability and probability measures, definitions and simple properties of binomial, Poisson and normal distributions and their inter relations. Concept of population and sample, random sample, methods of taking simple random sample. Sampling distributions of mean both σ known and σ unknown.

Statistical tests of hypothesis: Sampling distribution of mean and standard error, Large sample tests (Test for an assumed mean and equality of two population means with known SD). Small sample tests (t-test for an assumed mean and equality of means of two populations when sample observations are independent). Chi-square test –independence of attributes, goodness of fit.

Text Books:

1. Miller & Freund's, "Probability and Statistics for Engineers", Richard A Johnson, PHI, New Delhi, 11th Edition (2011).

Reference Books:

1. Fundamentals of Mathematical Statistics", S C Gupta and V K Kapoor, S Chand & Sons, New Delhi, 11th Edition
2. "Higher Engineering Mathematics", by Dr.B.S.Grewal, Khanna Publishers, 40th Edition, New Delhi.

ENGINEERING SCIENCES

PROBLEM SOLVING THROUGH PROGRAMMING

Code:13ES101 **L –T – P: 3-0-2**

Prerequisite: Nil **Credits: 4**

Scalar Types and Input/output: Character set, Declaration, Integer types, Boolean type, Character type, Pointer type, Real floating-Point types, The pointer type, Typedefs, Initialization, Introduction to formatted input and output: the printf(), scanf() function. **Operators and Expressions**: Assignment, Arithmetic operators, Implicit type conversions, Precedence and associativity of operators, Relational, Logical, Compound assignment, Increment and Decrement, Cast operators type conversions, size of operator, Conditional operators. Comma operator, bitwise operators. **Statements and Control Flow:** Flow charts for Algorithm Development, simple and compound statements, Null and Expression statements, Selection statements, Repetition statements, Jump statements. Pseudo code for Procedures and algorithm development. **Functions:** Function Definition, Function prototypes, calling functions, Standard C Header files and libraries, Mathematical functions, and Recursive functions. **Arrays:** Declaration of Arrays, How arrays are stored in memory, Initialization of arrays , Processing Data in Arrays, Passing Arrays to Functions, Introduction to Vectors and Matrices. **Pointers:** Pointer variables, pointer Arithmetic, calling functions by Reference using pointers, constant pointer, Relation between pointers and arrays, using pointers to pass One-Dimensional arrays to functions, Dynamic Allocation of Memory, Functions Returning pointers, Pointers to pointers, Array of pointers, Pointers to functions: Functions with arguments of pointers to functions, functions returning pointers to functions. Generic pointer for passing arguments with different data types, Pointer to arrays, Dynamic allocation of 2D arrays. **File Processing:** Opening and closing files, reading and writing sequential files and random access files. **Structures, Enumerations, Unions:** Structures, Enumerations, Unions**, Characters and Strings :** Character Code, Character input and output, character-Handling functions, Stings, string input and output, The continuation character, converting strings to numerical values, string manipulation: length, copy, append, compare. Searching strings. The main() function and command line arguments. **Formatted Input and Output**: Formatting output for functions in the printf() family: Printing Integers, Floating point Numbers, Characters and Strings. Formatting input for functions in the scanf() family: Input an Integer, floating point Number, Characters and Strings. **Storage classes**. Global and local variables, storage classes, External functions and variables **Preprocessing Directives:** Macro replacement, Predefined Macros, Source file inclusion, Conditional inclusion.

TEXT BOOKS

1. C forEngineers and Scientists – An Interpretive Approach byHarryH. Cheng, McGraw Hill InternationalEdition 2010.

REFERENCES

2. The C Programming Language: ANSI C Version 2nd Edition by Brian W. Kernighan, Dennis M. Ritchie, Prentice-Hall/Pearson Education, 2005
3. A Book on C: Programming in C (4th Edition) by Al Kelley, Ira Pohl, Pearson Education 2001.
4. Problem Solving and Program Design in C (6th Edition) by Jeri R. Hanly, Elliot B. Koffman, Pearson Education 2004.
5. A Structured Programming Approach Using C(3rd Edition) by Behrouz A. Forouzan, Richard F. Gilberg, West Pub., 1997.

MEASUREMENTS

Code:13ES102 **L –T – P: 3-0-2**

Prerequisite: Nil **Credits: 4**

Fundamentals of Measurements

Introduction, types of measurements, generalized measurement system with examples, static & dynamic characteristics of measurement system, types of Errors, error sources and remedies, statistical analysis of data, regression analysis (using excel) of data, distortion.

Electrical measurements

Fundamentals: Basic parameters like Current, Voltage, RMS value, Average value, Power, Power factor, Resistance, Impedance, Inductance, and Capacitance.

Transduction principles: Magnetic, Induction, Electrostatic, Thermoelectric, Hall Effect.

Measurements using: PMMC, Extension of range, Rectifier type, MI, EDM, Electrostatic, Thermocouple type, Wheatstone bridge, Anderson's bridge, Maxwell's and Schering Bridge.

Project ideas.

Electronic measurements

Fundamentals of Cathode Ray Oscilloscope:

Block diagram, CRO probes, Delay line, types of Oscilloscopes.

Measurement of: Signal voltage, Current, Phase & Frequency using Lissajous patterns, Industrial applications of CRO.

Electro-physiological measurements: Electrodes, ECG – EEG – EMG – ERG typical waveforms.

Project ideas.

Mechanical measurements

Fundamentals: Displacement, Velocity, Speed, Force, Moment, Torque, Stress, Strain, Pressure, Flow, Temperature, Viscosity, Humidity.

Measurement of:Displacement – Flapper-Nozzle technique, LVDT, Interferometer.

Speed – Tachometer, Magnetic & Photo pick up. Force & Torque – Load cells, Prony brake.

Stress & Strain – Mechanical Strain gauge, Resistance strain gauge. Pressure – Manometers, McLeod gauge, Bourdon pressure gauge. Flow – Notches, Orifice meter, Rotameter, Turbine meter, Hot-wire anemometer. Temperature – Thermometer, Thermocouples, Thermistors, Pyrometers.Viscosity – Psychrometers, Falling ball type, Rotating vane type. Humidity – Hygrometers.

Project ideas.

TEXT BOOKS/REFERENCES:

1. Experimental methods for engineers – JP Holman – 7e – TMH
2. Mechanical measurements – Thomas G Beckwith – 6e – Pearson
3. Introduction to Instrumentation and Measurements– Robert B Northrop – 2e – CRC Press
4.Measurements and Instrumentation principles– Alan S Morris

5.Hand Book of Bio-Medical instrumentation– R.S. Khandpur, TMH
6.A course in electrical & electronic measurements and instrumentation – AK Sawhney.

ENGINEERING MATERIALS

Code:13ES103 **L –T – P: 3-0-0**

Prerequisite: Nil **Credits: 3**

Crystal Structure And Crystallography: Crystal lattice – primitive and unit cell – crystal systems – Bravais lattice – Miller indices – Structure of Crystal – Simple Cubic, Body Centered Cubic, Face centered Cubic and Hexagonal Close Packed structure. Sodium chloride structure, X ray Spectrum – Moseley's law – diffraction of X-rays by crystals – Bragg's law in one dimension – Experimental methods in X-ray diffraction – Laue's method, rotating crystal method – powder photograph method – point defects - line, surface and volume defects – effects of crystal imperfections, Applications.

Magnetic Properties Of Materials:Basic concepts – magnetic moment, susceptibility, permeability; Types of materials – Diamagnetic, paramagnetic, ferromagnetic, anti ferromagnetic and ferrimagnetic materials, Weiss theory of ferromagnetism, domain theory of ferro magnetism, Ferrites, Hysteresis effect; Soft and hard magnetic materials; Applications- Fabrication of transformers, motors, magnetic storage devices- magnetic memories, magnetic tapes, magnetic recorder, relays and sensors

Electrical Properties Of Materials: Introduction to electrical materials – Band theory of solids-conducting materials -Ohm's law, electrical conductivity, electrical resistivity –, semiconducting materials, types – properties and effects of impurities and temperature. Insulating materials –. Requirements of good insulating materials: Some insulating materials – glass, mica, ceramics, asbestos, resins, rubber, transformer oil. Introduction to Dielectric materials – Polar and non-polar dielectrics, Dielectric constant, Dielectric Polarization – electronic, ionic, orientation or dipolar and space charge polarizations(qualitative treatment), frequency and temperature dependence of polarization, ferro electricity- spontaneous polarization and structure of barium titanate .Piezo electricity & Piezo electric materials- applications.

Mechanical And Thermal Properties Of Metals: Definitions – elasticity, plasticity, Stress, strain, strength, hardness, brittleness, ductility, creep, fatigue, fracture, and toughness. Relationship between stress and strain; Hardness – Hardness tests, Heat treatment processes (Tempering, Quenching Nitriding, Hardening), specific heat and thermal conductivity.

Micro And Nano Materials: Agile materials for microwave components, Terahertz meta materials and its applications (Radar Sensors, and Future wireless communications), Basic concepts of Nano Science and technology, Size effects of materials, Nano materials classification and Properties, Nano material preparation by sol-gel method and Chemical Vapor Deposition method..Introduction to Carbon nano tubes (CNT's), Synthesis of CNT's by bottom up Approach, Properties of Carbon nano tubes and their applications in science and techno technology.

BOOKS

1.Materials Science and Engineering by Callister, WILEY Publishers(2008)
2.Introduction to Solid State Physics – C.Kittel, John Wiley(2004)
3.Materials Science for Engineering Students-FISCHER,,Elsevier Publishing.USA

REFERENCE BOOKS:

1.Material Science by V.Raghavan (TMH)

2.Solid State Physics, 6th Edition, S.O.Pillai, New age International Publishers

3.Material Science – M. Arumugam, Anuradha Agencies, (2004)

4.Solid State Physics – A.J.Deckker(2004)

ENGINEERING GRAPHICS WITH CAD

Code:11ES104 **L –T – P: 0-0-4**

Prerequisite: Nil **Credits: 2**

Introduction to Computer Aided Drafting, AutoCAD Commands,Types of lines, Dimensioning, Theory of Projection – Elements of projection, planes of projection, methods of projection.

Projection of Points and Straight Lines – Projection of points,projections of straight lines, various positions of straight lines w.r.t. reference planes, traces of lines.

Projection of Planes – Types of planes, projection of planes, various positions of planes w.r.t reference palnes (Use First angle method of projection)

Projection of Solids – Types of solids, projection of solids in simple position, projection of solids with axis inclined to one reference plane and parallel to other. (Use First angle method of projection)

Orthographic Projection –Introduction to Orthographic projections,types of surfaces, invisible lines, precedence of lines, steps to draw orthographic views, orthographic projection of different objects. (Use First angle method of projection)

Isometric projection – Theory of isometric projection, isometric view, isometric views from orthographic views for simple objects. (Use First angle method of projection)

BOOKS:

Notes will be made available

REFERENCE BOOKS

1. Engineering Drawing by N.D.Bhatt
2. Engineering Drawing with an introduction to AutoCAD by Dhananjay A Jolhe,Tata McGraw-Hill Publishing company limited
3. Engineering Graphics with AutoCAD by D. M. Kulkarni, A. P. Rastogi and A.K.Sarkar; PHI Learning Private Limited, New Delhi, 2009.

WORKSHOP PRACTICE

Code:13ES105 **L –T – P: 0-0-4**

Prerequisite: Nil **Credits: 2**

General Introduction, Safety rules and regulations, First aid practice

MODULE -1:

CARPENTRY - Hands on practice on wood working operation using hand tools

FITTING - Hands on practice on preparing fits.

TIN SMITHY- Hands on practice on sheet metal working.

FOUNDARY - Hands on practice on moulding by preparing a sand mould

BASIC ELECTRONICS- Hands on practice on Soldering by mounting electronic components on leg board and related experiments.

HOUSE WIRING- Hands on practice on House wiring connections

MODULE 2:

Demonstration on Power tools in construction, Wood working, Electrical and Mechanical Engineering practices.

MODULE -3:

Information technology covering hardware:

Task 1: Identify the peripherals of a computer components in a CPU and its functions

Task 2: Disassemble and assemble the PC back to working condition

Task 3: Loading of operating system**.**

TEXT BOOKS

1. K.L.U Workshop Practice Lab manual.
2. P.Kannaiah and K. L. Narayana "Engineering Practices Laboratory", 2009, SciTech Publications, Chennai.
3. Anfinson, David and Ken Quamme(2008), IT Essentials PC Hard ware and Software Companion Guide, CISCO Press, Pearson Education

REFERENCES

1. K. Venkata Reddy, "Workshop Practice Manual", Sixth edition, 2011 print, BS Publications, Hyderabad.
2. B S Nagendra Parashar and R K Mittal, "Elements of Manufacturing Process", 2010 print, Prentice Hall of India, New Delhi
3. Gupta , Vikas (2010),Comdex Information Technology Course Tool Kit – WILEY Dream tech
4. Chris Grover, Mathew MacDonald, E.A., Vander Veer, (2007), Micro soft Office 2007: The Missing Manual, O reilly Media.

ENGINEERING MECHANICS

Code:13ES106 **L –T – P: 3-0-2**

Prerequisite: Nil **Credits: 4**

Force systems: Introduction, Forces acting at a point, Moment of a force about a point and about an axis, Couple moment, General case of forces in a plane.

Equilibrium of force system: Free body diagram, Equilibrium of a two-force and three force body in a plane, Analysis of trusses by method of joints and sections.

Force systems in space **(**Vector approach), forces in space-Resultant

Friction: Laws of Coulomb friction, problems involving dry friction, wedge friction.

Properties of areas: Centroid and Centre of gravity, Moments of inertia of an area, polar moment of inertia, Mass moment of inertia.

Virtual work: Principle, Potential energy and equilibrium, stability.

General principles of Dynamics: Kinematics of Rectilinear, Curvilinear and Rotary motion of a particle. Kinetics of Rectilinear, Curvilinear and Rotary motion of a rigid body in a plane.

D'Alembert's principle- Motion of the mass center, Momentum and Impulse,

Work and energy methods, plane motion.

