ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

EMBEDDED SYSTEMS

For

M.TECH TWO YEAR POST GRADUATE DEGREE COURSE

(Applicable for the batches admitted from 2020-2021)

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

Established: 2009 **PGECET Code: MLRS**

Academic Regulations, Course Structure & Detailed Syllabus under Autonomous Status

Master of Technology (M.Tech)

Choice Based Credit System (CBCS)

(MLRITM R20 Regulations)

(Applicable for the batches admitted from 2020-21)

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

[Autonomous]

(An UGC Autonomous Institution, Approved by AICTE and Affiliated to JNTUH Hyderabad)
Accredited by NAAC with 'A' Grade, Recognized under the section 2(1) &12 (B) of UGC Act 1956

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PRELIMINARY DEFINITIONS AND NOMENCLATURES

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. 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 Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

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

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University, Hyderabad) and State Government.

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

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry, Biology etc., are considered to be foundational innature.

Betterment: Betterment is a way that contributes towards improvement of 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 (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Certificate course: It is a course that makes a student gain hands-on experience and skill required for holistic development in a specific area/field.

Choice Based Credit System: The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

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

Commission: Means University Grants Commission (UGC), New Delhi.

Continuous Internal Examination: It is an examination conducted towards internal assessment.

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

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 perweek.

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

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 upto 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 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 like Structural Engineering, Embedded Systems, CSE, etc.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff and other resources in the process of study for a degree.
Detention in a course: Student who does not obtain 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 any semester can apply in writing in prescribed format before commencement of that semester.
Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.
Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.
Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.
Grade Point: It is a numerical weight allotted to each letter grade on a 10 point scale.
Institute: Means MLRITM, Hyderabad unless indicated otherwise by the context.
Massive Open Online Course (MOOC): MOOC courses inculcate the habit of self learning. MOOC courses would be additional choices in all the elective group courses.
Pre-requisite: A course, the knowledge of which is required for registration into higher level course.
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: Means, Master of Technology (M.Tech) degree program / UG degree program: B.Tech.
Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.
Project work: It is a design or research based work to be taken up by a student during his/her second year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.
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 of a Program.
Regulations: The regulations, common to all M.Tech programs offered by Institute are designated as "IARE-R18" and are binding on all the stakeholders.
Semester: It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. The odd semester starts usually in July and even semester in December.
Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.
S/he: Means "she" and "he" both.
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.
University: Means the Jawaharlal Nehru Technological University Hyderabad, Hyderabad.
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.
Words 'he', him', 'his', occur, they imply 'she', 'her', 'hers' also.

FOREWORD

The autonomy is conferred to Marri Laxman Reddy Institute of Technology and management (MLRITM), Hyderabad by University Grants Commission (UGC), New Delhi based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like J N T University Hyderabad (JNTUH), Hyderabad and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

MLRITM is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the institute and recommendations of the JNTUH to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the institute to order to produce a quality engineering graduate to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

PRINCIPAL

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(Autonomous)

ACADEMIC REGULATIONS

M.Tech. Regular Two Year Degree Program
(for the batches admitted from the academic year 2020 - 21)

For pursuing two year postgraduate Master Degree program of study in Engineering (M.Tech) offered by Marri Laxman Reddy Institute Of Technology and Management under Autonomous status and herein after referred to as MLRITM.

1.0 CHOICE BASED CREDITSYSTEM

The Indian Higher Education Institutions (HEI's) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester system at first year itself. The semester system helps in accelerating the teaching learning process and enables vertical and horizontal mobility in learning.

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits and adopt an interdisciplinary approach to learning.

Choice Based Credit System (CBCS) is a flexible system of learning and provides choice for students to select from the prescribed elective courses. A course defines learning objectives and learning outcomes and comprises of lectures / tutorials / laboratory work / field work / project work /mini project work with seminar/ viva / seminars / presentations / self-study etc. or a combination of some of these.

Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

The CBCS permits students to:

1. Choose electives from a wide range of elective courses offered by the departments of the Institute.
2. Undergo additional courses of interest.
3. Adopt an inter-disciplinary approach in learning.
4. Make the best use of expertise of the available faculty.

2.0 MEDIUM OF INSTRUCTION

The medium of instruction shall be English for all courses, examinations, seminar presentations and project work. The curriculum will comprise courses of study as given in course curriculum in accordance with the prescribed syllabi.

3.0 ELIGIBILITY FORADMISSION

The admissions for category A and B seats shall be as per the guidelines of Telangana State Council for Higher

Education (TSCHE) in consonance with government reservation policy.

a) Under Category A: 70% of the seats are filled based on GATE/PGECET ranks.
b) Under Category B: 30% seats are filled on merit basis as per guidelines of TSCHE.

4.0 UNIQUE COURSE IDENTIFICATION CODE

Every specialization of the M.Techprogramme will be placed in one of the groups as listed in the Table 1.

Table 1: Group of Courses

S. No	Specialization	Offering Department	Code
1	Structural Engineering	Civil Engineering	ST
2	CAD / CAM	Mechanical Engineering	CC
3	Embedded Systems	Electronics and Communication Engineering	ES
4	Computer Science and Engineering	Computer Science and Engineering	CSE

5.0 TYPES OFCOURSES

Courses in a programme may be of four kinds: **Core, Elective, Open and Audit.**

5.1 Core Course:

There may be a core course in every semester. This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a program in said discipline of study.

5.2 Elective Course:

Electives provide breadth of experience in respective branch and applications areas. Elective course is a course which can be chosen from a pool of courses. It maybe:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

There shall be five professional core elective groups out of which students can choose not more than two courses from each group. Overall, students can opt for four professional elective courses which suit their project work in consultation with the faculty advisor/mentor. In addition, one course from each of the two open electives has to be selected. A student may also opt for more elective courses in his/her area of interest.

5.3 Open Elective Course:

An elective may be discipline centric focusing on those courses which add generic proficiency to the students or may be chosen from supportive/general discipline called as "Open Elective".

5.4 Audit Course:

The value added courses are audit courses offered through joint ventures with various organizations providing ample Scope for the students as well as faculty to keep pace with the latest technologies pertaining to their chosen fields of study. A plenty of value added programs will be proposed by the departments one week before the commencement of class work. The students are given the option to choose the courses according to their desires and inclinations as they choose the desired items in a cafeteria. The expertise gained through the value added programs should enable them to face the formidable challenges of the future and also assist them in exploring new opportunities. Its result shall be declared with "Satisfactory" or "Not Satisfactory" performance.

6.0 SEMESTER STRUCTURE

The institute shall follow semester pattern. An academic year shall consist of a first semester and a second semester and the summer term. Each semester shall be of 23 weeks (Table 2) duration and this period includes time for course work, examination preparation and conduct of examinations. Each main semester shall have a minimum of 90 working days; out of which number of contact days for teaching / practical shall be 75 and 15 days shall be for examination preparation. The duration for each semester shall be a minimum of 17 weeks of instruction. The Academic Calendar is declared at the beginning of the academic year as given in Table2.

Table 2: Academic Calendar

FIRST SEMESTER (23 weeks)	I Spell Instruction Period	9 weeks	21 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	2 weeks	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Exams			2 weeks
SECOND SEMESTER (23 weeks)	I Spell Instruction Period	9 weeks	21 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 Week	
	Preparation & Practical Examinations	2 weeks	
	Semester End Examinations		2 weeks
Summer Vacation and Supplementary Exams			4 weeks
THIRD SEMESTER	I Spell Instruction Period	9 weeks	18 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Project Work Phase – I		
	Semester End Examinations		1 week
FOURTH SEMESTER	Project Work Phase - II		18 weeks

7.0 PROGRAMDURATION

A student shall be declared eligible for the award of M.Tech degree, if he/she pursues a course of study and completes it successfully in not less than two academic years and not more than four academic years. A student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his/her admission, shall forfeit his/her seat in M.Tech course.

a) A student will be eligible for the award of M.Tech degree on securing a minimum of 5.0/10.0CGPA.
b) In the event of non-completion of project work and/or non-submission of the project report by the end of the fourth semester, the candidate shall re-register by paying the semester fee for the project. In such a case, the candidate will not be permitted to submit the report earlier than three months and not later than six months from the date of registration.

8.0 CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Core Courses, Elective Core Courses, Laboratory Course, Mini Project with Seminar, Internship, Project Work-1 and Project Work-2.

Each Theory and Laboratory course carries credits based on the number of hours / week as follows:

- **Lecture Hours (Theory):** 1 credit per lecture hour per week.
- **Laboratory Hours (Practical):** 1 credit for 2 practical hours, 2 credits for 3 or 4 practical hours per week.
- **Project Work:** 1 credit for 2 hours of project work per week.

8.1 Credit distribution for courses offered is shown in Table3.

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Core Courses	3	4
2	Professional Core Elective Courses	3	3
3	Technical Paper writing	2	2
4	Laboratory Courses	4	2
5	Open Elective Courses	3	3
6	Mini Project with Seminar	2	2
7	Project Work-1 Dissertation	20	8
8	Project Work-2 Dissertation	32	8

8.2 Course wise break-up for the total credits:

Total Theory Courses (12) Core Courses (6)+Professional Core Electives (04) + Open Electives (02)	6@4credits + 04@ 3 credits + 02@3 credits	42
Total Laboratory Courses (02)	02@2credits	04
Seminar(02)	2@2credit	04
Technical Paper Writing	1@2 credit	02
Comprehensive Viva Voce	1@4 credit	04
Project Work-1	1 @8credit	08
Project Work-2	1 @8credits	08
Project Evaluation(Viva-Voce)	1@16 credit	16
TOTAL CREDITS		**88**

9.0 EVALUATIONMETHODOLOGY

9.1 Theory Course:

Each theory course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIE during the semester, marks are awarded by taking average of two sessional examinations.