TEXT BOOKS:

1."Vector Mechanics for Engineers (in SI units) Statics & Dynamics" by F.P. Beer and E.R. Johnston – Mc Graw Hill Publications.

2."Engineering Mechanics Statics & Dynamics" by Singer – B S Publications.

3."Engineering Mechanics" by S.Timoshenko, D.H.Young, J.V.Rao McGraw hill companies. Fourth edition.

REFERENCE BOOK:

1."Engineering Mechanics Statics & Dynamics" by R.C.Hibbeler – Pearson Publications

THERMODYNAMICS

Code:13ES201 **L –T – P: 3-0-0**

Prerequisite: Nil **Credits: 3**

Fundamental Concepts and Definitions: Thermodynamic system and control volume, Macroscopic and Microscopic points of view. Thermodynamic properties, processes, state, path, cycle. Thermodynamic equilibrium and Quasi-static process. Reversible and Irreversible processes, Zeroth law, concept of temperature.

Work and Heat: Definition of work, units, work done at the moving boundary of system, work done in various non-flow processes, definition of heat, units, comparison of heat and work.

First Law for Non-Flow Systems: First law of thermodynamics for a closed system undergoing a cycle and for a change of state, energy-a property of system, internal energy and enthalpy. Specific heat at constant volume and constant pressure.PMM1 and Converse of PMM1.

First Law for Flow Systems: Control mass and control volume, First law of thermodynamics for a control volume, Steady flow energy equation and applications to engineering equipment.

Second Law of Thermodynamics: Thermal reservoirs, Kelvin-Plank and Clausius statements of second law of thermodynamics, Equivalence of Kelvin-Plank and Clausius statements, Carnot cycle, Reversed heat engine, Carnot's theorem, Corollary of Carnot's theorem, Absolute thermodynamic temperature scale, problems.

Entropy: Definition of entropy, Clausius theorem, entropy change in reversible process Temperature-entropy plot, Inequality of Clausius, entropy change in an irreversible process, principle of increase of entropy, Applications of entropy principle, entropy change of an ideal gas, Availability and Irreversibility.

Thermodynamic Relations: Maxwell's equations, TdS equations, Difference in heat capacities, Ratio of heat capacities, energy equation, Clausius - Clapeyron equation

Air standard cycles: Otto, Diesel, Dual and Brayton cycles- Performance evaluation and mean effective pressure, Reversed Carnot cycle and Bell Coleman cycle.

TEXT BOOKS

1. Thermodynamics, An Engineering Approach - Younus A Cengel & Michael Boles, (6E) Tata McGraw Hill, New Delhi.
2. Engineering Thermodynamics - P.K.Nag, (4E) Tata McGraw Hill, New Delhi.

REFERENCE BOOKS

1. Fundamentals of Thermodynamics - G.J. Van Wylen., Sonntag (6E), Wiley India publications.
2. Engineering Thermodynamics Coheand Rogers (5 E)-Pearson education India limited.
3. Heat and Thermodynamics - Zemansky, Mc Graw Hill (5E).

OBJECT ORIENTED PROGRAMMING

Code:13ES202 **L –T – P: 3-0-2**

Prerequisite13ES101 **Credits: 4**

(for ECE , ECM and CSE): (for others see below)

Overview of C: Origins of C++, Object Oriented Concepts, Fundamentals of C++, Introduction to C++ Classes,Inheritance, Polymorphism- Function overloading, Operator overloading, Constructors,

Destructors. Classes & Objects: Classes vs. Structures, Classes vs. Unions, Friend functions, Friend Classes, Inline functions, Parameterized Constructors, Static Class Members, Scope Resolution Operator, Passing Objects to Functions, Returning Objects, Object assignment. Array of Objects, Pointers to objects, this Pointer, References: Reference parameters, passing references to objects, returning references, independent references, references to derived types, restrictions to references. Dynamic Memory Allocation Operators: initializing allocated memory, allocating arrays, allocating objects". Function Overloading, Overloading constructors, Copy Constructors, Finding the address of an overloaded function, Default Function Arguments, Function overloading & Ambiguity. Operator overloading: creating a member operator function, operator overloading using a friend function, Overloading new and delete, overloading some special Operators. Inheritance: Base class Access Control, inheritance & Protected Members, Inheriting Multiple Base classes, Constructors, Destructors and inheritance, Granting Access, Virtual Base Classes. Virtual Functions and polymorphism, Virtual Attributes, Hierarchical Virtual Function, Pure Virtual Functions, Using Virtual Functions, Early vs. Late binding. Templates: Generic Functions, Applying Generic Functions, Generic Classes. Exception Handling: Fundamentals, options, Un-caught exception function, applying exception handling. I/O System Basics: C++ streams, Stream classes, Formatted I/O, Creating user defined inserter and extractors, Creating user defined manipulator functions. File I/O: Reading & writing Text Files, Unformatted and Binary I/O, Random Access, I/O Status. Run-Time Type Identification, Casting Operators, dynamic cast. Namespaces: fundamentals, using, the std namespace, Conversion Functions, const Member Functions and mutable, Volatile Member Functions, Explicit Constructors, Using the ASM Keyword, Linkage Specification. String Class: String Member Functions, Searching Strings, Comparing Strings. STL: Introduction, Containers, Algorithms, Iterators.

Text Book:

1. C++ The Complete Reference by Herbert Schildt, 4thedition,Reference Books:
2. The C++ Programming Language by Bjarne Stroustrup, Addison-Wesley Professional; 4th edition, 2012.
3. C++ How to Program by Deitel HM and Deitel PJ., 9th edition, PHI.
4. Object-Oriented Programming in C++ by Robert Lafore, 4th edition, Sams Publishing, 2001
5. Object-Oriented Programming using C++ by Joyce Farrell, 2008
6. A Complete Guide to Programming in C++, Ulla Kirch-Prinz, Peter Prinz, Jones & Bartlett
7. Big C++, Horstmann,John Wiley,2006.

(for all B.Tech except CSE,ECE and ECM of 2013 batch and for all B.Tech of 2014 batch):

Introduction: Object-Oriented Programming, OOP Principles, Encapsulation, Inheritance and Polymorphism Java as a OOPs & Internet Enabled language, The Byte code, Data types, Variables, Dynamic initialization, scope and life time of variables, Arrays, Operators, Control statements, Type Conversion and Casting, Compiling and running of simple Java program. Classes and Objects: Concepts of classes and objects, Declaring objects, Assigning Object Reference Variables, Methods, Constructors, Access Control, Garbage Collection, Usage of static with data and methods, usage of final with data, Overloading methods and constructors, parameter passing - call by value, recursion, Nested classes. Inheritance: Inheritance Basics, member access rules, Usage of super key word, forms of inheritance, Method Overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, The Object class. Packages and Interfaces: Packages, Classpath, Importing packages, differences between classes and interfaces, Implementing & Applying interface. I/O Streams- file, byte streams, character streams, Exception Handling: Exception Handling fundamentals, Types of Exceptions, Usage of try and catch, throw, throws and finally keywords, Introduction to Multithreading.

Text books:

1. Herbert Schildt, "The Complete Reference Java2", 5th edition TMH, 2002.
2. Timothy A. Budd, "An Introduction to Object-Oriented Programming", 3/E, Pearson, 2008.

NETWORK THEORY

Code:13ES203 **L –T – P: 3-0-2**

Prerequisite: Nil **Credits: 4**

Circuit Concept, R, L, C parameters, concept of mutual inductance, dot convention, coefficient of coupling, voltage and current sources, source transformation, specifications of Active and Passive elements, voltage – current relationship for passive elements Kirchoff's Laws, Response of R-L, R-C, R-L-C (Series and parallel combinations) for impulse, step, ramp excitations, Magnetic Circuits – Analysis of series and parallel magnetic circuits AC Circuits: RMS and average values and form factor of different periodic wave forms (Sinusoidal, rectangular, triangle and sawtooth), steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation, concept of reactance, impedance, susceptance and Admittance, Phase and Phase difference, concept of power factor, Real and Reactive powers, j-notation, complex and polar forms of representations, complex power Series and parallel resonance, bandwidth, selectivity, Q factor, current locus diagrams Three phase circuits: phase sequence, star and delta connection, Relation between line and phase voltages and currents in balanced systems, Analysis of balanced and unbalanced 3 phase circuits, star/delta transformation Network topology: definitions, graph, tree, basic cut-set and basic tie set matrices for planar network, Loop and Nodal methods of analysis of networks (including coupled circuits), duality and dual networks. Network theorems: (without proof): Superposition, Reciprocity, Thevinin's, Norton's, Maximum power transfer. Application to steady state analysis, network functions, driving point and transfer functions –poles and Zeros one port and two port networks Two port network parameters: Z, Y, Transmission and Hybrid parameters and their relationships Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C and sinusoidal excitations, initial conditions, time domain and Laplace transform methods of solutions.

TEXT BOOKS

1. M. E. Van Valkenberg, "Network Analysis", Prentice-Hall of India Pvt. Ltd., 3rd edition, 1998
2. William Hayt and jack E. Kemmerly, "Engineering circuit analysis" Tata Mc Graw-Hill Companies, 5th edition.

REFERENCE BOOKS

1. Charles K Alexander, Mathew N O Sadiku, "Fundamentals of Electric Circuits", Tata McGraw Hill Education Pvt. Ltd., Third Edition.
2. D. Roy Choudhury, "Networks and Systems", New Age International Limited Publishers,
3. J. Edminister & M. Nahvi, "Electric circuits", Schaum's outlines Tata Mc Graw Hill Publishing Company Ltd., 1999.
4. Mohd. H. Rashid, "Spice for circuits & Electronics using PSPICE", Prentice-Hall of India, 2nd edition.

DATA STRUCTURES

Code:13ES204 **L –T – P: 3-0-2**

Prerequisite: 13ES101 **Credits: 4**

Algorithm Analysis: Mathematical Background, Model, Analyze, Running Time Calculations, Lists**. Stacks and Queues:** Abstract Data Types (ADTs), The List ADT, Implementation of list, The Stack ADT, The Queue ADT. **Trees:** Preliminaries, Binary Trees, The Search Tree ADT—Binary Search Trees, AVL Trees, Splay Trees, Tree Traversals (Revisited), B-Trees-INSERTIONS **Hashing:** General Idea, Hash Function, Separate Chaining, Hash Tables without Linked Lists, Rehashing. **Priority Queues (Heaps):** Model, Binary

Heap, Applications of Priority Queues. **Sorting:** Preliminaries, Insertion Sort, A Lower Bound for Simple Sorting Algorithms, Shell sort, Heap sort, Merge sort, Quick sort, Bucket Sort, External Sorting. **Graph Algorithms:** Definitions, Topological Sort.

Text Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2008 , Third Edition, Pearson Education.

Reference Books:

1. A.V.Aho, J. E. Hopcroft, And J. D. Ullman, "Data Structures And Algorithms", Pearson Education, First Edition Reprint 2003.
2. Horowitz, Sahni, Anderson Freed, "Fundamentals of datastructures in C" , Second Edition-2007.
3. R. F. Gilberg, B. A. Forouzan, "Data Structures", Second Edition, Thomson India Ed ition, 2005
4. Robert Kruse, C.L. Tondo, Bruce Leung, Shashi Mogalla, "Data Structures & Program Design in C", Fourth Edition-2007.
5. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenebaum, "Data Structures using C & C++ " , Second Edition-1995.
6. Michael T.Goodrich,Roberto Tamassia, David M. Mount, Data Structures and algorithms in C++,2nd edition,John Wiley,2011.

SIGNAL PROCESSING

Code:13ES205 **L –T – P: 3-0-2**

Prerequisite: Nil **Credits: 4**

Introduction to Discrete Time (DT) Sequences and Systems: Introduction to Signal processing: Elements of Continuous Time and Digital Signal Processing systems. Advantages of DSP systems over Analog processing systems.**Sampling and Reconstruction:** Graphical and analytical proof of sampling theorem. Reconstruction of signal from its samples.Flat Top Sampling, Effect of under sampling-Aliasing.Sampling of Band-pass Signals. **DT Sequences:** Representation of DT sequences, some elementary DT sequences, Classification of discrete time sequences and Elementary manipulation of DT sequences. **DT Systems:** Input-output Description of Systems, Classification of DT systems: Linearity, Static, Time-Invariant, Causality and Stability of systems. Interconnection of DT system.

Analysis of LTI Systems: Analysis of Discrete-Time Linear Time-Invariant (LTI) Systems: Response of LTI systems to arbitrary inputs:The Convolution Sum. Properties of Convolution, Causality and Stability of LTI systems in terms of impulse response.**Frequency domain representation of discrete time signals and systems:** Discrete Time Fourier Transform (DTFT) and its Properties. **Review of Z-transforms**, System Function, Impulse Response, Causality and Stability of LTI systems in terms of System Function. **Applications of Z.Transforms**: Solutions of Linear Constant Coefficient Difference Equations. **Power and EnergyDensity Spectrum** Relations of LTI systems (both in continuous and discrete) **Fourier Transformation of Discrete Time Sequences: Discrete Fourier Series (DFS):** Introduction to DFS, DFS representation of periodic sequences. Properties of discrete Fourier Series. **Discrete Fourier Transforms (DFT):** Introduction to DFT, Properties of DFT, Circular convolution Linear convolution using DFT, Computation of DFT. Relation between Z-Transform and DFS. **Fast Fourier Transforms (FFT):** Introduction to FFT - Radix-2 Decimation in Time (DIT) and Decimation in Frequency (DIF) FFT Algorithms, Inverse FFT using direct FFT. **Design and Realization of Digital IIR Filters: Digital Filter-IIR Design:** Introduction, properties of IIR filters, Normalized Butterworth and Chebyshev Functions. Design of Digital filters using Bilinear Transformation, Impulse invariance and Step Invariance Transformation Methods, Frequency Transformation in Analog and Digital

Domains.**Realization of IIR system structures:** Basic Elements of Digital Systems, Realization of Direct form structures, Cascade form Structures and Parallel form structures. **Design and Realization of Digital FIR Filters: Digital Filter-FIR Design:** Introduction, Characteristics of Linear Phase FIR filters, frequency Response, Designing FIR filters using Windowing Methods. Frequency Sampling Method, Comparison of IIR & FIR Filters. **Realization of FIR system structures:** Realization ofDirect Form, Transposed Direct Form, Direct form for Linear-Phase FIR systems and Cascade Form structures.

TEXT BOOKS

1.John G Proakis, Dimtris G Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Pearson Education.

2. Ludeman" Fundamentals of Digital Signal Processing", Wiley India Pvt. Ltd.

REFERENCE TEXT BOOKS

1.Alan V Oppenherim, Ronald W Schafer, John R Back, Discrete Time Signal Processing, Pearson Education, 2nd Edition.

2.Emmanuel C Ifechor, Digital Signal Processing, Pearson Education, 2nd Edition.

3.Andreas Antonious, " Digital Signal Processing , Signals, Systems and Filters " Mc-Graw Hill,

4.Dimitris G. Manolakis, Vinay K. Ingle, "Applied Digital Signal Processing : Theory and practice", Cambridge University Press

5. Kumar, A. Anand, "Digital Signal Processing", PHI.

SIMULATION TEXT BOOKS

1. Vinay . Ingle, John G Proakis, "Digital Signal Processing Using Matlab" ,Pearson
2. Paul Tobin, "Pspice for Digital Signal Processing", Morgan & ClayPool.
3. Nasser Kehtarnavaz, Namjin Kim, "Digital Signal Processing System Level Design using LabVIEW", Elsevier.
4. E. S. Gopi, "Mathematical Summary for Digital Signal Processing Applications with Matlab", Springer
5. Forester W. Isen, "DSP for MATLAB™ and LabVIEW Volume III Digital Filter Design", Morgan & Clay Pool
6. Robert J. Schilling,Sandra L. Harris,"Fundamentals of Digital Signal Processing Using MATLAB, 2e ",Cengage Learning
7. Samuel D. Stearns, Don R. Hush,"Digital Signal Processing with Examples in MATLAB, 2e ",CRC Press, Inc.

PROFESSIONAL CORE

OPERATING SYSTEMS

Course Code: 13CS203 **L –T – P: 3-0-2**

Prerequisite: NIL **Credits: 4**

Introduction to Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Distributed Systems, Special-Purpose Systems. **Operating-System Structures-** Operating-System Services , User Operating-System Interface, System Calls , Types of System Calls, System Programs , Operating-System Design and Implementation, Operating-System Structure, Virtual Machines, Operating-System Generation, System Boot. **Processes-Concept**, Process Scheduling, Operations on Processes, Interprocess Communication, Examples of IPC Systems, Communication in Client-Server Systems **Systems Programming:** System Calls and library functions, introduction, Error Handling: perror (), Regular File Management, Process Management, Signals, Interprocess Communications. **Multithreaded Programming-** Multithreading Models, Thread Libraries,

Threading Issues. **Process Scheduling-** Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling. **Process Synchronization-**The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples, and Atomic Transactions. **Deadlocks-** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention. Deadlock Avoidance, Deadlock Detection. Recovery from Deadlock. **Memory Management Strategies-** Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Example: The Intel Pentium **Virtual Memory Management-** Demand Paging , Page Replacement , Allocation of Frames , Thrashing , Memory-Mapped Files , Allocating Kernel Memory. **File-System -** The Concept of a File, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection. **File system Implementation-** File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, NFS, Example: The WAFL File System.

Text Books:

1.Silberschatz & Galvin, 'Operating System Concepts', 9th edition, Wiley 2012.

Reference Books:

1. W.Richard stevans,pearson,"Advanced programming in the Unix environment", 2nd edition, Pearson 2009 .
2. William Stallings ,"Operating Systems: Internals and Design Principles" ,6th edition, pearson 2009 .
3. Albert S. Woodhull , Andrew S.Tanenbaum ,"Operating Systems: Design and Implementation",Pearson Education International, 2009**.**
4. Harvey M. Deitel , Paul J. Deitel , David R. Choffnes: "Operating Systems" ,3/E, Pearson/Prentice Hall, 2004.
5. Crowley, "Operating System : A Design-Oriented Approach", : 1/E, Tata Mcgraw Hill Education Private Limited (2009)
6. Gary Nutt:"Operating Systems",3/E Pearson (2004) .
7. Graham Glass, King Ables ,"Linux for Programmers and users", Prentice Hall(2006)

DATABASE MANAGEMENT SYSTEMS

Course Code: 13CS204 **L –T – P: 3-0-2**

Prerequisite: 13ES204 **Credits: 4**

Introduction To Database Systems, The Entity -Relationship Model, The Relational model, Relational Queries, Relational Algebra And Calculus, SQL: Queries, Programming, Triggers, Query -By-Example (QBE), Data Storage And Indexing, Storing Data: Disks And Files, File Organizations And Indexes, Tree -Structured Indexing, Hash-Based Indexing, Query Evaluation, External Sorting, Evaluation Of Relational Operators, Introduction To Query Optimization, A Typical Relational Query Optimizer, Database Design, Schema Refinement And Normal Forms, Transaction Management Overview, Concurrency Control, Crash Recovery.

Text Book:

1.Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 3/E, Tata Mcgraw Hill 2004.

Reference Book:

1.A Silberschatz , Henry F Korth, S. Sudarshan ,"Database System Concepts" , Fifth Edition, Tata Mcgraw-Hill, 2003 .

2.Elmasri & Navathe Fundamentals of Data base Systems, 6th edition, Pearson2008.

3.Thomas M. Connolly,"Database Systems: A Practical Approach to Design, Implementation and Management" 5th Edition, Pearson (2008).
4.Hector Garcia-Molina Jeffrey D. Ullman ,"Database Systems: The Complete Book", 2/e, pearson2008.
5.Jan L. Harrington, "Relational Database Design and Implementation: Clearly Explained", 3/e, Morgan Kaufmann Publishers, 2009.

COMPUTER NETWORKS

Course Code: 13CS205 **L –T – P: 3-0-2**
Prerequisite: NIL **Credits: 4**

Use of Computer Networks, Network Hardware, Network software, Reference models, Example Networks Physical Layer: The theoretical basis for Data Communication, Guided Transmission media, Modems, ADSL, Trunks and Multiplexing, switching Data Link Layer: DLL design issues. Error Detection and Correction, Elementary data link protocols, sliding window protocols. Medium Access Control Sub layer: Channel allocation problem, multiple access protocols, Ethernet, Data link Layer switching Network Layer: Network layer design issues, Routing algorithms, congestion control algorithms, Quality of service, Internetworking, network layer in the Internet Transport Layer: Transport service, Elements of transport protocols, Internet transport protocols: TCP & UDP, Performance Issues Application Layer: Domain Name System, Electronic Mail, World Wide Web.

Text Books:

1. Andrew S.Tanenbaum, Computer Networks, PHI, Fourth Edition.2003

Reference Books:

1.William Stallings, Data and Computer Communications, 7/e, Pearson Edition, ,2007
2.Behrouz A. Fourouzan, TCP/IP Protocol Suite, Tata McGraw Hill, Third Edition, 2006.
3.Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Elsevier, 2012.
4.James F. Kurose, Keith W. Ross, "Computer Networking:A Top-Down Approach", Pearson Education, 2012.

SOFTWARE ENGINEERING

Course Code: 13CS301 **L –T – P: 3-0-2**
Prerequisite: 13ES202 **Credits: 4**

Software and Software Engineering: Nature of software, software application domains, unique nature of web applications, software engineering, software process, software engineering practice, software myths. **Process Models:** Generic process model, prescriptive process models, specialized process models, unified process, personal and team process models, product and process. **Agile development:** Agility, agile process, extreme programming and other agile process models. **Modeling:** Core principles, principles that guide each frame work activity. **Understanding Requirements:** Identify stakeholders, recognizing multiple view points, Eliciting requirements, building requirement model, negotiating requirements, validating requirements. **Requirement Modeling. Design concepts:** Design process, Design concepts, design model. **Architecture Design:** Software architecture, architectural styles, architectural design, assessing alternative architectural designs, architectural mappings using data flow. **Component-level design:** Designing class based components, conducting component level design. **User interface design:** The golden rules, user interface analysis and design, interface analysis, interface design steps**. Quality concepts:** software quality, software quality dilemma, achieving software quality. **Review Techniques,** Software **quality assurance:** Elements of software quality assurance, sqa tasks, goals. Formal approaches. **Software testing strategies:** A strategic approach to software testing,

strategic issues, test strategies for conventional software, validation testing, system testing, testing **conventional applications.**

Text Books:

1.Roger S.Pressman ,"Software Enginering – A Practitioner's Approach 7th Edition, Mc Graw Hill(2010).

Reference Books:

1.Ian Sommerville,'Software Engineering', Sixth Edition,Pearson Education(2001).
2.Software Engineering: Modern Approaches by, Wiley; 2 edition (April 5, 2010).
3.Shari Lawrence Pfleeger , Joanne M. Atlee :"Software Engineering: Theory and Practice" ,4/e, Prentice Hall(2009).
4.Software Engineering Best Practices: Lessons from Successful Projects in the Top Companies by Capers Jones, McGraw-Hill Osborne Media; 1 edition (October 8, 2009).
5.James F. Peters, Witold Pedrycz:"Software Engineering An Engineering Approach", 2/e, John Wiley, 2000.
6.Stephen R. Schach:" Object-Oriented and Classical Software Engineering,8/e, McGraw-Hill Science/Engineering/Math (2010) .
7.Carlo Ghezzi, Dino Mandrioli, Mehdi Jazayeri:"Fundamentals of Software Engineering", 2/e, PHI Learning. 2003.
8.Richard Schmidt, "Software Engineering: Architecture-Driven Software Development", Elsevier Science & Technology Books, 2013.

DESIGN OF ELECTRONIC SYSTEMS

Course Code: 13EC201 **L –T – P: 3-0-2**

Prerequisite: 13BS103 **Credits: 4**

Introduction to Electronics and Design: Introduction, History of Electronics, Electronic Systems, Electronic Signal and Notation, Classification of Electronic Systems, Specifications of Electronic Systems, Types of Amplifiers, Design of Electronic Systems, Design of Electronic Circuits, Electronic Devices, Emerging Electronics. **Introduction to Amplifiers and Frequency Response:** Introduction, Amplifier Characteristics, Amplifier Types, Cascaded Amplifiers, Frequency Response of Amplifiers, Miller's Theory, Frequency Response Methods, Amplifiers Design. **Introduction to operational Amplifiers and Applications:** Introduction, Characteristics of Ideal Op-Amps, Analysis of Ideal Op-Amp Circuits, Op-Amp Applications- Integrator, Differentiator Op-Amp Circuit Design. **Semiconductor Diodes:** Introduction, Ideal Diodes, Transfer Characteristics of Diode Circuits, Practical Diodes, Analysis of Practical Diode Circuits, Modeling of Practical Diodes, Zener Diodes, Light-Emitting Diodes, Power Rating, Diode Data Sheets. **Applications of Diodes:** Introduction, Diode Rectifier, Output Filters for Rectifiers, Diode Peak Detectors and Demodulators, Diode Clippers, Diode Clamping Circuits, Diode Voltage multipliers, Diode Function Generators. **Semiconductor and PN Junction Characteristics:** Introduction, Semiconductor Materials, Zero-Biased PN Junction, Reverse-Biased PN Junction, Forward-Biased PN Junction, Junction current Density, Temperature Dependences, High-Frequency AC Model. **Field-Effect Transistors:** Introduction, Junction Field Effect Transistors, Metal Oxide Field-Effect Transistors, Enhancement MOSFETs, Depletion MOSFET's, MOSFET Models and Amplifier, A MOSFET Switch, DC Biasing of MOSFET's, Common-Source (CS) Amplifiers, Common-Drain Amplifiers, Common-Gate Amplifiers, Multistage Amplifiers, DC Level Shifting and Amplifier, Frequency Response of MOSFET Amplifiers, Design of MOSFET Amplifiers. **Bipolar Junction Transistors and Amplifiers:** Introduction, Bipolar Junction Transistors, Principles of BJT Operation, Input and Output Characteristics, BJT Circuit Models, The BJT Switch, DC Biasing of Bipolar Junction Transistors, Common Emitter Amplifiers, Emitter Followers, Common Base Amplifiers, Multistage Amplifiers, The Darlington Pair Transistor, DC Level

Shifting and Amplifier, Frequency Model and Response of Bipolar Junction Transistors, Frequency Response of BJT Amplifiers, MOSFETs versus BJTs, Design of Amplifiers.

TEXT BOOKS

1.Muhammad H. Rashid "Microelectronics Circuits Analysis and Design" 2nd Edition, Cengage Learning.

REFERENCES

1. Sedra Smith " Micro-electronic circuits theory and applications", Oxford press
2. Donald A. Neamen, "Microelectronics: Circuit Analysis and Design", McGraw Hill.
3. J Millman," Microelectronics", McGraw Hill.
4. Richard C. Jaeger, Travis N. Blalock," Microelectronic Circuit Design", Mc Graw Hill
5. J J Cathey," Electronic Devices and circuits', Schaum's Outline.
6. R Loxton,"Problems and Solutions in Electronics', Chapman & Hall.