9.1.1 Semester End Examination(SEE):

The SEE shall be conducted for 70 marks of 3 hours duration. The syllabus for the theory courses shall be divided into FIVE units and each unit carries equal weightage in terms of marks distribution. The question paper pattern shall be as defined below. Two full questions with 'either' 'or' choice will be drawn from each unit. Each question carries 14 marks. There could be a maximum of three sub divisions in a question. The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept
30 %	To test the analytical skill of the concept
20 %	To test the application skill of the concept

9.1.2 Continuous Internal Assessment(CIA):

For each theory course the CIA shall be conducted by the faculty/teacher handling the course as given in Table 4. CIA is conducted for a total of 30 marks, with 25 marks for Continuous Internal Examination (CIE) and 05 marks for Technical Seminar and TermPaper.

Table 4: Assessment pattern for TheoryCourses

COMPONENT	**THEORY**		
Type of Assessment	CIEExam (Sessional)	Technical Seminar and Term Paper	**TOTAL MARKS**
Max. CIA	25	5	30

Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 9th and 17th week of the semester respectively. **The CIE exam is conducted for 25 marks of 2 hours duration, consisting of 5 one mark compulsory questions in part-A and 4 questions in part-B. The student has to answer any 4 questions out of five questions, each carrying 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.**

Technical Seminar and Term Paper:

Two seminar presentations are conducted during I year I semester and II semester. For seminar, a student under the supervision of a concerned faculty member, shall identify a topic in each course and prepare the term paper with overview of topic. The evaluation of Technical seminar and term paper is for maximum of 5 marks. Marks are awarded by taking average of marks scored in two Seminar Evaluations.

9.2 Laboratory Course:

9.2.1 Each lab will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment. The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being a internal examiner and another is external examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

9.2.2 All the drawing related courses are evaluated in line with lab courses. The distribution shall be 30 marks for internal evaluation (20 marks for day–to–day work, and 10 marks for internal tests) and 70 marks for semester end lab examination. There shall be ONE internal test for 10 marks each in a semester.

9.3 Project work

Normally, the project work should be carried out at Host Institute (Marri Laxman Reddy Institute of Technology and management). However, it can also be carried out in any of the recognized Educational Institutions, National Laboratories, Research Institutions, Industrial Organizations, Service Organizations or Government Organizations with the prior permission from the guide and concerned Head of the Department. A student shall submit the outcome of the project work in the form of a dissertation.

9.3.1 The student shall submit the project work synopsis at the end of III semester for Phase-I of project evaluation. The Phase-I of project work shall be evaluated by Project Review Committee (PRC) at the end of the third semester for a maximum of 100 marks. Head of the Department (HOD) shall constitute a PRC comprising of senior faculty of the specialization, Guide and Head of the Department.

9.3.2 The first phase of project work is to be carried out in IV semester for Phase –II of Project work. The student will be allowed to appear for final viva voce examination at the end of IV semester only if s/he has submitted s/he project work in the form of paper for presentation/ publication in a conference/journal and produce the proof of acceptance of the paper from the organizers/publishers.

9.3.3 The student shall submit the project work in the form of dissertation at least four weeks ahead of the completion of the program. Head of the Department shall constitute an Internal Evaluation Committee (IEC) comprising of the Chairman BOS (PG), HOD and Guide. As per convenes of all meeting for open pre-submission seminar evaluation of the student. If the open pre-submission seminar by a student is not satisfactory, another seminar shall be scheduled within two weeks.

The evaluation of the project work and the marks allotted are as under:

S. No	Project Phases	Mode	Evaluation Committee	Marks
1	Phase - I	Continuous evaluation at the end of III Semester	Guide	30
2		Evaluation at the end of III Semester	Project Review Committee (PRC) comprising of senior faculty of the specialization, guide and HOD.	70
Total (Phase – I)				**100**
3	Phase - II	An open pre-submission seminar by the student	The Internal Evaluation Committee (IEC) comprising of the Chairman, BOS (PG), HOD and guide wherein the HOD convenes its meeting.	30
4		End Semester Examination (An open seminar followed by viva- voce)	The External Evaluation Committee (EEC) comprising of External Examiner, HOD and guide wherein the HOD shall be the chairman of the committee.	70
Total (Phase-II)				**100**

9.3.4 As soon as a student submits his project work, Principal shall appoint the External Examiner among the panel of examiners recommended by the Chairman, BOS(PG).

9.3.5 The Principal shall schedule the End Semester Examination in project work soon after the completion of the study of program and a student can appear for the same provided s/he has earned successfully all the requisite credits. The student shall produce the dissertation duly certified by the guide and HOD during the Examination.

9.3.6 The project reports of M.Tech students who have not completed their course work successfully will be evaluated in that semester itself and the result sent confidentially to the Controller of Examinations. The results of the project work evaluation will be declared by the Controller of Examinations only after the successful completion of the courses by those students.

9.3.7 After approval from the PRC, a soft copy of the thesis should be submitted for ANTI-PLAGIARISM check and the plagiarism report should be submitted to the College and be included in the final. thesis. The Thesis will be accepted for submission, if the similarity index is less than 30%.Ifthe similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to TWO. The candidate has to register for the Project work and work for one semester. After three attempts, the admission is liable to be cancelled. The college authorities are advised to make plagiarism check of every soft copy of theses before submissions.

10.0 ATTENDANCE REQUIREMENTS AND DETENTIONPOLICY

10.1 It is desirable for a candidate to put on 100% attendance in each course. In every course (theory/laboratory), student has to maintain a minimum of 75% attendance including the days of attendance in sports, games, NCC and NSS activities to be eligible for appearing in Semester End Examination of the course.

10.2 For cases of medical issues, deficiency of attendance in each course to the extent of 15% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the Department if his/her attendance is between 80% to 65% in every course, subjected to submission of medical certificate and other needful documents to the concerned department.

10.3 The basis for the calculation of the attendance shall be the period prescribed by the institute by its calendar of events. For late admission, attendance is reckoned from the date of admission to the program.

10.3 However, in case of a student having less than 65% attendance in any course, s/he shall be detained in the course and in no case such process will be relaxed.

10.4 Students whose shortage of attendance is not condoned in any subject are not eligible to write their semester end examination of that courses and their registration shall stand cancelled.

10.5 A prescribed fee shall be payable towards Condonation of shortage of attendance.

10.6 A candidate shall put in a minimum required attendance at least in three (3) theory courses for getting promoted to next higher class / semester. Otherwise, s/he shall be declared detained and has to repeat semester.

10.7 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, s/he shall not be eligible for readmission into the same class.

11.0 CONDUCT OF SEMESTER END EXAMINATIONS ANDEVALUATION

11.1 Semester end examination shall be conducted by the Controller of Examinations (COE) by inviting Question Papers from the External Examiners.

11.2 Question papers may be moderated for the coverage of syllabus, pattern of questions by Semester End Examination Committee chaired by Head of the Department one day before the commencement of semester end examinations.

11.3 Internal Examiner shall prepare a detailed scheme of valuation.

11.4 The answer papers of semester end examination should be evaluated by the internal examiner immediately after the completion of exam and the award sheet should be submitted to COE in a sealed cover before the same papers are kept for second evaluation by external examiner.

11.5 In case of difference is more than 15% of marks, the answer paper shall be re-evaluated by a third examiner appointed by the Examination Committee and marks awarded by him shall be taken asfinal.

11.6 HOD shall invite 3-9 external examiners to evaluate all the end semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

11.7 Examination Control Committee shall consolidate the marks awarded by internal and external examiners to award grades.

12.0 SCHEME FOR THE AWARD OFGRADE

12.1 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory course, if she/he secures:

i. Not less than 40% marks for each theory course in the semester end examination, and
ii. A minimum of 50% marks for each theory course considering both CIA and SEE

12.2 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each Laboratory / Seminar and Technical Writing / Project, if she/he secures

i. Not less than 40% marks for each Laboratory / Seminar / Project course in the semester end examination,
ii. A minimum of 50% marks for each Laboratory / Mini project with Seminar / Project course considering both internal and semester end examination.

12.3 If a candidate fails to secure a pass in a particular course, it is mandatory that s/he shall register and reappear for the examination in that course during the next semester when examination is conducted in that course. It is mandatory that s/he should continue to register and reappear for the examination till s/he secures a pass.

13.0 LETTER GRADES AND GRADEPOINTS

13.1 Performances of students in each course are expressed in terms of marks as well as in Letter Grades based on absolute grading system. The UGC recommends a 10point grading system with the following letter grades as given below:

Range of Marks	Grade Point	Letter Grade
100 - 80	10	S (Superior)
70 – 79	9	A+ (Excellent)
60 – 69	8	A (Very Good)
55 – 59	7	B+ (Good)
50 – 54	6	B (Average)
Below 50	0	F (Fail)
Absent	0	Ab (Absent)
Authorized Break of Study	0	ABS

13.2 A student is deemed to have passed and acquired to correspondent credits in particular course ifs/he obtains any one of the following grades: “S”, “A+”, “A”, “B+”,“B”.

13.3 A student obtaining Grade “F” shall be considered Failed and will be required to reappear in the examination.

13.4 "SA" denotes shortage of attendance (as per item 10) and hence prevention from writing Semester End Examination.

13.5 At the end of each semester, the institute issues grade sheet indicating the SGPA and CGPA of the student. However, grade sheet will not be issued to the student if s/he has any out standing dues.