SIMULATION BOOKS

1. David Baez-Lopez ," Circuit Analysis with Multisim", Morgan & Claypool Publishers
2. Paul Tobin ,'PSpice for Circuit Theory and Electronic Devices", Morgan and Claypool Publishers
3. Steven T. Karris, "Electronic Devices and Amplifier Circuits with Matlab Applications" Orchrd Publications
4. *John Okyere Attia , Electronics and Circuit Analysis Using Matlab", Second Edition, CRC Press*

ELECTROMAGNETIC FIELD THEORY

Course Code: 13EC202 **L –T – P: 3-0-2**

Prerequisite: 13BS103 **Credits: 4**

Vector Analysis: Introduction to vector analysis, co-ordinate systems

Electrostatics: Types of charge distributions, Coulomb's Law, Electric field intensity, Electric-field intensity due to different charge distributions, electric flux, electric flux density, Gauss's Law and applications, Divergence, Divergence theorem , Potential and Potential difference, Potential field of a point charge and a system of charges, Potential gradient, electric dipole, Poisson's and Laplace's equations. Capacitance of different configurations. Boundary conditions on E and D , Energy density in Electrostatic field **Steady Magnetic Field:** Electric current, current densities, equation of continuity. Fundamentals of steady magnetic field, Faraday's Law of Induction, Magnetic flux density, Magnetic field strength, Biot-savart's Law and applications, Ampere's circuital law, differential form of Ampere's circuital law, Curl, Stoke's theorem, Lorentz force equation, force on a current element in magnetic field, Ampere's force law, Boundary conditions on H and B, scalar and vector magnetic potentials, energy density in magnetic field. **Maxwell's Equations**: Introduction, equation of continuity for time - varying fields, Faraday's law, Inconsistency of Ampere's Law, the concept of displacement current, modified Ampere's circuital Law, Maxwell's equations for static fields and time – varying fields both in differential form and integral form. Maxwell's equations in phasor form, Boundary conditions. **Electromagnetic Waves:** Introduction, wave equations for free space, Uniform plane wave-general solution and propagation. wave equations for conducting medium. wave equations in phasor form, wave propagation in loss less medium, conducting medium, good dielectrics and good conductors, skin effect, polarization. Poynting theorem and pointing vector, complex Poynting vector. **Guided Waves:** Introduction, Waves between parallel plates, Derivation of field equations between parallel plates and propagation parameters, field components for TE waves, field components of TM waves, Propagation parameters of TE and TM waves, Guided wavelength. Transverse electromagnetic wave (TEM wave), velocities of propagation. Attenuation in parallel plane guides, wave impedances **Wave Guides:** waves in rectangular wave guides, Derivation of field equations in rectangular wave guides, propagation parameters of TE and TM waves in rectangular wave guides.

TEXT BOOKS

1. W.H. Hayt Jr , "Engineering Electromagnetic", Mc-Graw Hill – New York, 7th Edition
2. EC.Jordan, "EM waves and Radiating Systems", Pearson Education, 1997
3. GSN Raju, "Electromagnetic Field Theory and Transmission Lines", Pearson Education Pvt. Ltd., New Delhi, 2005.

REFERENCE BOOKS

1. Mathew no Sadiku, "Elements of Electromagnetics ", Oxford University Press, 2003.
2. Joseph A Edminister, "Theory and problems of Electromagnetics", 2nd edition, Scham's Outline series, Mc-Graw Hill International.
3. Fawwaz T. Ulaby," Fundamentals of Applied Electromagnetics ", Pearson Education
4. Constantine A. Balanis," Advanced Engineering Electromagnetics" John Wiley

SIMULATION TEXT BOOK

1. Karl E. Lonngren,Sava V Savov," Fundamentals of Electromagnetic with Matlab", SciTech.

BASICS OF DIGITAL SYSTEMS

Course Code: 13EC203 **L –T – P: 3-0-2**

Prerequisite: 13BS101 **Credits: 4**

Number Systems & Codes: Review of Number systems, Classification of codes, Binary, BCD, Excess – 3, Gray, Error detection & Correction and Alphanumeric codes. **Boolean Algebra:** Boolean postulates, theorems, logic gates, implementation of logic gates using universal gates, Boolean functions – standard and canonical forms, simplification of Boolean functions using theorems, K – map simplification (up to 5 variables), Quine Mc-Cluskey method (up to 5 variables). **Combinational Logic systems** General design procedure for Combinational logic circuits, Design and applications of Binary Adders and Subtractors, Comparators, Encoders, Decoders, Multiplexers and De-multiplexers, Design of BCD to 7 Segment Decoder, Code converters, Parity Generator and Checker, BCD Adder / Subtractor, Carry look ahead adders. **Sequential Logic Functions:** Flip Flops**,** excitation Tables, State Table, conversion of flip flops, Analysis of sequential logic functions, state reduction and state assignment techniques, Mealy and Moore models, Design of sequential logic functions. **Sequential Logic Circuits:** Counters: Modulus of a counter, Asynchronous or ripple counters, synchronous counters, design of counters. **Shift registers:** Bi-directional Shift register, Universal shift register, Sequence Generator, Sequence Detector. **Algorithmic State Machine (ASM) Charts:** Salient features of ASM chart, Timing considerations, Control implementation, Design with multiplexers.

TEXT BOOKS

1. M. Morris Mano, "Digital Logic and Computer Design" Pearson
2. ZviKohavi, "Switching and Finite Automata Theory" 2nd Edition, Pearson

REFERENCE TEXT BOOKS

1. Khan & Khan, "Digital Logic Design", Scitech
2. RP Jain, "Modern Digital Electronics", 3rd Edition, PHI
3. A. Anand Kumar, "Fundamentals of Digital Circuits" PHI

SIMULATION TEXT BOOKS

1. Michael D. Ciletti**, "**Advanced Digital Design with the Verilog HDL (2nd Edition)"
2. David R Smith, Paul D Franzon, "Verilog Styles for Synthesis of Digital Systems "
3. J. Bhasker, "A Verilog HDL Primer", 3rd Edition, BS Publications
4. Peter J. Ashenden "Digital Design – An Embedded System Approach using Verilog"
5. Palnitkar S., "Verilog HDL: A Guide to Digital Design & Synthesis", PHI

ANALOG ELECTRONIC CIRCUITS

Course Code: 13EC205 **L –T – P: 3-0-2**

Prerequisite: 13EC201 **Credits: 4**

Feedback Amplifiers: Introduction, Feedback, Characteristics of Feedback, feedback topologies, Analysis of Feedback Amplifiers, Series-Shunt feedback, Series-Series Feedback, Shunt-Shunt Feedback, Shunt-Series Feedback, Feedback Circuit Design, Stability Analysis, Compensation Techniques. **Operational Amplifiers:** Introduction, Internal Structure of Op-Amps, Parameters and Characteristics of Practical Op-Amps, BJT Op-Amps, Analysis of the LM741 Op-Amps, Design of Op-Amps Differential Amplifiers: Introduction, Internal Structure of Differential Amplifiers, MOSFET Current Sources, MOS Differential Amplifiers, Depletion MOS Differential Amplifiers, Frequency Response of Differential Amplifiers, Design of Differential Amplifiers. **Power Amplifiers:** Introduction, Classification of Power Amplifiers, Power Transistors, Class A Amplifiers, Class B push-pull Amplifiers, Complementary Class AB push-pull Amplifiers, Class C Amplifiers, Class D Amplifiers, Class E Amplifiers, Short-Circuit and Thermal Protection, Power Op-Amps, Thermal Considerations, Design of Power Amplifiers. **Oscillators:** Introduction, Principles of Oscillators, Audio Frequency Oscillators, Radio Frequency Oscillators, Crystal Oscillators, Active-Filter Tuned Oscillators, Design of Oscillators. **Active Filters:** Introduction, Active versus Passive Filters, Types of Active Filters, First-Order Filters, The Biquadratic Function, Butterworth Filters, Transfer Function Realizations, Low pass Filters, High-Pass Filters, Band-Pass Filters, Band-Reject Filters, All-Pass Filters, Switched Capacitor Filters, Filter Design Guide Lines. **Integrated Analog Circuits and Applications:** Introduction, Circuits with Op-Amps and Diodes, Comparators, Zero Crossing Detectors, Schmitt Triggers, Square-Wave Generators, Triangular-Wave Generators, Sawtooth-Wave Generators, Voltage Controlled Oscillators, The 555 Timer, Phase Lock Loops, Voltage-to-Frequency and Frequency-to-Voltage Converters, Sample-and-hold Circuits, Digital-to-Analog Converters, Analog-to-Digital Converters, Circuit Design Using Analog Integrated Circuits.

TEXT BOOK

1. Muhammad H. Rashid “Microelectronics Circuits Analysis and Design” 2nd Edition, Cengage Learning.

REFERENCES

1. Sedra Smith “ Micro-electronic circuits theory and applications”, Oxford press
2. Donald A. Neamen,”Microelectronics: Circuit Analysis and Design”, McGraw Hill.
3. J Millman,” Microelectronics”, McGraw Hill.
4. Richard C. Jaeger, Travis N. Blalock,” Microelectronic Circuit Design”, Mc Graw Hill
5. J J Cathey,” Electronic Devices and circuits’, Schaum’s Outline.
6. Loxton, ”Problems and Solutions in Electronics’, Chapman & Hall.

SIMULATION BOOKS

1. David Baez-Lopez ,” Circuit Analysis with Multisim”, Morgan & Claypool Publishers
2. Paul Tobin ,’PSpice for Circuit Theory and Electronic Devices”, Morgan and Claypool Publishers
3. Steven T. Karris, "Electronic Devices and Amplifier Circuits with Matlab Applications" Orchrd Publications
4. *John Okyere Attia , Electronics and Circuit Analysis Using Matlab, Second Edition, CRC Press*

CMOS VLSI Design

Course Code: 13EC206 **L –T – P: 3-0-2**

Prerequisite: 13EC201 **Credits: 4**

Technology Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS Technologies. VLSI Fabrication, Oxidation, Lithography, Diffusion, Ion Implantation, Metallization,

Integrated Resistors and Capacitors. **MOS Theory Analysis:** Basic Electrical Properties of MOS Circuits: I_{ds}-V_{ds} Relationships, MOS Transistor Threshold Voltage V_{th}, g_m, g_{ds}, Figure of Merit ω_o, Short Channel and Narrow Channel Width Effects. Pass Transistor, Transmission Gate, NMOS Inverter, Various Pull-ups, CMOS Inverter Analysis and Design, Bi-CMOS Inverters, Latch up in CMOS Circuits. **CMOS Circuits and Logic Design Rules:** MOS Layers, Stick Diagrams, Design Rules and Layout, 2µm, 1.2 µm Design Rules, Rules for Vias and Contacts, Stick Diagrams and Simple Symbolic Encodings for NMOS, PMOS, CMOS and BiCMOS Logic Gates. Scaling of CMOS Circuits. **CMOS Circuit Charactersation and Performance Estimation:** Sheet Resistance R_S and its Concept to MOS, Area Capacitance Units, Calculations - Delays, Driving Large Capacitive Loads, Delay Estimation, Logical Effort and Transistor Sizing, Power Dissipation, Reliability. **CMOS Fault models:** need for testing, manufacturing test principles,

TEXT BOOKS

1. Kamran Ehraghian, Dauglas A. Pucknell and Sholeh Eshraghiam, "Essentials of VLSI Circuits and Systems" – PHI, EEE, 2005 Edition.
2. Neil H. E. Weste and David. Harris Ayan Banerjee,, "CMOS VLSI Design" - Pearson Education, 1999.

REFERENCES BOOKS:

1. Sung-Mo Kang, Yusuf Leblebici,"CMOS Digital Integrated Circuits" TMH 2003
2. Jan M. Rabaey, "Digital Integrated Circuits" Pearson Education, 2003
3. Wayne Wolf, "Modern VLSI Design ", 2nd Edition, Prentice Hall,1998.

SIMULATION TEXT BOOKS

1. Etienne Sicard, Sonia Delmas Bendhia, "Basics of CMOS Cell Design", TMH, EEE, 2005.

DESIGN WITH PLDS AND FPGAS

Course Code: 13EC312 **L –T – P: 3-0-2**

Prerequisite: 13EC203 **Credits: 4**

Introduction: Full Custom Design; Semicustom Design; Programmable Logic Devices; Notations for Programmable Logic Devices; Design Methodology Using Programmable Logic Devices; Design Soft Ware; **Programmable Read Only Memory (PROM):** Mask programmed ROM; EPROM; EEPROM; Programmable Logic Element (PLE); Combinational Logic Design using PLEs; Sequential Circuit Realization using PLEs; **Programmable Logic Devices:** Programmable Logic Device (PLD); Sequential PLD; Complex PLD; Field Programmable Gate Array (FPGA); Xilinx SRAM-Based FPGA; Comparison between FPGA, ASIC and CPLD; FPGA based system design; **Field Programmable Gate Arrays:** Introduction; The Xilinx logic Cell Array; Advanced futures of the 4000 series; The Actel ACT; Technology Trends; **New generation Architectures of Programmable Logic Device:** Erasable Programmable Logic Devices; Reprogrammable Generic Logic Devices; Erasable Programmable Logic Array (EPLA); Generic Array Logic (GAL); Programmable Electrically Erasable Logic (PEEL);

TEXT BOOKS

1. Parag K. Lala, "Digital System Design Programmable Logic Devices", B S Publications
2. Debaprasad Das, "VLSI Design", Oxford.
3. Pak K. Chan, Samiha Mourad, "Digital Design Using Field Programmable Gate Array", Pearson Education.

REFERENCE TEXT BOOKS

1. Bob Zeidman, "Designing with PFGAs and CPLDs", CMP Books,
2. Stephen Brown Zvonko Vranesic "Fundamentals of Digital Logic with VHDL Design" McGraw-Hill, 2008

SIMULATION BOOK

1. Ian Grout,"Digital Systems Design with FPGAs and CPLDs",Newnes,

2. Scott Hauck,André Dehon,"Reconfigurable Computing: The Theory and Practice of FPGA-Based Computing", Elsevier Science.

MICRO-PROCESSORS & MICRO-CONTROLLERS

Course Code: 13EC311 **L –T – P: 3-0-2**

Prerequisite: 13EC203 OR 13CS201 **Credits: 4**

8086 Microprocessor: Introduction to Microprocessor, Intel Microprocessor families ,8086 Microprocessor architecture, Register Organization, Pin Description, Physical Memory Organization, Modes of operation. **8086 Instruction set & Assembly Language programming:** Addressing modes, Instruction set, Assembler directives, simple Programs, Procedures and Macros, 8086 Interrupts. **8051 Microcontroller:** Microcontroller families, 8051 Architecture, Signal Description, Register organization, Internal RAM, Special Function Registers, Interrupt control flow, Timer/Counter Operation, Serial Data Communication, and RS-232C Standard.**8051 Programming & Interfacing:** Addressing modes, Instruction set, Simple Programs involving Arithmetic and Logical Instructions, Timers/Counters, Serial Communication & Interrupts. **Interfacing:** Matrix Key Board, Stepper Motor, LCD's, DAC & ADC. **Introduction to ARM Processor:** Architecture, Registers, Pipe Line, Interrupts, Architecture revisions, ARM Instructions, LPC 2148 Architecture, GPIO.

TEXT BOOKS

1.D.V.Hall "Microprocessor and Interfacing", 2nd Edition Tata McGraw Hill Publishing Company.

2.Mazidi & Mc Kinley "The 8051 Micro controller and Embedded systems: using assembles and C, 2nd edition.

3. Andrew N Sloss, Dominic symes," ARM System developers Guide", Elesiver

REFERENCE BOOKS

1. A.K. Ray & K. M Bhurchandi, "Advanced Microprocessors & peripherals", Tata Mc Graw Hill Publishing Company 2002.
2. Walter A Tiebel Avtar Singh", The 8088 and 8086 Microprocessor", Pearson Education
3. Rajkamal, "Microcontrollers - Architecture, Programming, Interfacing & System Design", 2nd edition, Pearson Education.
4. The 8051 Microcontroller 3E by Kenneth Ayala, Thomson Delmar Learning Edition
5. Steve Furber, "ARM system-on-chip architecture", 2e Pearson Education
6. Walter A Tiebel Avtar Singh", The 8088 and 8086 Microprocessor", Pearson Education

CONTROL SYSTEMS

Course Code: 11EE304 **L –T – P: 3-0-2**

Prerequisite: 13ES203 **Credits: 4**

Control system terminology, examples of simple control systems, open loop and closed loop control systems, Types of control systems. **Mathematical models of physical systems:** Analogy with mechanical systems, Formulation of differential equations for electrical systems Transfer functions of open and closed loop systems, DC & AC servomotors, synchro pair as error detector, block diagram representation of control systems: block diagram algebra, signal flow graph, Mason's gain formula. **Time domain analysis:** Standard test signals – step, ramp, parabolic and impulse; impulse response, characteristic equation of feed back systems, transient response of first order and second order systems

to standard test signals, time domain specifications, steady state error and error constants, Introduction to P, PI, PID controllers. **Stability analysis:** Concept of stability and conditions for stability, Routh – Hurwitz criterion, dominant poles of transfer function **Root Locus Technique:** The root locus concept, basic properties, magnitude and angle conditions, properties and construction of the complex root loci, effects of adding poles and zeros to G(s) H(s) on the root loci.

Frequency response Analysis & Design: Introduction, frequency response specifications, correlation between time and frequency response, specifications, polar (Nyquist) plot, Bode plot, phase margin and gain margin; stability analysis from Nyquist plot effect of adding poles & zeros to G(s) H(s) on the shape of polar plots. Preliminary design considerations – Introduction to lead, lag, lead - lag compensation techniques in frequency domain. **State space analysis:** Concepts of state, state variables, state vector, input vector, output vector; development of state models for simple systems, solution of state equation, the state transition matrix and its properties; characteristic equation and transfer function from state models, eigen values and eigen vectors. Diagonalization; transformation to phase variable canonical form, diagonal canonical form, Jordan canonical form. Concepts of controllability and observability.

Text Books:

1. J Nagrath & M Gopal, "Control System Engineering", 5th Edition New Age International Publication, New Delhi 2011.
2. B.C. Kuo," Automatic ontrol Systems", Prentice Hall India Publications, NewDelhi , Eighth Edition,2010.

Reference Books

1. K Ogata, "Modern Control Engineering", Prentice Hall India Publication, New Delhi , Fifth Edition,2010.
2. M.Gopal, " Control Systems Principles and Design" Tata Mc-Graw Hill Publications, Fourth Edition,2012.
3. Dhanesh N. Manik, "Control Systems", Cengage Learning Pvt. Ltd., First edition, 2012

COMPUTER ORGANIZATION

Course Code: 13EM201 **L –T – P: 3-0-2**
Prerequisite: 13EC203 **Credits: 4**

REGISTER TRANSFER & MICRO-OPERATIONS: Register Transfer Language, Register Transfer, Bus & memory Transfers, Arithmetic Micro-operations, Logic Micro Operations, Shift Micro-operation, and Arithmetic Logic Shift Unit. **BASIC COMPUTER ORGANISATION AND DESIGN**: introduction codes, Computer Registers, Computer instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output and interrupt, Design of Basic Computer, Design of accumulator Logic**, MICRO PROGRAMMED CONTROL:** Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit. **CENTRAL PROCESSING UNIT:** General registers Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced instruction Set Computer (RISC). **COMPUTER ARITHMETIC:** Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point Arithmetic Operations. **MEMORY ORGANIZATION:** Memory Hierarchy, Main Memory, Associative Memory, Cache Memory, Virtual Memory. **INPUT-OUTPUT ORGANIZATION:** Peripheral Devices, input-Output interface, Asynchronous Data Transfer, Modes of Transfer, Priority interrupt, Direct Memory Access (DMA), input –output Processor.

Text Books:

1.Morris M.Mano," Computer Systems Arichitecture",3rd Edition.

Reference Books:

1. John P Hayes," Computer Arichitecture and Organization"2nd Edition
2. V.CarlHamacheret.al," Computer Organization" 2nd Edition
3 Computer architecture and organization by Raja Raman and Radha Krishna-PHI

COMMUNICATION SYSTEMS

Course Code: 13EM202 **L –T – P: 3-0-2**

Prerequisite: 13EC205 **Credits: 4**

Amplitude Modulation techniques: Introduction to Modulation, Continuous wave AM Generation and Demodulation of AM: DSB, DSB-SC, SSB and VSB, phase and frequency modulation, narrow band and wide band F.M, Direct and indirect methods of generation of F.M, demodulation of F.M wave. **Transmitters and Receivers**: AM Transmitter and FM Transmiter, Armstrong method receiver, AM Superhetrodyne, receivers FM Superhetrodyne receivers. **Pulse modulation techniques:** Sampling Process, Types of Sampling, FDM, TDM, Modulation and Demodulation of PAM, PPM & PWM. S/N ratio of PAM, PWM, PWM & PPM, Quantization process, Quantization Noise, PCM, and DPCM **Digital Modulation Techniques**: ASK, FSK, BPSK, DPSK, QPSK, QAM, Bandwidth Efficiency, Carrier recovery, Clock recovery. **Information Theory**: Uncertainty, Information, Entropy, Source coding theorem: Shannon-Fanon coding, Huffman coding. **Codes:** Liner block codes, Cyclic codes, Convolution codes.

Text Books:

1. "Introduction to Analog and Digital Communication System" – By Simon Haykin, 2nd Edition.
2. "Communication Systems" by Singh R.P. and Sapre S.D - TMH
3. "Advanced Electronic Communication Systems" – By Wayne Tomasi, 6th Edition, PHI.

Reference Books:

1. "Analog and Digital Communications" – By Sam K.Shanmugam, Wiley
2. "Modern Digital & Analog Communication Systems" – By B.P. Lathi, 3rd Edition,

INTERNET PROGRAMMING

Course Code: 11EM301 **L –T – P: 3-0-2**

Prerequisite: 13ES202 **Credits: 4**

HTML, DHTML, Cascading Style Sheets, XML, A Closer Look at Methods and Classes, Inheritance, Packages and Inheritance, Exception Handling. Multithreaded Programming, I/O, Applets, and Other Topics, the Applet Class, Event Handling. Servlets and Java Server Pages, Database Access through the Web: Architecture for Database Access, the MySQL Database System, Database Access with JDBC and MySQL.

TEXTBOOKS:

1. Deitel & Deitel & Nieto, "Internet & World Wide Web – How to Program", PEA, Third Edition.
2. Herbert Schildt, "Java the Complete Reference", 7th Edition, Tata McGraw Hill, 2007. (Chapters 7,8,9,10,11,13,21,22,23,29,30)
3. Robert W. Sebesta, "Programming the World Wide Web", 4th Edition, Pearson Education, 2008 (Chapters 1,2,3,4,5,6,7,10,11,13.3, 13.4, 13.7).

REFERENCES:

1. M. Deitel, P.J. Deitel, A.B. Goldberg, "Internet & World Wide Web, How to Program", 4th Edition, Pearson Education, 2004.
2. Chris Bates, "Web Programming Building Internet Applications", 3rd Edition, Wilet India, 2006.
3. Y. Daniel Liang, "Introduction to JAVA Programming", 7th Edition, Pearson Education, 2007.
4. Xue Bai,"The Web Warrior to Web Programming", Cengage Learning, 2003.
5. Anders Moller, Michael Schwartzbach, "An Introduction to XML and Web Technologies", 1st Edition, Pearson Education, 2006.
6. Ivan BayRoss, "Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl", BPB Publication, 3rd Edition, 2005.
7. Cay S. Horstmann, Gary Cornell, "Core Java, Volume I- Fundamentals", 8th Edition, PrenticeHall, Sun Microsystems Press, 2008.
8. Uttam K Roy, "Web Technologies", OXFORD University Press, 2012.
9. Jeffrey C Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education, 2009.

EMBEDDED SYSTEMS

Course Code: 11EM401 **L –T – P: 3-0-2**

Prerequisite: NIL **Credits: 4**

ES Basics: Introduction to Embedded Systems: Definition, Comparison with Loaded Systems, Challenges of Embedded systems, Application of Embedded Systems. Hardware fundamentals and devices: CHIPS, GATES, PCB, Power and decoupling, Timing Diagrams, Signal loading related issues, Clocks, Flip Flops, Memories, Micro Processors, PINS, ports, Address Resolution, Address Decoding within Micro Processors, Micro Processors VS Micro Controllers, Busses and Bus Handling, DMA, UART and RS232, PAL, FPGA, Timers, Counters, Pulse width Modulators for speed control, LCD Controllers, Key Pad Controllers, Stepper motor controllers, A/D Converters, Introduction to Temp Sensors, Flow Control devices, Humidity Control devices, Speed Control devices. Interfacing: Communication basics, Basic Terminology, Basic Protocol concepts, I/O Addressing: Port Based Addressing, Bus Based addressing, Memory mapped I/O, Standard I/O, Interfacing Micro Processors through Interrupts and DMA, Arbitration Techniques, Multi Bus Architecture Serial Communication and Protocols: I2C, CAN, Fire-wire, USB, Parallel Communication and protocols: PCI Bus, ARM Bus, Wireless Communication and Protocols: IrDA, Blue Tooth, 802.11g. ES Software Processing Platform: Micro Processor Architecture both CISC and RISC, Interrupt Processing, Shared data problem, Interrupt Latency, Software Architectures: Round Robin, Round Robin with Interrupts, Function Queue Scheduling, RTOS, and selecting architecture. Real Time Operating Systems: Tasks and Task data, Scheduler, Reentrancy, Semaphores, Semaphore Problems, Message Queues, Mail Boxes, Pipes, Timer Functions, Event Handling, Memory Management, Interrupt Processing, and Power saving Functions. Introduction to µcos and VxWorks. Analysis, Design and Software Development: Analysis and designing Embedded Systems using RTOS: Overview, General Design Principles, Hardware and software CO design in Embedded Systems, Encapsulating Semaphores and Queues, Real Time Scheduling Considerations, Software development process and tools Testing and Debugging Techniques, Testing and Debugging Tools.

Text Books:

1. An Embedded Software Premier - David E- Siman, PEARSON Education
2. Embedded System Design - Frank Vahid / Tony Givargis, WILEY India

Reference Books :

1. Embedded / real - time systems - DR.K.V.K.K.Prasad, dreamtech
2. Embedded Systems - Raj – Kamal, Second Edition TMH

PROFESSIONAL ELECTIVES

EMBEDDED SYSTEMS – STREAM

REAL TIME OPERATING SYSTEMS

Course Code: 11EM330 **L –T – P: 3-0-0**
Prerequisite: 13CS203 **Credits: 3**

Review of Operating Systems: Basic Principles, Operating System structures, System Calls, Files, Processes, Design and Implementation of processes, Communication between processes, Introduction to Distributed operating system, distributed scheduling. **Overview of RTOS:** RTOS Task and Task state, Process Synchronisation- Message queues, Mail boxes, pipes, Critical section, Semaphores, Classical synchronisation problem, Deadlocks **REAL TIME MODELS AND LANGUAGES:** Event Based – Process Based and Graph based Models, Real Time Languages, RTOS Tasks, RT scheduling, Interrupt processing, Synchronization, Control Blocks, Memory Requirements. **REAL TIME KERNEL:** Principles, Design issues, Polled Loop Systems, RTOS Porting to a Target, Comparison and study of various RTOS like QNX, VX works, PSOS, C Executive- Case studies. **RTOS APPLICATION DOMAINS:** RTOS for Image Processing, Embedded RTOS for voice over IP, RTOS for fault Tolerant Applications, RTOS for Control Systems.

REFERENCES:

1. Raj Kamal, “Embedded Systems- Architecture, Programming and Design” Tata McGraw Hill, 2006.
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. Krishna.C.M, Kang, Shin.G, “Real Time Systems”, McGraw Hill, 1997.
5. Raymond J.A.Bhur, Donald L.Bailey, “An Introduction to Real Time Systems”, PHI 1999.
6. Mukesh Sighal and Shi.N.G “Advanced Concepts in Operating System”, McGraw Hill 2000.

PCB DESIGN

Course Code : 13EM 332 L – T – P: 3-0-0
Pre-requisite : NIL Credits: 3

ELECTRONICS COMPONENTS & MOUNTING: Active and passive components – resistor, capacitor, inductor, semiconductor diode, LED, zener diode, Bipolar junction transistor, IC’s, SMD, connectors use of multimedia & CRO. Preparation & mounting of components – lead cutting. **BASIC OF PCB &**

SOLDERING TECHNIQUES: Introduction – Classification of PCB – single, double, multilayer and flexible boards – copper clad laminates materials of copper clad laminates – manufacturing process – properties of laminates (electrical & physical) - types of laminates. Hand soldering Tools Solder alloys – soldering flexes – soldering techniques – Iron soldering – mass soldering, DIP soldering – wave soldering – solder mask. **SCHEMATIC & LAYOUT DESIGN:** Schematic diagram – Net list – Design rule check – creating components for library – Imperial – metric Tracks – Pads – Vias – Clearances – Rats nest – silk screen – selection of board size – power plane – grounding. **DESIGN OF PCB'S:** Single sided PCB – Double sided PCB – Multilayer PCB – Auto routing – manual routing – Design rule check – creating of foot print for library creating Gerber file. **PCB FABRICATION:** Film master preparation - Image transfer - photo printing – Screen Printing – Plating techniques etching techniques – Mechanical Machining operations.