14.0 COMPUTATION OF SGPA AND CGPA

The UGC recommends to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The credit points earned by a student are used for calculating the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA), both of which are important performance indices of the student. SGPA is equal to the sum of all the total points earned by the student in a given semester divided by the number of credits registered by the student in that semester. CGPA gives the sum of all the total points earned in all the previous semesters and the current semester divided by the number of credits registered in all these semesters. Thus,

$$SGPA = \sum_{i=1}^{n} (Ci\ Gi) / \sum_{i=1}^{n} Ci$$

Where, $C_i$is the number of credits of the i^{th}course and $G_i$is the grade point scored by the student in the i^{th} course and n represent the number of courses in which a student's is registered in the concerned semester.

$$CGPA = \sum_{j=1}^{n} (Cjsj) / \sum_{j=1}^{n} Ci$$

Where, $S_j$is the SGPA of the j^{th}semester and $C_j$is the total number of credits upto the semester and m represent the number of semesters completed in which a student registered upto the semester. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

15.0 ILLUSTRATION OF COMPUTATION OF SGPA ANDCGPA

15.1 Illustration forSGPA

Course Name	Course Credits	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 x 8 = 24
Course 2	4	B+	7	4 x 7 = 28
Course 3	3	B	6	3 x 6 = 18
Course 4	3	S	10	3 x 10 = 30
Course 5	3	C	5	3 x 5 = 15
Course 6	4	B	6	4 x 6 = 24
	20			**139**

Thus, ***SGPA* = 139 / 20 = 6.95**

15.2 Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit:20 SGPA:6.9	Credit:22 SGPA:7.8	Credit:25 SGPA:5.6	Credit:26 SGPA:6.0

Thus, ***CGPA =*** $\frac{20x6.9 + 22x7.8 + 25x5.6 + 26x6.0}{93}$

= 6.51

16.0 PHOTOCOPY /REVALUATION

A student, who seeks the revaluation of the answer script, is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s) within 2 working days from the declaration of results in the prescribed format to the Controller of Examinations through the Head of the Department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses.

17.0 GRADUATIONREQUIREMENTS

The following academic requirements shall be met for the award of M .Tech degree.

17.1 Student shall register and acquire minimum attendance in all courses and secure 88credits.

17.2 A student who fails to earn 88 credits within four consecutive academic years from the year of his/her admission with a minimum CGPA of 5.0, shall forfeit his/her degree and his/her admission stands cancelled.

18.0 AWARD OFDEGREE

Classification of degree will be as follows:

CGPA ≥ 7.5	CGPA ≥ 6.5 and < 7.5	CGPA ≥ 5.5 and < 6.5	CGPA ≥ 5.0 and< 5.5	CGPA< 5.0
First Class with Distinction	**First Class**	**Second Class**	**Pass Class**	**Fail**

a) In case a student takes more than one attempt in clearing a course, the final marks secured shall be indicated by * mark in the marks memo.

b) All the candidates who register for the semester end examination will be issued grade sheet by the Institute. Apart from the semester wise marks memos, the institute will issue the provisional certificate subject to the fulfillment of all the academic requirements.

19.0 IMPROVEMENT OFGRADE:

A candidate, after becoming eligible for the award of the degree, may reappear for the final examination in any of the theory courses as and when conducted for the purpose of improving the aggregate and the grade. But this reappearance shall be within a period of two academic years after becoming eligible for the award of the degree.

However, this facility shall not be availed of by a candidate who has taken the Original Degree Certificate. Candidates shall not be permitted to reappear either for CIE in any course or for Semester End Examination (SEE) in laboratory courses (including Project Viva-voce) for the purpose of improvement.

20.0 TERMINATION FROM THEPROGRAM

The admission of a student to the program may be terminated and the student may be asked to leave the institute in the following circumstances:

a) The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.
b) The student fails to satisfy the norms of discipline specified by the institute from time to time.

21.0 WITH-HOLDING OFRESULTS

If the candidate has not paid any dues to the college / if any case of indiscipline / malpractice is pending against him/her, the results of the candidate will be withheld. The issue of the degree is liable to be withheld in such cases.

22.0 GRADUATIONDAY

The institute shall have its own annual Graduation Day for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.
The college shall institute prizes and medals to meritorious students annually on Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

23.0 DISCIPLINE

Every student is required to observe discipline and decorum both inside and outside the institute and not to indulge in any activity which will tend to bring down the honor of the institute. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations he/she shall be liable for punitive action as prescribed by the Institute from time totime.

24.0 GRIEVANCE REDRESSALCOMMITTEE

The institute shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD as the members. This Committee shall solve all grievances related to the course under consideration.

25.0 TRANSITORY REGULATIONS

25.1 A student who has been detained in any semester of previous regulations for not satisfying the attendance requirements shall be permitted to join in the corresponding semester of this regulation.

25.2 Semester End Examination in each course under the regulations that precede immediately these regulations shall be conducted three times after the conduct of last regular examination under those regulations. Thereafter, the failed students, if any, shall take examination in the equivalent papers of these regulations as suggested by the Chairman, BOS concerned.

26.0 REVISION OF REGULATIONS ANDCURRICULUM

The Institute from time to time may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall come into force and shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S.No	**Nature of Malpractices / Improper conduct**	**Punishment**
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject ofthe examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of anymatter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Controller of Examinations /Additional Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the COE or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the COE or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the Institute premises or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

M.TECH in EMBEDDED SYSTEMS

COURSE STRUCTURE (R20)

Applicable From 2020-21 Admitted Batch

I YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2015503	Microcontrollers & Programmable Digital Signal Processors	PC	3	0	0	3	30	70	100
2	2015504	System Design with Embedded Linux	PC	3	0	0	3	30	70	100
3		Professional Elective - I	PE	3	0	0	3	30	70	100
4		Professional Elective - II	PE	3	0	0	3	30	70	100
5	2015521	Microcontrollers & Programmable Digital Signal Processors Lab	PC	0	0	3	2	30	70	100
6	2015522	System Design with Embedded Linux Lab	PC	0	0	3	2	30	70	100
7	2015502	Research Methodology & IPR	PC	2	0	0	2	30	70	100
8		Audit Course - I	AC	2	0	0	0	100	-	100
TOTAL				**16**	**0**	**6**	**18**	**310**	**490**	**800**

I YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2025505	RTL Simulation and Synthesis with PLDs	PC	3	0	0	3	30	70	100
2	2025506	Advanced Digital Signal Processing	PC	3	0	0	3	30	70	100
3		Professional Elective - III	PE	3	0	0	3	30	70	100
4		Professional Elective - IV	PE	3	0	0	3	30	70	100
5	2025523	RTL Simulation and Synthesis with PLDs Lab	PC	0	0	3	2	30	70	100
6	2025524	Advanced Digital Signal Processing Lab	PC	0	0	3	2	30	70	100
7	2025525	Mini Project with Seminar	PS	0	0	4	2	30	70	100
8		Audit Course - II	AC	2	0	0	0	100	-	100
TOTAL				**14**	**0**	**10**	**18**	**310**	**490**	**800**

II YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1		Professional Elective - V	PE	3	0	0	3	30	70	100
2		Open Elective	OE	3	0	0	3	30	70	100
3	2035526	Dissertation Phase - II	PS	0	0	12	6	100	0	100
TOTAL				**6**	**0**	**12**	**12**	**160**	**140**	**300**

II YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2045527	Dissertation Phase - III	PS	0	0	12	6	100	0	100
2	2045528	Dissertation Viva - Voce	PS	0	0	28	14	0	100	100
TOTAL				**0**	**0**	**40**	**20**	**100**	**100**	**200**

Professional Elective (PE) Courses

Professional Elective-I

S. No.	Course Code	Course Title
1	2015507	Programming Languages for Embedded Software
2	2015508	AI & Machine Leaning
3	2015509	Computer Vision

Professional Elective-II

S. No.	Course Code	Course Title
1	2015510	Communication Buses & Interfaces
2	2015511	Parallel Processing
3	2015512	Advanced Computer architecture

Professional Elective-III

S. No.	Course Code	Course Title
1	2025513	IoT & Applications
2	2025514	VLSI Signal Processing
3	2025515	SOC Architecture

Professional Elective-IV

S. No.	Course Code	Course Title
1	2025516	Hardware Software Co - Design
2	2025517	Network Security and Cryptography
3	2025518	Physical Design Automation

Professional Elective-V

S. No.	Course Code	Course Title
1	2035519	Scripting Languages
2	2035520	Memory Technologies
3	2035521	Wireless Sensor Networks

Audit Course – I		
S. No.	**Course Code**	**Course**
1	2010001	English for Research Paper Writing and its SIgnificance
2	2010002	Disaster Management
3	2010003	Sanskrit for Technical Knowledge
4	2010004	Value Education

Audit Course – II		
S. No.	**Course Code**	**Course**
1	2020005	Constitution of India in Practice
2	2020006	Pedagogy Studies
3	2020007	Stress Management by Yoga
4	2020008	Personality Development Through Life Enlightenment Skills

Open Elective (OE) Course

S. No.	Course Code	Course Title
1	2035501	Overview of VLSI & Embedded Systems
2	2035502	Principles of Electronic Communications
3	2035503	Fundamentals of Nano Technology

***Open Elective** – Students should take Open Electives from List of Open Electives Offered by Other Departments/Branches Only.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2015503: MICROCONTROLLERS & PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

I Year M.Tech (ES) I – Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the various applications of ARM processors
- To analyze the interrupt operations of ARM Processors
- To understand the operation of LPC17xx microcontroller
- To understand about different programmable DSP architectures
- To design the various logical operations using VLIW processors

Course Outcomes:

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

- Compare and select ARM processor core based SoC with several features/peripherals based on requirements of embedded applications
- Identify and characterize architecture of Programmable DSP Processors
- Develop small applications by utilizing the ARM processor core and DSP processor based platform
- Learn about various interrupt handling mechanisms in ARM processors
- Design of logical applications using programmable DSP processors

UNIT-I

ARM Cortex-M3 processor: Applications, Programming model – Registers, Operation - modes, Exceptions and Interrupts, Reset Sequence Instruction Set, Unified Assembler Language, Memory Maps, Memory Access Attributes, Permissions, Bit-Band Operations, Unaligned and Exclusive Transfers. Pipeline, Bus Interfaces.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the Architecture of ARM processor
- Summarize the operational modes of ARM processor
- Illustrate the various applications of ARM processor

UNIT-II

Exceptions, Types, Priority, Vector Tables, Interrupt Inputs and Pending behaviour, Fault Exceptions, Supervisor and Pendable Service Call, Nested Vectored Interrupt Controller, Basic Configuration, SYSTICK Timer, Interrupt Sequences, Exits, Tail Chaining, Interrupt Latency.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the various interrupts in ARM processor
- Summarize the Exception handling mechanisms of ARM processors
- Illustrate the various interrupt behavior of ARM processor

UNIT-III

LPC 17xx microcontroller- Internal memory, GPIOs, Timers, ADC, UART and other serial interfaces, PWM, RTC, WDT.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the Architecture of LPC 17xx microcontroller
- Summarize the operational modes of LPC 17xx microcontroller
- Illustrate the various applications of LPC 17xx microcontroller

UNIT-IV

Programmable DSP (P-DSP) Processors: Harvard architecture, Multi port memory, architectural structure of P-DSP- MAC unit, Barrel shifters, Introduction to TI DSP processor family.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the concepts of programmable DSP Processors
- Demonstrate the various blocks of programmable DSP Processors
- Illustrate the concepts of TI DSP processor family

UNIT-V

VLIW architecture and TMS320C6000 series, architecture study, data paths, cross paths, Introduction to Instruction level architecture of C6000 family, Assembly Instructions memory addressing, for arithmetic, logical operations.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the concepts of TMS320C6000 series Processors
- Demonstrate the various arithmetic and logical operations of TMS320C6000 series Processors
- Illustrate the programmable instruction set of C6000 family processors

TEXT BOOKS:

1. Joseph Yiu, “The definitive guide to ARM Cortex-M3”, Elsevier, 2nd Edition
2. Venkatramani B. and Bhaskar M. “Digital Signal Processors: Architecture, Programming and Applications” , TMH , 2nd Edition

REFERENCES:

1. Sloss Andrew N, Symes Dominic, Wright Chris, “ARM System Developer's Guide: Designing and Optimizing”, Morgan Kaufman Publication.
2. Steve furber, “ARM System-on-Chip Architecture”, Pearson Education
3. Frank Vahid and Tony Givargis, “Embedded System Design”, Wiley.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2015504: SYSTEM DESIGN WITH EMBEDDED LINUX

I Year M.Tech (ES) I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To provide a basic understanding of the Linux OS and the Eclipse IDE framework
- To understand the complexities of Embedded Linux Distributions in embedded systems
- To understand the process of configuring, booting and testing the Embedded Linux distributions and applications running on Embedded Linux target systems
- Enable students to analyze and develop software programs for embedded systems
- Develop an understanding of the technologies behind the embedded computing systems

Course Outcomes:

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

- Appreciate the principles of the embedded Linux development model
- Develop the code for profile applications and drivers in embedded Linux
- Appreciate and create Linux BSP for a hardware platform
- Familiarity of the embedded Linux development model
- Write, debug, and profile applications and drivers in embedded Linux

UNIT - I

Introduction to Real Time Operating Systems: Characteristics of RTOS, Tasks Specifications and types, Real-Time Scheduling Algorithms, Concurrency, Inter-process Communication and Synchronization mechanisms, Priority Inversion, Inheritance and Ceiling.

Embedded Linux Vs Desktop Linux, Embedded Linux Distributions, System calls, Static and dynamic libraries, Cross tool chains.

Learning Outcomes: At the end of the unit, the student will be able to

- Overview of the real-time scheduling algorithms and mechanisms
- Understand Synchronization mechanisms
- Understand the state-of-the-art in embedded Linux Libraries

UNIT - II

Embedded Linux Architecture, Kernel Architecture – HAL, Memory manager, Scheduler, File System, I/O and Networking subsystem, IPC, User space, Start-up sequence.

Learning Outcomes: At the end of the unit, the student will be able to

- Implement Embedded systems with Embedded operating systems
- Develop applications with Embedded Linux
- Understand Synchronization mechanisms

UNIT - III

Board Support Package Embedded Storage: MTD, Architecture, Drivers, Embedded File System. Embedded Device Drivers: Communication between user space and kernel space drivers, Character and Block Device Drivers, Interrupt handling, Kernel modules.

Embedded Drivers: Serial, Ethernet, I2 C, USB, Timer, Kernel Modules.

Learning Outcomes: At the end of the unit, the student will be able to

- Overview of Kernel modules
- Understand the state-of-the-art in embedded Linux Libraries

- Port the OS with applications.

UNIT - IV

Porting Applications Real-Time Linux: Linux and Real time, Programming, Hard Real-time Linux.

Learning Outcomes: At the end of the unit, the student will be able to

- Develop Embedded Real Time software that is required to run embedded systems.
- Develop real-time applications using RTOS.
- Build real-time embedded systems using RTOS.

UNIT - V

Building and Debugging: Boot loaders, Kernel, Root file system, Device Tree.

Learning Outcomes: At the end of the unit, the student will be able to

- Apply product development process for realization of the product.
- Develop real-time applications using free RTOS.
- Build real-time embedded systems using free RTOS and VxWorks RTOS.

Text Books:

1. Chris Simmonds “Mastering Embedded Linux Programming” - Second Edition, PACKT Publications Limited.
2. Karim Yaghmour, “Building Imbedded Linux Systems”, O'Reilly & Associates.

Reference Books:

1. P Raghvan, Amol Lad, Sriram Neelakandan, “Embedded Linux System Design and Development”, Auerbach Publications.
2. Christopher Hallinan, “Embedded Linux Primer: A Practical Real World Approach”, Prentice Hall, 2nd Edition, 2010.
3. Derek Molloy, “Exploring Beagle Bone: Tools and Techniques for Building with Embedded Linux”, Wiley, 1st Edition, 2014.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2015507: PROGRAMMING LANGUAGES FOR EMBEDDED SOFTWARE (PE- I)

I Year M.Tech (ES) I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To explore the difference between general purpose programming languages and Embedded Programming Language
- Get knowledge in Embedded OS (Linux) fundamentals
- It aims at familiarizing the students in embedded concepts and programming in 'C'
- To provide case studies for programming in embedded systems
- Differentiate interpreted languages from compiled languages

Course Outcomes:

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

- Write simple programs and implement the same embedded hardware.
- Develop and analyze algorithms in C++
- Write an embedded C application of moderate complexity
- Differentiate interpreted languages from compiled languages
- Develop programs using scripting languages

UNIT-I

Embedded 'C' Programming: Bitwise operations, Dynamic memory allocation, OS services, Linked stack and queue, Sparse matrices, Binary tree, Interrupt handling in C, Code optimization issues, Writing LCD drives, LED drivers, Drivers for serial port communication, Embedded Software Development Cycle and Methods (Waterfall, Agile).

Learning Outcomes: At the end of this unit, the students will be able to

- Write an embedded C application of moderate complexity
- Develop and analyze algorithms in C
- Differentiate interpreted languages from compiled languages

UNIT-II

CPP Programming: 'cin', 'cout', formatting and I/O manipulators, new and delete operators, Defining a class, data members and methods, 'this' pointer, constructors, destructors, friend function, dynamic memory allocation.

Learning Outcomes: At the end of this unit, the students will be able to

- Develop and analyze algorithms in C++
- Analyze different types of I/O manipulators and their operation
- Understand the class, data members and their function

UNIT-III

Overloading and Inheritance: Need of operator overloading, overloading the assignment, overloading using friends, type conversions, single inheritance, base and derived classes, friend classes, types of inheritance, hybrid inheritance, multiple inheritance, virtual base class, polymorphism, virtual functions.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the need of operator overloading
- Find the difference between types of inheritance, hybrid inheritance, multiple inheritance
- Acquire knowledge on polymorphism, virtual functions

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

UNIT-IV

Templates: Function template and class template, member function templates and template arguments, Exception Handling: syntax for exception handling code: try-catch-throw, Multiple Exceptions.

Learning Outcomes: At the end of this unit, the students will be able to

- Explain the different types function template and class template
- Understand the concept of Exception Handling
- Analyze the multiple exceptions

UNIT-V

Scripting Languages Overview of Scripting Languages – PERL, CGI, VB Script, Java Script.

PERL: Operators, Statements Pattern Matching etc. Data Structures, Modules, Objects, Tied Variables, Inter process Communication Threads, Compilation & Line Interfacing.

Learning Outcomes: At the end of this unit, the students will be able to

- Explain the Overview of Scripting Languages
- Understand the basics of Operators, Statements Pattern Matching in PERL
- Analyze the different concepts in Inter process Communication Threads

TEXT BOOKS:

1. Michael J. Pont, “Embedded C”, Pearson Education, 2nd Edition, 2008.
2. Randal L. Schwartz, “Learning Perl”, O’Reilly Publications, 6th Edition 2011.