TEXT BOOKS

1. Printed Circuit Board – Design, Fabrication, Assembly & Testing by R.S.Khandpur,
TATA McGraw Hill Publisher
2. Printed circuit Board – Design & Technology by Walter C.Bosshard
3. ISTE Hand book on Printed Circuit Board Fabrication.

MICRO CONTROLLERS INTERFACING & SYSTEM DESIGN.

Course No	: 13EM 334	L – T – P: 3-0-0
Pre-requisite	: 11EC311	Credits: 3

OVERVIEW OF ARCHITECTURE AND MICROCONTROLLER RESOURCES: Architecture of microcontroller-Microcontroller resources-Resources in advanced and next generation microcontrollers-8051 microcontroller-Internal and External memories-Counters and Timers-Synchronous serial cum asynchronous serial communication-Interrupts.**8051 FAMILY MICROCONTROLLERS INSTRUCTION SET:** Basic assembly language programming-Data transfer instructions-Data and bit manipulation instructions-Arithmetic instructions-Instructions for logical operations on the bytes among the Registers, Internal RAM, and SFR's Program flow control instructions-Interrupt control flow. **SREAL TIME CONTROL: INTERRUPTS:** Interrupt handling structure of an MCU-Interrupt Latency and Interrupt deadline-Multiple sources of the interrupts -Non-maskable interrupt sources-Enabling of disabling of the sources-polling to determine the interrupt resources and assignment of the priorities among them-Interrupt structure in Intel 8051.TIMERS: Programmable Timers in MCU's-Free running counter and real time control-Interrupt interval and density constraints. **PIC MICROCONTROLLER:** Instruction, Architecture overview, memory organization Interrupts and reset, I/O ports, Timers. **SYSTEM DESIGN:** DIGITAL AND ANALOG INTERFACING METHODS: Switch, key and keyboard interfacing –LED and Array of LEDs-Keyboard-cum-Dislay controller (8279) - Alphanumeric Devices-Display Systems and its Interfaces. Interfacing with the Flash memory-Interfaces-Interfacing to High power Devices-Analog input Interfacing-Analog output Interfacing Optical motor Shaft Encoders- Industrial Control-Industrial process Control System-prototype MCU based Measuring Instruments-Robotics and embedded control.

TEXT BOOKS

1. D.V.Hall "Microprocessor and Interfacing", 2nd Edition Tata McGraw Hill Publishing Company, 2006.

2. A.K. Ray & K. M Bhurchandi, "Advanced Microprocessors & peripherals", Tata Mc Graw Hill Publishing Company 2002.
3. Rajkamal, "Microcontrollers - Architecture, Programming, Interfacing & System Design", 2nd edition, Pearson Education.
4. Mazidi & Mc Kinley "The 8051 Micro controller and Embedded systems: using assembles and C, 2nd edition.

ADVANCED EMBEDDED PROCESSOR ARCHITECTURES.

Course Code : 13EM430 L – T – P: 3-0-0
Pre-requisite : 13EC311 Credits: 3

ARM Processor as System-on-Chip: Acorn RISC Machine – Architecture inheritance – ARM programming model – ARM development tools – 3 and 5 stage pipeline ARM organization – ARM instruction execution and implementation – ARM Co-processor interface. **ARM Assembly Language Programming:** ARM instruction types – data transfer, data processing and control flow instructions – ARM instruction set – Co-processor instructions, Thumb Instruction set. **Architectural Support for System Development:** Advanced Microcontroller bus architecture – ARM memory interface – ARM reference peripheral specification – Hardware system prototyping tools – ARMulator – Debug architecture. **ARM Processor Cores:** ARM7TDMI, ARM8, ARM9TDMI, ARM10TDMI, The AMULET Asynchronous ARM Processors-AMULET1. **Embedded ARM Applications:** The VLSI Ruby II Advanced Communication Processor, The VLSI ISDN Subscriber Processor, The OneC™ VWS22100 GSM chip, The Ericssion-VLSI Bluetooth Baseband Controller, The ARM7500 and ARM7500FE

TEXT BOOKS (MAXIMUM 2)

1. ARM System on Chip Architecture – Steve Furber – 2nd ed., 2000,Addison Wesley Professional.
2. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st ed., 2004, Springer

REFERENCE BOOKS (MAXIMUM 2)

1. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM

2. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001,Kluwer Academic Publishers.

HARDWARE SOFTWARE CO -DESIGN

Course Code : 11 EM 432 L – T – P: 3-0-0
Pre-requisite : 11 EC 311 Credits: 3

Co- Design Issues: Co- Design Models, Architectures, Languages, A Generic Co-design Methodology. **Co-Synthesis Algorithms:** Hardware software synthesis algorithms: hardware – software partitioning distributed system co-synthesis. **Prototyping and Emulation:** Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping. **Target Architectures:** Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-

Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems. **Compilation Techniques and Tools for Embedded Processor Architectures:**
Modern embedded architectures, embedded software development needs, compilation technologies practical consideration in a compiler development environment. **Design Specification and Verification:** Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification **Languages for System – Level Specification and Design-I** System – level specification, design representation for system level synthesis, system level specification languages. **Languages for System – Level Specification and Design-II** Heterogeneous specifications and multi-language co-simulation the cosyma system and lycos system.

TEXT BOOKS:

1. Hardware / software co- design Principles and Practice – Jorgen Staunstrup, Wayne Wolf – 2009, Springer.
2. Hardware / software co- design Principles and Practice, 2002, kluwer academic publishers

EMBEDDED NETWORKING

Course Code	: 13EM 336	L – T – P: 3-0-0
Pre-requisite	: 11EC311	Credits: 3

EMBEDDED COMMUNICATION PROTOCOLS: Embedded Networking: Introduction – Serial/Parallel Communication – Serial communication protocols -RS232 standard – RS485 – Synchronous Serial Protocols -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming -ISA/PCI Bus protocols – Firewire. **USB AND CAN BUS**: USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication: Packets –Data flow types – Enumeration –Descriptors –PIC 18 Microcontroller USB Interface – C Programs –CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing – PIC microcontroller CAN Interface –A simple application with CAN. **ETHERNET BASICS:** Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables, Connections and network speed – Design choices: Selecting components –Ethernet Controllers – Using the internet in local and internet communications – Inside the Internet protocol. **EMBEDDED ETHERNET**: Exchanging messages using UDP and TCP – Serving web pages with Dynamic Data – Serving web pages that respond to user Input – Email for Embedded Systems – Using FTP – Keeping Devices and Network secure. **WIRELESS EMBEDDED NETWORKING**: Wireless sensor networks – Introduction – Applications – Network Topology – Localization –Time Synchronization - Energy efficient MAC protocols –SMAC – Energy efficient and robust routing – Data Centric routing

TEXT BOOKS

1. Frank Vahid, Givargis 'Embedded Systems Design: A Unified Hardware/Software Introduction', Wiley Publications
2. Jan Axelson, 'Parallel Port Complete', Penram publications
3. Dogan Ibrahim, 'Advanced PIC microcontroller projects in C', Elsevier 2008
4. Jan Axelson 'Embedded Ethernet and Internet Complete', Penram publications
5. Bhaskar Krishnamachari, 'Networking wireless sensors', Cambridge press 2005

WEB TECHNOLOGIES - STREAM

WEB PROGRAMMING

Course Code : 13EM 331 L – T – P: 3-0-0
Pre-requisite : 11EM301 Credits: 3

Introduction to HTML, Working with Text, Creating Tables and Working with Frames, **Cascading Style Sheets**: Working with Style Sheets. **Java Script**: Introduction, Simple program, obtaining user input with prompt dialogs, memory concepts, arithmetic, decision making, assignment operators, control structures – IF, IF…ELSE, WHILE, , FOR repetition statement, SWITCH multiple-selection statement, DO…WHILE repetition statement, logical operators. Java Script: Program modules in javascript, function definitions, scope rules, global functions, recursion, arrays, references and reference parameters, passing arrays to functions, sorting arrays, searching arrays, multi-dimensional arrays, math object, string object, date object, Boolean and number object, document object, window object, using cookies, using JSON to represent objects. **Document Object Model**: Introduction, Modeling a document, DOM Nodes and Trees, Traversing and modifying a DOM tree, DOM Collections, dynamic styles, summary of DOM objects and Collections, registering event handlers, onload, onmousemove, the event object, this, onmouseover, onmouseout, onfocus, onblur, onsubmit, onreset, event bubbling, more events. **PHP:** Introduction, PHP basics, string processing and regular expressions, form processing and business logic, connecting to database, using cookies, dynamic content, operator precedence. **Web Servers**: Microsoft Internet Information Services, Apatche Web Server, Active Server Pages.

Textbooks

1. Internet and World Wide Web: How to Program, Deitel and Deitel, 4th Edition, Prentice Hall, 2009.
2. HTML Black Book ,Steven Holzner ,Dream tech publications (2000).

Reference Books

1. N.P Gopalan, J.Akilandeswari Web Technology – A Developer's Perspective PHI (2008).
2. Web Technologies –Uttam K Roy ,Oxford Higher Education .
3. Chris Bates Web Programming – Building Internet Applications Addison Wesley (2006).

VISUAL PROGRAMMING

Course Code : 13EM 333 L – T – P: 3-0-0
Pre-requisite : 11EM301 Credits: 3

The Philosophy of .NET Understanding the previous states affair, The .NET Solution, The building Block of the .NET platform (CLR,CTS,CLS), the role of the .NET base class libraries, what C# brings to the table, additional .NET – Aware programming Languages, An overview of .NET binaries (aka assemblies), The role of the common intermediate language, Compiling CIL to platform specific instruction, Understanding the common type system, Intrinsic CTS data types, Understanding the common languages specification, Understanding the common languages runtime, A tour of the .NET namespace, increasing your namespace nomenclature, Deploying the .NET runtime. **Building C# Applications** The role of the command line compiler (CSC.exe), Building C# application using csc.exe, Working with csc.exe response file, generating bug reports, Remaining C# compiler option, The command line debugger, using the visual studio. Net IDE, Other key aspects of the VS.Net IDE, Documenting your source code via XML, C# preprocessor directives, An interesting Aside: The System. Environment class, Building .Net application with other IDEs. **C# Language Fundamentals** : An Anatomy of a basic C# class, Creating

objects: Constructor basic, the composition of a C# application, Default Assignment and variable scope, The C# member initialization syntax, Basic input and output with the console class, Understanding value types and reference types, The master node: System. Objects, The system Data type (And C# aliases), Converting between value type and reference type: Boxing and Unboxing, Defining program constraints, C# Iterations constructs, C# control flow constructs, The complete set C# operator, Defining Custom class methods, Understanding static methods, Method parameter modifiers, Array manipulation in C#, String manipulation in C#, C# Enumerations, Defining structures in C#, Defining custom namespaces. **Object Oriented Programming** with C# Formal definition of the C# class, Definition the "Default public interface" of a type, Recapping the pillars of OOP, The first pillar: C# Encapsulation services, Pseudo Encapsulation: Creating read only field, The second pillar: C#'s Inheritance supports keepingfamily secrets: The "Protected" keyword, The Nested type definitions, The third pillar: C#'s Polymorphic support casting between types, Generating class definitions using Visual Studio. Net. Exceptions and Objects Life Time Ode to errors, Bugs and exceptions, The role of .NET exceptions handling, The system. Exception base class throwing a generic exception catching exception, CLR system level exception (System. system exception),Custom application level exception (System. application exception), Handling multiple exception, The finally block, The last chance exception, dynamically identify application and system level exception, Debugging system exception using VS.Net, Understanding Object life time, The CIT of new, The basic of garbage collection, Finalizing a type, Finalization process, building and Ad hoc destruction method, garbage collection optimization, The system .GC type. **Interfaces and Collections** Defining interfaces using C#, Invoking interface member at the object level, Exercising the shape hierarchy, Understanding explicit interface implementation, Interfaces as Polymorphic agents, Building interface hierarchies, Implementing interface using VS.Net, Understanding the Iconvertible interface, Building a custom enumerator (I Enumerable and Ienumerator), Building cloneable objects (Icloneable), Building comparable objects (I Comparable), Exploring the system the collection namespace, Building a custom container (Retrofitting the carstype). **Understanding .Net Assembles Problems with classic COM Binaries**, An overview of .Net assembly, Building a simple file test assembly, A C# Client Application, A Visual Basic .Net Client application, Cross Language Inheritance, Exploring the Carlibrary's manifest, Exploring the Carlibrary's Types, Building the multi file assembly, Using the multi file assembly, Understanding private assemblies, Probing for private assemblies (The Basics), Private assemblies and XML Configuration files, Probing for private assemblies (The Details),Understanding Shared assembly, Understanding Shared Names, Building a Shared assembly, Understanding delay Signing, Installing/Removing shared assemblies, Using a Shared assembly.

Text Book:

1. Andrew Troelsen C# and The .Net platform, , Second edition,2003, Dream TECH Press,India.
2. Tom Archer Inside C#, , 2001,WP Publishers.

Reference Books

1. Joe duffy, Professional .NET Framework 2.0, Worx Publications, Willey India Edition, 2006 Edition
2. David S Platt, Introducing Microsoft .NET, Prentice Hall of India, Eastern Economy edition, 2nd Edition
3. Matthew Reynolds, Karli Watson, Bill Forgey, Brian Patterson, .NET

WEB MIDDLEWARE AND WEB SERVICES

Course Code : 13EM 335 L – T – P: 3-0-0
Pre-requisite : 11EM301 Credits: 3

Distributed Information systems – design, architecture and communication, Middleware – understanding middleware, RPC and related middleware, TP monitors, object brokers, message-

oriented middleware. Enterprise Application Integration (EAI) – from middleware to application integration, EAI middleware **Workflow management systems**, Web technologies – exchanging information over the internet, web technologies for supporting remote clients, application servers and application integration. Web services and their approach to distributed computing, Web services technologies and web services architecture **Basic web services technology,** minimalistic infrastructure. SOAP, WSDL, UDDI, web services at work, interactions between specifications, related standards. Service coordination protocols, introduction, infrastructure for coordination protocols. **WS-coordination,** WS-transaction, RosettaNet, other standards, Service composition – basics, a new chance of success, service composition models, dependencies between coordination and composition. **BPEL, Outlook** – state of the art in web services, applicability of web services, web services as a problem and solution. Case studies - Web services: industry adoption, case studies: context setting, a proposed solution.

Textbooks

1. Web Services: Concepts, Architectures and Applications (Data-Centric Systems and Applications) – Gustavo Alonso, Fabio Casati, Harumi kuno and Vijay Machiraju, Springer pub, 2003
2. Web Services, An introduction, B.V. Kumar and S.V Subrahmanya, Tata Mcgraw Hill, 2004

References

1. Web Services Essentials Distributed Applications with XML-RPC, SOAP, UDDI & WSDL by Ethan Cerami, O'Reilly , First Edition, February 2002.
2. Programming Web Services with SOAP by James Snell, O'Reilly First Edition Dec 2001.
3. Web Services Theory & Practice by Anura Guruge, Digital Press, 2004.
4. Executive's Guide to Web Services by Eric A. Marks & Mark. J. Werrell, John Wiley & Sons, 2003.

ENTERPRISE PROGRAMMING

Course Code : 13EM431 **L – T – P: 3-0-0**
Pre-requisite : 11EM301 **Credits: 3**

Java EE Essentials, J2EE Multi-Tier Architecture, Advanced JSP topics, Java Server Faces, Working with Databases, Advanced topics in JDBC. EJB Fundamentals and Session Beans, EJB Entity Beans, Message Driven Beans, EJB Relationships, EJB QL, and JDBC. Design Patterns and EJB. J2EE Design patterns and Frameworks: Pattern Catalog- Handle-Forward pattern, Translator pattern, Distributor pattern, Broadcaster pattern, Zero sum pattern, Status Flag Pattern, Sequencer pattern, Behavior Separation pattern, Consolidator pattern, Simplicity pattern, Stealth Pattern. Web Services and JAX-WS. Java Mail API, Java Interface Definition Language and CORBA, Java Remote Method Invocation, Java Messaging Service, Java Naming and Directory Interface API.

TEXTBOOKS:

1. Kevin Mukhar, James L. Weaver, Jim Crume, Chris Zelenak, "Beginning Java EE 5 from Novice to Professional", Apress, 2005 Edition.
2. James Keogh, "J2EE: The Complete Reference", McGraw-hill Osborne Media: 1st Edition, 2002.

REFERENCES:

1. Jan Graba, "An Introduction to Network Programming with Java", Springer, 2nd edition, 2006.

2. Antonio Goncalves, “Beginning Java EE 6 Platform with GlassFish 3”, Apress, 2009.
3. Mark D Hansen, “SOA Using Java web services”, Pearson, 2007.
4. Dreamtech Software Team, “Java Server Programming J2EE: Black Book”, Wiley, 2007.

SEMANTIC WEB

Course Code : 13EM 433 **L – T – P: 3-0-0**
Pre-requisite : 11EM301 **Credits: 3**

INTRODUCTION Components – Types – Ontological Commitments – Ontological Categories – Philosophical Background -Sample - Knowledge Representation Ontologies – Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web – Need – Foundation – Layers – Architecture. **LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES** Web Documents in XML – RDF - Schema – Web Resource Description using RDF- RDF Properties – Topic Maps and RDF – Overview – Syntax Structure – Semantics – Pragmatics - Traditional Ontology Languages – LOOM- OKBC – OCML - Flogic Ontology Markup Languages – SHOE – OIL - DAML + OIL- OWL **ONTOLOGY LEARNING FOR SEMANTIC WEB** Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning – Importing and Processing Ontologies and Documents – Ontology Learning Algorithms - Evaluation **ONTOLOGY MANAGEMENT AND TOOLS**

Overview – need for management – development process – target ontology – ontology mapping – skills management system – ontological class – constraints – issues. Evolution – Development of Tools and Tool Suites – Ontology Merge Tools – Ontology based Annotation Tools. **APPLICATIONS** Web Services – Semantic Web Services - Case Study for specific domain – Security issues – current trends.

TEXT BOOKS

1. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez “Ontological
Engineering: with examples from the areas of Knowledge Management, eCommerce and the Semantic Web” Springer, 2004
2. Grigoris Antoniou, Frank van Harmelen, “A Semantic Web Primer (Cooperative Information Systems)”, The MIT Press, 2004
3. Alexander Maedche, “Ontology Learning for the Semantic Web”, Springer; 1 edition, 2002

REFERENCES

1. John Davies, Dieter Fensel, Frank Van Harmelen, “Towards the Semantic Web: Ontology – Driven Knowledge Management”, John Wiley & Sons Ltd., 2003.
2. John Davies (Editor), Rudi Studer (Co-Editor), Paul Warren (Co-Editor) “Semantic Web Technologies: Trends and Research in Ontology-based Systems”Wiley Publications, Jul 2006
3. Dieter Fensel (Editor), Wolfgang Wahlster, Henry Lieberman, James Hendler, “Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential”, The MIT Press, 2002
4. Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, “The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management”, Wiley, 2003

HONOURS

ELECTRONICS & COMPUTER ENGINEERING

MICRO CONTROLLERS FOR EMBEDDED SYSTEM DESIGN

COURSE CODE: **11EM501** L – T – P: 3-0-2
PRE-REQUISITE: NIL CREDITS: 4

Introduction to Embedded Systems

Overview of Embedded Systems, Processor Embedded into a system, Embedded Hardware Units and Devices in system, Embedded Software, Complex System Design, Design Process in Embedded System, Formalization of System Design, Classification of Embedded Systems.

Microcontrollers and Processor Architecture & Interfacing

8051 Architecture. Real world interfacing, Introduction to advanced architectures, processor & memory organization, Instruction-level parallelism, and performance metrics.

PIC Microcontroller Hardware

Introduction, Architectural overview, Memory organization, interrupts and reset, I/O ports, Timers

Device Drivers & Interrupt service Mechanism

Programmed-I/O Busy-wait approach without ISM,ISR concept, Interrupt sources, Interrupt service mechanism, Multiple Interrupts, context and the periods for context switching, Interrupt latency and deadline, Classification of processors ISM from context-saving angle, Direct Memory Access, Device driver programming

Devices &Communication Buses for Devices Network

IO Types and examples, Serial communication Devices, Parallel Device ports, Networked Embedded systems, Serial Bus communication protocols

Text Books:

1. Embedded Systems - Architecture Programming and Design – Raj Kamal, 2nd ed., 2008, TMH.
2. Embedded C Programming and the Microchip PIC-Richard Barnett, O" Cull, Cox, 2009,Cengage Learning.

Reference Books:

1. Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes Cole, 1999, Thomas Learning

REAL TIME CONCEPTS FOR EMBEDDED SYSTEMS

COURSE CODE : 12EM-502 **L – T – P: 3-1-0**

PRE-REQUISITE: NIL **CREDITS: 4**

Introduction: Examples of Embedded Systems, Definition of Embedded Systems, Architecture of Embedded Systems, Real- Time Embedded Systems , Design Issues and Current Trends for Embedded Systems

Hard versus soft Real- Time Systems: Jobs and Processes, Release Times, Deadlines and Timing Constraints, Hard and Soft Timing Constraints, Hard Real Time Systems, Soft Real Time Systems

A Reference Model of Real – Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency, Functional Parameters- preemptivity of jobs, criticality of jobs, Resource Parameters of Jobs and Parameters of Resources, Scheduling Hierarchy- Scheduler and Schedules, Feasibility, Optimality and Performance Measures.

Classification of Real Time Scheduling Approaches: Clock- Driven Approach, Weighted Round- Robin Approach, Priority- Driven Approach, Dynamic versus Static Systems, Effective Release Times and Deadlines, optimality of the EDF and LST algorithms, Non optimality of the EDF and LST algorithms, Challenges in validating timing constraints in priority –driven systems Off-line versus On-line Scheduling

Clock-Driven Scheduling : Notations and Assumptions, Static, Timer -Driven Scheduler, General Structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of Aperiodic Jobs, Scheduling Sporadic Jobs-Acceptance test ,EDF Scheduling of accepted jobs and implementation, Pros and Cons of Clock Driven Scheduling,

Priority-Driven Scheduling of Periodic Tasks: Static Assumption, Fixed Priority v/s Dynamic Priority Algorithms, schedulability test for the EDF algorithm, a schedulability test for fixed priority tasks with short response times-time demand analysis, schedulability test for fixed priority tasks with arbitrary response times: busy intervals, general schedulability test, sufficient schedulability conditions for RM & DM algorithms: schedulable utilization of the RM algorithm for tasks with Di=pi, schedulable utilization of fixed priority tasks with arbitrary relative deadlines

Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems: Assumptions and Approaches, Deferrable Servers- Operations of Deferrable Servers, Constant utilization server Scheduling of sporadic jobs-a simple acceptance test in deadline driven systems, a simple acceptance test in fixed- priority driven systems

Resources and Resource Access control: Assumptions on Resources and Their Usage, Effects of Resource Contention and Resource Access Control, Non-preemptive Critical Sections, Basic Priority Inheritance Protocol, Basic Priority Ceiling Protocol- Definition, computation of blocking time, controlling accesses to Multiple Unit Resources

Real-Time Operating Systems: Overview- Threads and Tasks, The Kernel, Time Services and Scheduling Mechanisms- Time Services, Scheduling Mechanisms, Other Basic Operating System Functions- Communication and Synchronization, Event Notification and Software Interrupt, Memory Management, I/O and Networking

TEXT BOOKS:

1. Real Time Systems – By Jane W.S.Liu -Low Price Edition , Pearson Education Asia
2. Real-Time Concepts for Embedded Systems - Qing Li with Caroline Yao published by CMP Books

DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES

COURSE CODE: **13EM 602** L – T – P: 3-10-0

PRE-REQUISITE: NIL CREDITS: 4

Introduction To Digital Signal Processing: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. DiscreteFourier Transform (DFT) and Fast Fourier Transform (FFT), linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of errorin DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

Architectures for Programmable DSP Devices: 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.

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices- ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP2100, ADSP-2181 high performance Processor.

Introduction to Blackfin Processor – The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

Interfacing Memory And I/O Peripherals To Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

Text Books

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach to Digital Signal Processing – K Padmanabhan, R. Vijayarajeswaran, Ananthi.S, New Age International, 2006/2009.
3. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007.

References

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architecture & Features- Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Enguneering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI.
5. The Scientist and Engineering's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997.
6. Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes, ISBN 0750679123, 2005.

SENSORS AND SENSING PRINCIPLES

COURSE CODE: 13EM513	L – T – P: 3-1-0
PRE-REQUISITE: NIL	CREDITS: 4

Sensor Fundamentals:

Basic sensor technology -sensor characteristics –static and dynamic –Principles of sensing- capacitance-magnetic and electromagnetic induction –resistance piezoelectric effect –Pyroelectric effect -Hall effect-See beck and Pettier effect-heat transfer-light. **Sensor Characteristics:** Analysis of experimental data: causes and types of experimental errors –

statistical analysis of experimental data –method of least squares –correlation coefficient, multivariable regression – graphical analysis and curve fitting.

Physical /Chemical sensors: Position, Displacement and Level sensors, Velocity and Acceleration sensors,Force, Strain, Tactile and pressure sensors. Classification of chemical sensing Mechanism, Potentiometric sensors, Conduct metric Sensors, Amperometric Sensors, Enhanced Catalytic gas Sensors.

Optical Sensors: Optical Radiation- Electromagnetic Spectrum, Snell's Law and Total internal reflection, Diffraction principles, Optical Detectors and Sources-Photo diodes and transistors, Photo-darling ton pairs, Photoconductive sensors, CCD sensors, Fiber optic sensors. Solid state light sources- LED , Diode lasers, Semiconductor laser optical cavity resonator.

Bio sensors Origin and Transmission of bioelectrical Signals, The Electromyogram (EMG) & the Electrocardiogram (ECG) The Electroencephalogram (EEG) & Blood pressure measurement, Catalytic biosensors, mono-enzyme electrodes, bi-enzyme electrodes. cell based biosensors, biochips and biosensor arrays, problems and limitations.

Text books:

1. Biosensor Principles and Applications, Edited by Loïc J.Blum, Pierre R. Coulet Agarwal, Govind P, "fiber Optic Communication Systems", 2nd edition, Wiley, NewYork,1997
2. Principles of Biochemistry Albert L.Lehninger, David Lee Nelson,Michael M. 2005, Fourth Edition.
3. Sensors and Transducers D. Patranabis Prentice-Hall of India Pvt.Ltd August 15, 2004
4. Jacob Fraden, " Hand Book of Modern Sensors: physics, Designs and Applications", 3rd ed.,Springer, 2003.

COMMUNICATION PROTOCOLS AND STANDARDS

COURSE CODE: 13EM516	L – T – P: 3-0-2
PRE-REQUISITE: NIL	CREDITS: 4

Networks in process automation

Networks in process automation: Information flow requirements, Hierarchical communication model, Data Communication basics, OSI reference model, Industry Network, Network Topologies.

Communication Protocols:

Communication Protocols: Communication Basics, Basics, Network Classification, Device Networks, Control Networks, Enterprise Networking, Network selection. Proprietary and open networks: Network Architectures, Building blocks

Wired Communication:

Wired: Wired Communication: Industry open protocols (RS-232C, RS- 422, RS-485), CAN bus, I2C, SPI, Ethernet,USB ,OFC, Modbus, Modbus Plus, Data Highway Plus, Advantages and Limitations of Open networks.