REFERENCES:

1. A. Michael Berman, “Data structures via C++”, Oxford University Press, 2002.
2. Robert Sedgewick, “Algorithms in C++”, Addison Wesley Publishing Company, 1999.
3. Abraham Silberschatz, Peter B, Greg Gagne, “Operating System Concepts”, John Willey & Sons, 2005.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2015508: AI & MACHINE LEARNING
(PE- I)

I Year M.Tech (ES) I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To be able to formulate machine learning problems corresponding to different applications
- To understand a range of machine learning algorithms along with their strengths and weaknesses
- To understand the basic theory underlying machine learning
- To understand computational learning theory
- To study the pattern comparison techniques

Course Outcomes:

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

- Student should be we to understand the basic concepts such decision tree and neural networks.
- Ability to formulate machine learning techniques to respective problems.
- Understand the concepts of computational intelligence like machine learning.
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas.
- Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Supervised Learning (Regression/Classification). Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, Naive Baye. Linear models: Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods.

Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand complexity of Machine Learning algorithms and their limitations
- Understand modern notions in data analysis-oriented computing
- Explore supervised and unsupervised learning paradigms of machine learning

UNIT-II

Unsupervised Learning

Clustering: K-means/Kernel K-means Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion

Generative Models (mixture models and latent factor models)

Learning Outcomes: At the end of this unit, the students will be able to

- Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own
- Extract features that can be used for a particular machine learning approach in various IOT applications.
- To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.

UNIT-III

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests).

Learning Outcomes: At the end of this unit, the students will be able to

- To mathematically analyze various machine learning approaches and paradigms
- Be capable of performing experiments in Machine Learning using real-world data

- To learn the concept of how to learn patterns and concepts from data.

UNIT-IV

Biological foundations to intelligent Systems: Artificial Neural Networks.
Single layer and Multilayer Feed Forward NN, LMS and Back Propagation. Algorithm, Feedback networks and Radial Basis Function Networks.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand modern notions in data analysis-oriented computing
- Capable of confidently applying common Machine Learning algorithms in practice and implementing their own
- Analyze and design the different types of intelligent systems

UNIT-V

Fuzzy Logic, Knowledge Representation and Inference Mechanism, Defuzzification Methods Fuzzy Neural Networks and some algorithms to learn the parameters of the network like GA.

Learning Outcomes: At the end of this unit, the students will be able to

- To learn the Deep learning technique and various feature extraction strategies
- Analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances
- Understand complexity of Machine Learning algorithms and their limitations

TEXT BOOKS:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online).

REFERENCE BOOKS:

1. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
2. J M Zurada , “An Introduction to ANN”,Jaico Publishing House
3. Simon Haykins, “Neural Networks”, Prentice Hall

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2015509: COMPUTER VISION
(PE- I)

I Year M.Tech (ES) I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To explore the difference between human vision and computer vision
- To provide knowledge in camera model
- To provide knowledge on shape representation
- To familiarize the concepts of motion detection and estimation
- To understand various algorithms used for object recognition

Course Outcomes:

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

- Understand the image formation models and feature extraction for computer vision
- Perform segmentation and motion detection on video
- Develop small applications and detect the objects in various applications
- Implement algorithms for object detection and classification
- Understand the concepts of stereo vision

UNIT-I

Image Formation Models: Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel, Stereo vision.

Learning Outcomes: At the end of this unit, the students will be able to

- Explain the camera model and camera calibration
- Understand the concept of 3D reconstruction framework
- Explain the concepts of stereo vision

UNIT-II

Feature Extraction: Image representations (continuous and discrete), Edge detection, Edge linking, corner detection, texture, binary shape analysis, boundary pattern analysis, circle and ellipse detection, Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

Learning Outcomes: At the end of this unit, the students will be able to

- Explain the features used for representing an object
- Understand the concept of pattern analysis
- Explain the principles of lighting for computer vision

UNIT-III

Shape Representation and Segmentation: Deformable: Curves and surfaces, Snakes and active contours Level set representations, Fourier and wavelet descriptors, Medial representations, Multi-resolution analysis, Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.

Learning Outcomes: At the end of this unit, the students will be able to

- Explain the algorithms used for shape representation
- Understand the concept of segmentation
- Understand various algorithms used for segmentation.

UNIT-IV

Motion Detection and Estimation: Regularization theory, Optical computation, Stereo Vision Motion estimation, Background Subtraction and Modelling, Optical Flow, KLT, Spatio- Temporal Analysis, Dynamic Stereo; Motion parameter estimation, Structure from motion, Motion Tracking in Video.

Learning Outcomes: At the end of this unit, the students will be able to

- Explain the concept of stereo vision
- Understand the principles of optical computation
- Understand the concept of motion tracking in video

UNIT-V

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition.

Learning Outcomes: At the end of this unit, the students will be able to

- Explain the concept of object recognition
- Understand the methods for object recognition
- Understand the principle of shape matching

Text Books:

1. D. Forsyth and J. Ponce, “Computer Vision - A modern approach”, 2nd Edition, Pearson Prentice Hall, 2012
2. Szeliski, Richard, “Computer Vision: Algorithms and Applications”, 1st Edition, Springer-Verlag London Limited, 2011.

REFERENCES:

1. Richard Hartley and Andrew Zisserman, “Multiple View Geometry in Computer Vision”, 2nd Edition, Cambridge University Press, 2004.
2. K. Fukunaga, “Introduction to Statistical Pattern Recognition”, 2nd Edition, Morgan Kaufmann, 1990.
3. Rafael C. Gonzalez and Richard E. Woods,” Digital Image Processing”, 3rd Edition,

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(AUTONOMOUS)

2015510: COMMUNICATION BUSES & INTERFACES
(PE-II)

I Year M.Tech (ES) I – Sem. **L T P C**

3 0 0 3

Pre-requisite: Nil

Course Objectives:
- To understand the concepts interfacing
- To study the design concepts of various buses
- To know the architecture of communication system
- To analyze different types of hardware and software in interface design
- To understand various protocols in interfacing

Course Outcomes:

At the end of this course, students will be able to
- Understand various buses and interfaces
- Conclude the use of different communication channels
- Select a particular serial bus suitable for a particular application
- Develop APIs for configuration, reading and writing data onto serial bus
- Design and develop peripherals that can be interfaced to desired serial bus

UNIT - I

Serial Buses: Physical interface, Data and Control signals, features, limitations and applications of RS232, RS485, I2C, SPI.

Learning Outcomes: At the end of the unit, the student will be able to
- Analyze different types of serial communication interfaces
- Conclude the use of various control signals
- Design a serial communication interface for embedded system

UNIT - II

CAN: Architecture, Data transmission, Layers, Frame formats, applications.

Learning Outcomes: At the end of the unit, the student will be able to
- Understand Control Area Network (CAN) protocol
- Understand the frame formats of CAN
- Acquire knowledge on the applications of CAN

UNIT - III

PCIe: Revisions, Configuration space, Hardware protocols, applications.

Learning Outcomes: At the end of the unit, the student will be able to
- Understand the concept of PCI Express (PCIe)
- Explain the working operation and configuration of PCIe
- Identify the applications of PCIe

UNIT - IV

USB: Transfer types, enumeration, Descriptor types and contents, Device driver.

Learning Outcomes: At the end of the unit, the student will be able to
- Explain the different transfer types in USB
- Understand the working operation of USB
- Analyze the various versions of USB

UNIT - V

High Speed Data Transfer: Data Streaming Serial Communication Protocol - Serial Front Panel Data Port (SFPDP) using fiber optic and copper cable.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze and design the different types of data streaming protocols
- Conclude the methods for speed improvement
- Explain the operation of different data streaming protocols

Text Books:

1. Jan Axelson, “Serial Port Complete - COM Ports, USB Virtual Com Ports, and Ports for Embedded Systems”, Lakeview Research, 2nd Edition.
2. Jan Axelson, “USB Complete”, Penram Publications.

Reference Books:

1. Mike Jackson, Ravi Budruk, “PCI Express Technology”, Mindshare Press.
2. Wilfried Voss, “A Comprehensible Guide to Controller Area Network”, Copperhill Media Corporation, 2nd Edition, 2005.
3. Serial Front Panel Draft Standard VITA 17.1 – 200x.

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2015511: PARALLEL PROCESSING
(PE-II)

I Year M.Tech (ES) I – Sem.

L	T	P	C
3	0	0	3

Pre-requisite: Knowledge on Microcontrollers and digital programmable processors.

Course Objectives:

- The course gives an overview of the parallel processing with Pipelining techniques
- To understand the multi-processor architectures
- To familiarize students with the fundamental tools of parallel processing
- To the foundations for development of efficient parallel programming techniques
- To design algorithm in application area on parallel processing platforms

Course Outcomes:

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

- Understand the different types of pipelining techniques
- Understand the concepts of parallel processing
- Identify limitations of different architectures of computer
- Analysis quantitatively the performance parameters for different architectures
- Investigate issues related to compilers and instruction set based on type of architectures

UNIT-I

Overview of Parallel Processing and Pipelining, Performance analysis, Scalability, Principles and implementation of Pipelining, Classification of pipelining processors, Advanced pipelining techniques, Software pipelining

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concepts of parallel processing
- Understand the principles of Pipelining techniques
- Conclude the use of different Pipelining techniques

UNIT-II

VLIW processors: Case study: Superscalar Architecture- Pentium, Intel Itanium Processor, Ultra SPARC, MIPS on FPGA, Vector and Array Processor, FFT Multiprocessor Architecture.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the multi-processor architecture
- Understand the limitations of different architectures of computer
- Familiar with the parallel computing models

UNIT-III

Multithreaded Architecture, Multithreaded processors, Latency hiding techniques, Principles of multithreading, Issues and solutions.