Fieldbus Trends

Fieldbus: Fieldbus Trends, Hardware selection, Fieldbus design, Installation, Documentation, Fieldbus advantages and limitations, Automotive Most bus, Hot standby router protocol(HSRP) and Hot 255 modem, Dial up modem, Physical media -Cabling types and noise level conditions, leased line modems.

WPAN

Wireless: WPAN, Wi-Fi, Bluetooth, Zig-Bee, Z-wave, GPRS, GSM. Infrared communication: Routers, Hubs, Bridges, Ethernet switches, Different type of converters - Serial to Ethernet, Ethernet to OFC, Serial to OFC, RS232 to RS485

Outcomes: After completion of these course students should able to, Build sensor networks and Communicate through various media

Text Books:

1. TCIP/IP protocol suite , Behrouz A. Forouzen, III Edition

2. Data communications, computer networks, open systems, Prakash C. Guptha, V Edition

OPEN ELECTIVES

DATA WAREHOUSING AND MINING

COURSE CODE: 11 OE 432 **L – T – P: 3-0-0**
PRE-REQUISITE: NIL **CREDITS: 3**

INTRODUCTION TO DATA MINING: Motivation and importance, What is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining. Data Warehouse and OLAP Technology for Data Mining: What is a Data Warehouse, Multi-Dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining.
Data Preprocessing: Why Pre-process the Data? Data Cleaning, Data Integration and Transformation Data Reduction, Discretization and Concept Hierarchy Generation. Data Mining Primitives: Mining Association rule in large Databases, Association Rule Mining, Mining Single-dimensional Boolean Association rules from Transactional Databases, Mining Multi-dimensional Association rules from relational databases & Data Warehouse. Classification and prediction, Concepts and Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian. Classification, Classification by Back-propagation, Classification Based on Concepts from Association Rule Mining. Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Major clustering methods, partitioning methods, Hierarchial methods, Density-Based Methods: DBSCAN, Grid-based Method: STING; Model-based Clustering Method: Statistical approach, Outlier analysis.

Text Book:

1. Jiawei Han and Micheline Kamber,Data Mining Concepts and Techniques, Morgan Kaufman Publications

Reference Books:

1. Adriaan,Introduction to Data Mining, Addison Wesley Publication
2. A.K.Pujari Data Mining Techniques, University Press

E – COMMERCE

COURSE CODE: 11 OE 433 **L – T – P: 3-0-0**
PRE-REQUISITE: NIL **CREDITS: 3**

Electronic Commerce: Revolution. E-Commerce Business models and concepts: The Internet and World Wide Web: E-commerce infrastructure. Building an E-commerce web site, Security and Encryption, E-Commerce payment systems E-Commerce Marketing concepts, E-Commerce Marketing communications, Ethical, Social and Political issues in E-Commerce Retailing on the Web, Online Service industries, B2B E-Commerce: Supply chain management and collaborative commerce. Internet Resources for Commerce, Technologies for Web Servers, Internet Applications for commerce, Internet Charges, Internet Access and Architecture, Searching the Internet

Text Books:

1. Kenneth C.Laudon, Carol G.Traver , E-Commerce, (Pearson Education)

Reference Books:

1. Daniel Minoli,Emma Minoli,'Web Commerce Technology Handbook',(TMG)
2. Elias M.Awad'Electronic Commerce'(PHI)

LINUX PROGRAMMING

COURSE CODE: 13OE 421 L – T – P: 3-0-0

PRE-REQUISITE: NIL CREDITS: 3

Linux Utilities-File handling utilities, Security by file permissions, Process utilities ,Disk utilities Text processing utilities, and Backup utilities Sed- scripts, operation, addresses, commands, applications, Awk execution, field and records , scripts, operation, patterns, actions functions using system commands in awk. Working with Bourne again Shell (bash) responsibilities, here documents , running shell script, Shell as a programming language, shell meta characters, Control structures, arithmetic in shell, examples Interrupt processing, functions, debugging shell scripts. Files : file Concept , File System Structure, I nodes, File Attributes, File types Library functions ,standard and formatted I/O in C, stream errors Kernel support for files ,System calls, file descriptors, low level file access File structure related system calls (FILE APIS), file and record locking File and directory management-Directory file APIS, Symbolic links and hard links. Process concept, Kernel support for process, process attributes, process creation , waiting for a process, Process termination ,Zombie process, orphan process, Process APIs Introduction to signals, signal generation and handling ,Kernel support for signals, signal function, unreliable signals , reliable signals Kill ,raise, alarm, pause, abort, sleep functions. Introduction to IPC, pipes, FIFOs-Introduction to three types of IPC-message queues, semaphores and shared memory -Kernel support for messages, Unix system V APIs for messages- Client /Server example

Text Books:

1. Unix system Programming using C++ T.Chan , PHI (UNIT III to Unit VIII)
2. Unix Concept and Applications, 4th edn. Sumitabha dasTMH
3. Beginning Linux programming 4th edn. N. Matthew, R stones Wrox Wiley India edn.

Reference Books:

1. Linux system Programming , Robot Love, O;Reilly, SPD
2. Unix Network Programming , W.R. Stevens , PHI
3. Unix and Shell Programming , B. A. Forouzan and R.F Gilberg, Cengage learning
4. Unix Internals , U Vahalia , Pearson Educaiton Unix and shell Pr

INTERNET TECHNOLOGIES

COURSE CODE: 12OE447 L – T – P: 3-0-0

PRE-REQUISITE: NIL CREDITS: 3

Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response –– Generation of dynamic web pages. Markup Language (HTML): Introduction to HTML and HTML5 - Formatting and Fonts –Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – Frames - HTML Forms.Cascading Style Sheet (CSS3): The need for CSS, Introduction to CSS – Basic syntax and structure -Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Backgrounds – Manipulating text - Margins and Padding - Positioning using CSS. Introduction to Java Script, Objects in Java Script, Dynamic HTML with Java Script .XML: Document type definition, XML Schemas, Document Object model.

TEXT BOOKS:

1. Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How To Program", Fifth Edition, Pearson Education, 2011.

2. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech,2011.

TELEVISION ENGINEERING

COURSE CODE: 12OE441 L – T – P: 3-0-0
PRE-REQUISITE: NIL CREDITS: 3

ELEMENTS OF A TELEVISION SYSTEM: Picture transmission, sound transmission, picture reception, sound reception synchronization, receiver controls, color television.Analysis and Synthesis of Television Pictures: Gross structure, image continuity, no. of scanning lines, flicker, fine structure, tonal gradation. **COMPOSITE VIDEO SIGNAL: Video** signal dimensions, horizontal sync details, vertical sync details, scanning sequence details, functions of vertical pulse train, sync details of 525 line system.

SIGNAL TRANSMISSION AND CHANNEL BANDWIDTH : Amplitude Modulation, channel bandwidth, vestigial side band transmission, Transmission efficiency, complete channel bandwidth, reception of vestigial side band signals, frequency modulation, FM channel bandwidth, channel bandwidth for color transmission, allocation of frequency bands for television signal transmission, television standards. **THE PICTURE TUBE :**Monochrome picture tube, Beam deflection, screen phosphor, face plate, picture tube characteristics, picture tube circuit controls. Television Camera Tubes: Basic principal, Image orthicon, Vidicon. **BASIC TELEVISION BROADCASTING:** Television transmitter, positive & negative modulation. Television Receiver: Receiver sections, vestigial side band correction, choice of intermediate frequencies, picture tube circuitry & controls, sound signal separation, sound section, Sync processing & AFC circuit, vertical Deflection circuit, Horizontal deflection circuit. Television Signal propagation & Antennas: Television Transmission antennas, television receiver antennas, color television antennas.

TEXT BOOK:

1. R.R.Gulati, Monochrome and Color Television:; New Age

REFERENCE BOOK:

1. Dhake; TV and Video Engineering: TMH**.**

EMBEDDED TECHNOLOGIES

COURSE CODE: 11OE439 L – T – P: 3-0-0
PRE-REQUISITE: NIL CREDITS: 3

EMBEDDED DESIGN LIFE CYCLE Product specification – Hardware / Software partitioning – Detailed hardware and software design – Integration – Product testing – Selection Processes – Microprocessor Vs Micro Controller – Performance tools – Bench marking – RTOS Micro Controller – Performance tools – Bench marking – RTOS availability – Tool chain availability – Other issues in selection processes. **PARTITIONING DECISION** Hardware / Software duality – coding Hardware – ASIC revolution – Managing the Risk – Co-verification – execution environment – memory organization – System startup – Hardware manipulation – memory mapped access – speed and code density. **INTERRUPT SERVICE ROUTINES** Watch dog timers – Flash Memory basic toolset – Host based debugging – Remote debugging – ROM emulators – Logic analyzer – Caches – Computer optimization – Statistical profiling. **IN CIRCUIT EMULATORS** Buller proof run control – Real time trace – Hardware break points – Overlay memory – Timing constraints – Usage issues – Triggers. **TESTING** Bug tracking – reduction of risks & costs – Performance – Unit testing – Regression testing – Choosing test cases – Functional tests – Coverage tests – Testing embedded software – Performance testing – Maintenance.

Text Books

1. Arnold S. Berger – “Embedded System Design”, CMP books, USA 2002.
2. Sriram Iyer, “Embedded Real time System Programming”

Reference Books

1.. ARKIN, R.C., Behaviour-based Robotics, The MIT Press, 1998

COURSES FOR B.TECH (ECM) FOR ACADEMIC YEAR 2013-2017

I SEMESTER								II SEMESTER							
S.NO	COURSE CODE	SUBJECT NAME	L	T	P	HOURS	CREDITS	S.NO	COURSE CODE	SUBJECT NAME	L	T	P	HOURS	CREDITS
1	13-HS-101	English	2	0	2	2	3	1	13HS102	Language And Reasoning Skills	2	0	2	4	3
2	13-BS-102	Differential Equations	3	1	0	4	4	2	13ES103	Engineering Materials	3	0	0	3	3
3	13-BS 103	Engineering Physics	3	0	2	6	4	3	13ES101	Problem Solving Thorugh Programminmg	3	0	2	6	4
4	11-BS-104	Engineering Chemistry	3	0	2	6	4	4	13BS101	Linear Algebra And Multivariate Calculus	3	0	2	6	4
5	13-ES 106	Engineering Mechanics	3	0	2	6	4	5	13ES102	Measurements	3	0	2	6	4
6	11BS105	Ecology And Environment	2	0	0	2	2	6	13HS104	Human Values	2	0	0	2	2
7	13-ES105	Workshop Practice	0	0	4	4	2	7	11ES104	Engineering Graphics With Cad	0	0	4	4	2

III SEMESTER								IV SEMESTER							
S.NO	COURSE CODE	SUBJECT NAME	L	T	P	HOURS	CREDITS	S.NO	COURSE CODE	SUBJECT NAME	L	T	P	HOURS	CREDITS
1	13-BS-201	Mathematical methods	3	0	0	3	3	1	13-BS-206	Discrete Mathematics	3	0	0	3	3
2	13-ES-202	Object oriented programming	3	0	2	6	4	2	13-ES 201	Thermodynamics	3	0	2	3	4
3	13-ES 204	Data Structures	3	0	2	6	4	3	13-EC 203	Basics of Digital Systems	3	0	2	6	4
4	13-ES 203	Network Theory	3	0	2	6	4	4	13-EC 205	Analog Electronic Circuits	3	0	2	6	4
5	13-ES 205	Digital Signal Processing	3	0	2	6	4	5	13-CS 204	Data Base Management	3	0	2	6	4
6	13-EC201	Design of Electronic Systems	3	0	2	6	4	6	13-CS 203	Operating Systems	3	0	2	6	4
7	13-AC 302	Quantitative Aptitude and Reasoning	2	0	0	2	-	7		HS-Electives	3	0	0	3	3
8	13-AC 204	Sports / Games / Yoga (Audit Course)				35	23	8	13-NC 201	Certificate Course-1					

V SEMESTER								VI SEMESTER							
S.NO	COURSE CODE	SUBJECT NAME	L	T	P	HOURS	CREDITS	S.NO	COURSE CODE	SUBJECT NAME	L	T	P	HOURS	CREDITS
1	13CS205	Computer Networks	3	0	2	6	4	1	13EC311	Microprocessors & Micro Controllers	3	0	2	6	4
2	11EM301	Internet Programming	3	0	2	6	4	2	11EM401	Embedded Systems	3	0	2	6	4
3	13EM201	Computer organization	3	0	2	6	4	3	13CS301	Software Engineering	3	0	2	6	4
4	13EC312	Design with PLD/FPGA	3	0	2	6	4	4		PE – I	3	0	0	3	3
5	13EM202	Communication Systems	3	0	2	6	4	5		PE - II	3	0	0	3	3
6		OE-I	3	0	0	3	3	6	13TP401	Term Paper		0	4	4	2
7	13AC202	Employability Skills-I	1	0	2	2	-	7	13AC301	Advanced Employability Skills	1	0	2	2	-
8	13NC202	Certificate Course-2													

VII SEMESTER								VIII SEMESTER							
S.NO	COURSE CODE	SUBJECT NAME	L	T	P	HOURS	CREDITS	S.NO	COURSE CODE	SUBJECT NAME	L	T	P	HOURS	CREDITS
1	11EE304	Control Systems	3	0	2	6	4	1	11EE304	Control Systems	3	0	2	6	4
2	13EC206	CMOS VLSI Design	3	0	2	6	4	2	13EC206	CMOS VLSI Design	3	0	2	6	4
3		PE-III	3	0	0	3	3	3		PE-III	3	0	0	3	3
4		PE-IV	3	0	0	3	3	4		PE-IV	3	0	0	3	3
5		PE-V	3	0	0	3	3	5		PE-V	3	0	0	3	3
6	13AC201	Energy & Society	2	0	0	2	0	6	13AC201	Energy & Society	2	0	0	2	0
						23	17			OR				23	17
		OR						1	13PW402	Final Year Project	0	0	24	24	12
1	13 PS 401	Practice School	0	0	24		12	2		OE-II	3	0	0	3	3
2		OE-II	3	0	0	3	3	3		OE-III	3	0	0	3	3
3		OE-III	3	0	0	3	3							30	18
						30	18								172