Learning Outcomes: At the end of the unit, the student will be able to

- will be able to apply the basic algorithmic techniques
- Understand the “parallel-way of thinking” required in the design of parallel algorithms
- Develop, analyze, and implement algorithms for parallel computers

UNIT-IV

Parallel Programming Techniques: Message passing program development, Synchronous and asynchronous message passing, Shared Memory Programming, Data Parallel Programming, Parallel Software Issues.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze different types of parallel programming techniques
- design algorithms in a shared memory as well as a distributed memory environment
- Problem solving using parallel computers with shared memory and with distributed memory

UNIT-V

Operating systems for multiprocessors systems, Customizing applications on parallel processing platforms.

Learning Outcomes: At the end of the unit, the student will be able to

- Design algorithms for specific applications
- Analyze different types of algorithms for multiprocessing
- Develop a applications on parallel processing platforms

TEXT BOOKS:

1. Kai Hwang, Faye A. Briggs, “Computer Architecture and Parallel Processing”, MGH International Edition.
2. Kai Hwang, “Advanced Computer Architecture”, TMH.

REFERENCES:

1. V. Rajaraman, L. Sivaram Murthy, “Parallel Computers”, PHI.
2. William Stallings, “Computer Organization and Architecture, Designing for performance” Prentice Hall, 6th edition.
3. Kai Hwang, Zhiwei Xu, “Scalable Parallel Computing”, MGH.

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(AUTONOMOUS)

2015512: ADVANCED COMPUTER ARCHITECTURE
(PE-II)

I Year M.Tech (ES) I – Sem. **L T P C**

3 0 0 3

Pre-requisite: Basics of Microprocessors and Microcontrollers

Course Objectives:
- To make students know about the parallelism concepts in programming
- To give the students an elaborate idea about the different memory systems and buses
- To introduce the advanced processor architectures to the students
- To make the students know about the importance of multiprocessor and multicomputer
- To study about data flow computer architectures

Course Outcomes:

At the end of this course, students will be able to
- Demonstrate concepts of parallelism in hardware/software
- Discuss memory organization and mapping techniques
- Describe architectural features of advanced processors
- Interpret performance of different pipelined processors
- Explain data flow in arithmetic algorithms

UNIT - I:

Fundamentals of Computer Design: Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, quantitative principles of computer design, Amdahl's law.

Instruction set principles and examples- Introduction, classifying instruction set- memory addressing- type and size of operands, operations in the instruction set.

Learning Outcomes: At the end of the unit, the student will be able to
- Analyze various trends in computer design
- Analyze the performance of a computer
- Understand addressing modes and instruction set

UNIT - II

Data Pipelines: Introduction, basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe line for RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design: Introduction, review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

Learning Outcomes: At the end of the unit, the student will be able to
- Understand pipelining and issues related to it
- Understand the basics of reduced instruction set computing
- Acquire knowledge on memory hierarchy design

UNIT - III

Instruction Level Parallelism the Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation.

ILP Software Approach: Basic compiler level techniques, static branch prediction, VLIW approach,

Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

Learning Outcomes: At the end of the unit, the student will be able to
- Understand the concept of parallelism
- Explain Dynamic Scheduling
- Identify the compiler level techniques for ILP

UNIT - IV

Multi Processors and Thread Level Parallelism: Multi Processors and Thread level Parallelism-Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization.

Learning Outcomes: At the end of the unit, the student will be able to
- Explain the different types of parallelism
- Understand the characteristics of application domain
- Analyze various shared memory architecture

UNIT - V

Inter Connection and Networks: Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

Intel Architecture: Intel IA- 64 ILP in embedded and mobile markets Fallacies and pit falls.

Learning Outcomes: At the end of the unit, the student will be able to
- Analyze and design clusters
- Conclude the practical constraints in interconnecting networks
- Explain the Intel IA- 64 ILP architecture

Text Books:

1. John L. Hennessy, David A. Patterson, “Computer Architecture: A Quantitative Approach”, 3rd Edition, Elsevier.
2. Kai Hwang, “Advanced Computer Architecture” Second Edition, Tata McGraw Hill Publishers.

Reference Books:

1. John P. Shen and Miikko H. Lipasti, “Modern Processor Design: Fundamentals of Super Scalar Processors”, 2002, Beta Edition, McGraw-Hill
2. Kai Hwang, Faye A.Brigs., “Computer Architecture and Parallel Processing”, Mc Graw Hill.
3. Dezso Sima, Terence Fountain, Peter Kacsuk, “Advanced Computer Architecture - A Design Space Approach”, Pearson Education.

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2015521: MICROCONTROLLERS & PROGRAMMABLE DIGITAL SIGNAL PROCESSORS LAB

I Year M.Tech (ES) I – Sem. **L T P C**

0 0 3 2

Course Objectives:

- The students familiarize the assembling language programming and interfacing with various modules
- Interface various I/O peripherals like ADC, DAC, Keyboard, stepper motor etc., with microprocessors using 8255 PPI.
- Any type of industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.
- Understand of 8051 Microcontroller concepts, architecture, programming and application of Microcontrollers.
- Demonstrate basic knowledge of Microcontrollers & Interfacing by understanding the architecture of 8051 controller.

Course Outcomes:

At the end of the laboratory work, students will be able to

- Install, configure and utilize tool sets for developing applications based on ARM processor core SoC and DSP processor.
- Develop prototype codes using commonly available on and off chip peripherals on the Cortex M3 and DSP development boards.
- Design computers like desktops, laptops using various processors.
- Understand the full internal workings of a typical simple CPU including the utilization of the various hardware resources during the execution of instructions.
- Introduce the design of basic I/O hardware and microprocessor interfacing: memory chip selection, memory expansion, I/O interfacing, different I/O techniques.

List of Experiments:

1. Blink an LED with software delay, delay generated using the SysTick timer.
2. System clock real time alteration using the PLL modules.
3. Control intensity of an LED using PWM implemented in software and hardware.
4. Control an LED using switch by polling method, by interrupt method and flash the LED once every five switch presses.
5. UART Echo Test.
6. Take analog readings on rotation of rotary potentiometer connected to an ADC channel.
7. Temperature indication on an RGB LED.
8. Mimic light intensity sensed by the light sensor by varying the blinking rate of an LED.

The following experiments to be carried out on DSP C6713 evaluation kits and using Code Composer Studio (CCS):

9. To develop an assembly code and C code to compute Euclidian distance between any two points
10. To develop assembly code and study the impact of parallel, serial and mixed execution
11. To develop assembly and C code for implementation of convolution operation
12. To design and implement filters in C to enhance the features of given input sequence/signal

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(AUTONOMOUS)

2015522: SYSTEM DESIGN WITH EMBEDDED LINUX LAB

I Year M.Tech. (ES) I – Sem.

L	T	P	C
0	0	3	2

Course Objectives:

- Characteristics and challenges of embedded system.
- Demonstrate the Interfacing SSD and LCD with 8051.
- To make the student learn fundamentals of Operating Systems.
- To understand the embedded Linux development model.
- To be able to write and debug applications and drivers in embedded Linux.

Course Outcomes:

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

- Explain Assembly Language Programming Process and Tools.
- Demonstrate program for serial communication in 8051 at desired baud rate.
- Understand the fundamentals of interaction of OS with a computer and User computation.
- Demonstrate the fundamental concepts of how process are created and controlled with OS.
- Demonstrate Describe the programming logic of modeling Process based on range of OS features.

List of Experiments:

1. Write a Program to
   a) Read inputs from switches.
   b) To make LEDs blink.
2. Write a program to interface a switch and a buzzer to two different pins of a Port such that the buzzer should sound as long as the switch is pressed.
3. Write a Program for serial communication.
4. Write a Program for encryption / decryption.
5. Develop necessary interfacing circuit to read data from a sensor and process using the 8051 boards. The data to be displayed on a PC monitor.
6. Write a program to transmit a message from Microcontroller to PC serially using RS232
7. Sort RTOs on to 89CS1 board and Verify.
8. Simulate on elevator movement using RTO’s on 89CS1 board.

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2015502: RESEARCH METHODOLOGY & IPR

I Year M.Tech. (ES) I – Sem. **L T P C**

2 0 0 2

Prerequisite: Nill

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes:

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

- Illustrate research problem formulation
- Analyze research related information and research ethics
- Summarize the present day scenario controlled and monitored by Computer and Information Technology, where the future world will be ruled by dynamic ideas, concept, creativity and innovation
- Explain how IPR would take such an important place in growth of individuals & nation, to summarize the need of information about Intellectual Property Right to be promoted among student community in general & engineering in particular
- Relate that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about economic growth and social benefits

UNIT - I

Research Methodology: An Introduction, Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Learning outcomes: At the end of this unit, the student will be able to

- Explain the scope and objectives of a research problem
- List out criteria and characteristics of a good research problem
- Summarize the approaches of investigation of solutions for a research problem

UNIT - II

Literature Survey and Ethics:

Effective literature studies approaches, analysis, Plagiarism, Research ethics

Learning outcomes: At the end of this unit, the student will be able to

- Outline the Literature study approaches
- Adapt Research ethics in professional life
- Explain legal compliances of Plagiarism

UNIT - III

Interpretation and Report Writing:

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of

research proposal, a presentation and assessment by a review committee.

Learning outcomes: At the end of this unit, the student will be able to

- Demonstrate technical report writing
- Develop research paper writing skills
- Develop Power Point Presentation skills

UNIT - IV

Intellectual Property Rights and Patents:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Learning outcomes: At the end of this unit, the student will be able to

- Explain Intellectual Property Rights and differentiate among Patents, Designs, Trade Marks and Copyrights
- Outline the process of patenting and development
- Explain the procedure for granting patent

UNIT - V

Intellectual Patent Rights and Developments:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Learning outcomes: At the end of this unit, the student will be able to

- Explain patent right and its scope
- Make use of patent information and databases
- Discover the new developments in IPR

TEXT BOOKS:

1. C.R. Kothari, Research Methodology, 3rd edition, New Age International, 2017.
2. Ranjit Kumar, Research Methodology – A Step by Step for Beginner's, 2nd edition, Pearson, Education, 2016.

REFERENCES:

1. T. Ramappa, Intellectual Property Rights Under WTO, 2nd edition, S Chand, 2015
2. Kompal Bansal., Par shit Bansal, Fundamentals of IPR for Beginner's, 1st edition, BS Publications, 2016.
3. Mark Saunders., Philip Levis., Adrain Thornbill, Research Methods for Business Students, 3rd edition (Reprint), Pearson Education, 2013.

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(AUTONOMOUS)

2010001: ENGLISH FOR RESEARCH PAPER WRITING AND ITS SIGNIFICANCE
(Audit Course – I)

I Year M.Tech. (ES) I – Sem. **L T P C**

2 0 0 0

Pre-requisite: Nil

Course Objectives:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission
- Introduce you to the research process through writing about literature
- You will learn more about what makes an effective university-level essay and will know some strategies that can improve your papers in content, organization, word choice, grammar, and mechanics

Course Outcomes:

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

- Taking care of UK and USA English words while writing a research paper
- Understand structuring Paragraphs and Sentences for writing the paper
- What are the skills needed when writing the Sections of a paper, abstracts and introduction?
- Skills needed when writing the results and discussions, the references and their citations
- Understand plagiarism, and how to quote from another paper by paraphrasing with examples

UNIT – I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Learning Outcomes: At the end of the unit, the student will be able to:

- Taking care of UK and USA English words while writing a research paper
- Understand structuring Paragraphs and Sentences for writing the paper
- Identify Ambiguity and Vagueness for avoiding

UNIT – II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Learning Outcomes: At the end of the unit, the student will be able to:

- What are the skills needed when writing the Sections of a paper, abstracts and introduction?
- Understand plagiarism and how to quote from another paper by paraphrasing with examples
- Understand the how to write contributions

UNIT – III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Learning Outcomes: At the end of the unit, the student will be able to:

- What are the skills needed when writing the results and discussions?
- How to ensure paper is as good as it could possibly be the first- time submission
- Analyze different types of methods for writing a paper

UNIT – IV

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

Learning Outcomes: At the end of the unit, the student will be able to:

- What are the skills needed when writing the title, abstract and introductions?
- Skills required for analyzingvarious research papers for writing literature
- How to ensure paper is as good as it could possibly be the first- time submission

UNIT – V

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Learning Outcomes: At the end of the unit, the student will be able to:

- What are the skills needed for applying various methods while writing?
- Skills needed when writing the results and discussions
- Skills needed when writing the references and their citations

Text Books:

1. R. Goldbort R, “Writing for science,” Yale University Press, First edition 2006.
2. R. Day, “How to write and publish a scientific paper,” Cambridge University Press, First edition, 2006.

Reference Books:

1. N. Highman, “Handbook of writing for the mathematical sciences,” Society of industrial and applied mathamatics (SIAM), Second edition, 1998.
2. Adrian Wallwork, “English for writing research papers,” Springer New York Dordrecht Heidelberg London, Second edition, 2011.
3. Kate L. Turabian, “A manual for writers of research papers, theses, and dissertations,” University of Chicago Press, Ninth Edition, 2018.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2010002: DISASTER MANAGEMENT
(Audit Course – I)

I Year M.Tech. (ES) I – Sem. **L T P C**

2 0 0 0

Pre-requisite: Nil

Course Objectives:

- To learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response
- To critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
- To develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
- To critically understand the strengths and weaknesses of disaster management approaches
- To analyze planning and programming in different countries, particularly their home country or the countries they working

Course Outcomes:

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

- Able to Understand Definitions and Terminologies used in Disaster Management
- Able to promote Prevention and Preparedness for disaster
- Able to Understanding Disasters, man-made Hazards and Vulnerabilities
- Able to Understanding capacity building concepts and planning of disaster managements
- Able to know about disaster management mechanism

UNIT – I

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the definition of disaster and its factors and significance
- Conclude the difference between hazard and disaster
- Analyze the different types of disasters

UNIT – II

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

Learning Outcomes: At the end of the unit, the student will be able to

- Acquire knowledge on economic damage and destruction of ecosystem
- Understand the effects of natural disasters like earthquakes, volcanisms, cyclones etc.,
- Analyze the repercussions of manmade disasters in industries ,war and conflicts

UNIT – III

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of triggering
- Realize the applications of remote sensing and evaluation of Risk
- Identify the difference between governmental preparedness and community preparedness

UNIT – IV

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

Learning Outcomes: At the end of the unit, the student will be able to:

- Explain the elements and concept of reducing disaster risk
- Understand the techniques of risk assessment and risk situation in global and national disasters
- Study the strategies for survival and participation of people in risk assessment

UNIT – V

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation.
Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of Disaster Mitigation
- Analyze the emerging trends in Mitigation and types of mitigations
- Explain the programs of Disaster Mitigation in India

Text Books:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and Strategies" New Royal book Company.
2. Sahni, Pardeep et. al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.

Reference Books:

1. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep &Deep Publication Pvt. Ltd., NewDelhi.
2. R. B. Singh, "Natural Hazards and Disaster Management", 1st Edition, Rawat Publication, 2006.
3. Subir Ghosh, "Natural Disaster Management: New Technologies and Opportunities", First edition, ICFAI University Press, 2012.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2010003: SANSKRIT FOR TECHNICAL KNOWLEDGE
(Audit Course – I)

I Year M.Tech. (ES) I – Sem. **L T P C**

2 0 0 0

Prerequisite: Nil

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient
- literature Basic communication skills in understanding Sanskrit with LSRW (Listening, Speaking, Reading & Writing) capacities

Course Outcomes:

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

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students
- Usage of critical thinking while correlating concepts with personal experiences
- Usage of Shastric discipline and ancient traditional learning while discriminating others

UNIT-I

Alphabets in Sanskrit

Learning Outcomes: At the end of the unit, the student will be able to

- Pronounce all 49 sounds of the Sanskrit alphabet
- Vowels and vowel diacritics (Ghosa)
- Consonants (vyajjana) , conjuncts(Sanyoga) & Nu,merals (Sankhya)

UNIT-II

Past/Present/Future Tense, Simple Sentences

Learning Outcomes: At the end of the unit, the student will be able to

- Use present, past, and future tenses with appropriate time markers
- Identify the verb and tense in a sentence by circling and labeling
- Write a sentence using the past, present, or future tense

UNIT-III

Order, Introduction of roots

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn new words
- Form new sentences
- Gain mastery of communication skills eventually

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UNIT-IV

Technical information about Sanskrit Literature

Learning Outcomes: At the end of the unit, the student will be able to

- Morally and ethically well cultured students contributing to creating a better society
- Cultivating self realization, realizing the inner peace, thinking out of this material realm of things.
- Utilize the knowledge to tackle the hurdles in this journey of life

UNIT-V

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Learning Outcomes: At the end of the unit, the student will be able to

- Develop critical thinking to face challenges in life or academics
- Learn, plan and conduct small-scale survey studies and analyze the data in order to postulate research problems.
- To be citizens not after rat race but with interest of uplifting society with ethics and morals

TEXT BOOKS:

1. Dr. Vishwas, Samskrita, “Abhyas pustakam,” Bharti Publication, New Delhi.
2. Prathama Deeksha and Vempati Kutumbshastri, “Teach Yourself Sanskrit,” Rastriya Sanskrit Santhanam, New Delhi.

REFERENCE BOOKS:

1. Dr. Vishwas, Samskrita, “Abhyas pustakam,” Bharti Publication, New Delhi.
2. Prathama Deeksha and Vempati Kutumbshastri, “Teach Yourself Sanskrit,” Rastriya Sanskrit Santhanam, New Delhi.
3. Suresh Soni, “India’s Glorious Scientific Tradition,” Ocean book s (P) Ltd., New Delhi.

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(AUTONOMOUS)

2010004: VALUE EDUCATION
(Audit Course – I)

I Year M.Tech. (ES) I – Sem. **L T P C**

2 0 0 0

Prerequisite: Nil

Course Objectives:

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character
- To teach the philosophy of Life, personal value, social value, mind cultural value and personal health
- To teach professional ethical values, codes of ethics, responsibilities, safety, rights and related global issues.

Course outcomes:

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

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality
- To learn about philosophy of Life and Individual qualities
- To learn and practice social values and responsibilities

UNIT-I

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments

Learning Outcomes: At the end of the unit, the student will be able to:

- To learn and practice mind culture, forces acting on the body and causes of diseases and their curing
- Discuss on specific issues related to curriculum & assessment at elementary level of education.
- Understand Concept of quality and excellence in education, it's relation to quality of life and its role of educational transformation in national development

UNIT-II

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline.

Learning Outcomes: At the end of the unit, the student will be able to

- To learn more of Engineer as Responsible Experimenter
- Understand current practices, current Status, Recent Initiatives and future prospects of Elementary Education in India
- Critically study implementation of the RTE Act or other issues influencing Elementary Education in India

UNIT-III

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

Learning Outcomes: At the end of the unit, the student will be able to

- To learn more of Risk and Safety assessment with case studies
- Execute innovative methodologies in teaching
- Practice various teaching skills in peer group

UNIT-IV

Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.

Learning Outcomes: At the end of the unit, the student will be able to

- Apply the theoretical knowledge of teaching skills in real classroom situation
- To learn more of Responsibilities and Rights as Professional and facing Global Challenges
- Understanding of the historical and socio-economic trends of Indian society in order to be able to appreciate the interrelatedness of education with society

UNIT-V

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the relationship between Indian condition and Education for addressing equity, quality justice and inclusion
- Understand various policies related to Elementary Education and issues related to them
- Build a robust vision of a school, community and society from a liberal, humane perspective

TEXT BOOKS:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice,” Oxford University Press, New Delhi
2. M.G. Chitakra, “Education and Human Values,” A.P.H. Publishing Corporation, New Delhi, 2003.

REFERENCES:

1. M.K. Satchidananda, “Ethics, Education, Indian Unity and Culture,” Ajantha Publications, Delhi, 1991.
2. M.S. Das, & V.K. Gupta, “Social Values among Young adults: A changing Scenario,” M.D. Publications, New Delhi, 1995.
3. S.P. Ruhela, “Human Values and education, Sterling Publications,” New Delhi, 1986.

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(AUTONOMOUS)

2025505: RTL SIMULATION AND SYNTHESIS WITH PLDS

I Year M.Tech (ES) II – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To understand the design strategies of Finite State Machine (FSM)
- To design various system blocks using Verilog HDL
- To understand different technologies to configure FPGAs, ASICs, and PLDs
- To analyze various state-of-the-art techniques for optimization of systems
- To understand the concepts of IP and prototyping in system design

Course Outcomes:

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

- Describe Finite State Machines and comprehend concepts of clock related issues
- Model digital circuits using Verilog and understand the concepts of analog and mixed signal systems design using Verilog AMS
- Outline the concepts of different design flows in VLSI
- Illustrate different low power latches and Flip-flops
- Explain the concepts of IP cores and Prototyping

Unit-I

Design Strategies: Top down approach to design, Design of FSMs (Synchronous and asynchronous), Static timing analysis, Meta-stability, Clock issues, Need and design strategies for multi-clock domain designs.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the top down design approach
- Summarize the concepts of Finite state machines
- Illustrate the concepts of clock related issues

Unit-II

System Modeling with HDL: Design entry by Verilog, Combinational and Sequential logic design: Multiplexor/ De-multiplexer, ALU, parity circuits, Flip-flops, Shift Registers, Counters, Finite State Machines, Sequence generator, Sequence detector, Verilog AMS.

Learning Outcomes: At the end of the unit, the student will be able to

- Model various combinational circuits using Verilog
- Model various Sequential circuits using Verilog
- Discuss the concepts of analog and mixed signal system design using Verilog AMS

Unit-III

Design Methodologies: Programmable Logic Devices, Introduction to ASIC Design Flow, FPGA, SoC, Floor planning, Placement, Clock tree synthesis, Routing, Physical verification, Power analysis, ESD protection.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the concepts of programmable Logic Devices
- Demonstrate FPGA and ASIC design flows
- Illustrate the concepts of CPLD and FPGA architectures

Unit-IV

Optimization Techniques: Design for performance, Low power VLSI design techniques- Multi Threshold/V_{DD}, Body Biasing, Dynamic Threshold, Clock Gating, Power Gating, DVFS. Design for

testability.

Learning Outcomes: At the end of the unit, the student will be able to

- Demonstrate various digital logic circuits to improve performance
- Interpret different low power design techniques
- Illustrate the concepts of quality measures for design of various digital system blocks

Unit-V

IP and Prototyping: IP in various forms: RTL Source code, Encrypted Source code, Soft IP, Netlist, Physical IP, Use of external hard IP during prototyping, Case studies and Speed issues.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the concepts of IP in various forms
- Differentiate Soft IP and Hard IP
- Illustrate the concepts of prototyping

Text Books:

1. Richard S. Sandige, Modern Digital Design, Vol.1, Tata McGraw-Hill, 1990.
2. T. R. Padmanabhan and B. F.V.G. Bala Tripura Sundari, Design through Verilog HDL, Wiley-IEEE Press, 2004.

References:

1. Donald D Givone, Digital Principles and Design, 1st edition, Tata McGraw-Hill, 2003.
2. Anantha P. Chandrakasan, Robert W. Brodersen, Low-power Digital CMOS Design, 1st edition, Springer US,1995.
3. Bob Zeidman, Designing with FPGAs & CPLDs, CRC Press, 2002.

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2025506: ADVANCED DIGITAL SIGNAL PROCESSING

I Year M.Tech (ES) II – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To study different DSP algorithms for computation of DFT
- To study about the DSP Processor
- To learn the finite word length effects in signal processing
- To understand various application areas using Signal processing methods

Course Outcomes:

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

- Interpret theory of different filters and algorithms
- Acquire the basic knowledge of multi-rate DSP, solve numerical problems and write algorithms
- Analyze the performance of prediction and solution of normal equations
- List out the applications of DSP at block level
- Discuss the methods of Power Spectrum Estimation

UNIT – I

Overview of DSP, Characterization in time and frequency, FFT Algorithms, Digital filter design and structures: Basic FIR/IIR filter design & structures, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, FIR/IIR Cascaded lattice structures, and Parallel all pass realization of IIR.

Learning Outcome: At the end of this unit, the students will be able to

- Demonstrate the digital filter design structures
- Design of IIR/FIR filters
- Draw the FIR/IIR Cascaded lattice structures

UNIT - II

Multi rate DSP, Decimators and Interpolators, Sampling rate conversion, multistage decimator & interpolator, poly phase filters, QMF, digital filter banks, Applications in sub band coding.

Learning Outcome: At the end of this unit, the students will be able to

- Design of poly phase filters and digital filter banks.
- Describe the applications of sub band coding
- Distinguish between decimation & interpolation.

UNIT - III

Linear prediction & optimum linear filters, stationary random process, forward-backward linear prediction filters, solution of normal equations, AR Lattice and ARMA Lattice-Ladder Filters, Wiener Filters for Filtering and Prediction.

Learning Outcome: At the end of this unit, the students will be able to

- Understand the forward-backward linear prediction filters.
- Demonstrate the AR Lattice and ARMA Lattice-Ladder Filters.
- Interpret the results of Wiener Filters for Filtering and Prediction.

UNIT – IV

Adaptive Filters, Applications, Gradient Adaptive Lattice, Minimum mean square criterion, LMS algorithm, Recursive Least Square algorithm.

Learning Outcome: At the end of this unit, the students will be able to

- Describe the applications of various adaptive filters
- Demonstrate the Minimum mean square criterion
- Develop the LMS algorithm, Recursive Least Square algorithm

UNIT – V

Estimation of Spectra from Finite-Duration Observations of Signals. Nonparametric Methods for Power Spectrum Estimation, Parametric Methods for Power Spectrum Estimation, Minimum-Variance Spectral Estimation, Eigen analysis Algorithms for Spectrum Estimation.

Learning Outcome: At the end of this unit, the students will be able to

- Design the estimation of spectra from finite-duration observations of signals
- Distinguish between the nonparametric & parametric methods for power spectrum estimation
- Analyzes the performance of Eigen analysis algorithms for spectrum estimation

Unit-VI

Application of DSP & Multi rate DSP, Application to Radar, introduction to wavelets, application to image processing, design of phase shifters, DSP in speech processing & other applications.

Learning Outcome: At the end of this unit, the students will be able to

- Design of phase shifters in DSP
- Understand the significance and effects of wavelets and application to image processing
- List out the Application of DSP & Multi rate DSP, Application to Radar

Text Books:

1. G. Proakis & D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms & Applications”, J 4th Edition, PHI.
2. Emmanuel C. Ifeacher, Barrie. W. Jervis, “DSP – A Practical Approach”, 2nd Edition, Pearson Education.

References:

1. J.G.Proakis and D.G.Manolakis“Digital signal processing: Principles, Algorithm and Applications”, 4th Edition, Prentice Hall, 2007.
2. N. J. Fliege, “Multirate Digital Signal Processing: Multirate Systems -Filter Banks – Wavelets”, 1st Edition, John Wiley and Sons Ltd, 1999.
3. Bruce W. Suter, “Multirate and Wavelet Signal Processing”,1st Edition, Academic Press, 1997.

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2025513: IoT & APPLICATIONS

(Professional Elective - III)

I Year M.Tech (ES) II – Sem. **L T P C**

3 0 0 3

Pre-requisite: Nil

Course Objectives:

- Learn the basic issues, policy and challenges in the Internet
- Understand the components and the protocols in Internet
- Build a small low cost embedded system with the internet
- Understand the various modes of communications with internet
- Learn to manage the resources in the Internet

Course Outcomes:

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

- Understand the concept of IoT and M2M
- Understand the IoT architecture and applications in various fields
- Understand the industrial applications of IoT
- Understand the security and privacy issues in IoT

UNIT – I:

Introduction to IoT: IoT & Web Technology The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation irections, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the basics of IoT
- Understand various concepts of network and communication
- Understand the research trends in IoT

UNIT – II:

M2M to IoT: A Basic Perspective, Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the evolution from M2M to IoT
- Understand the industrial model of IoT
- Understand the standards of IoT

UNIT – III:

IoT Architecture: State of the Art – Introduction, Architecture, Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the architecture of IoT
- Explain the principles of Reference model

- Explain the operation of IoT system

UNIT – IV

Applications of IoT: IoT Applications for Value Creations- Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

Learning Outcomes: At the end of the unit, the student will be able to

- Explain the various applications of IoT
- Understand the industrial applications of IoT
- Understand the importance of IoT in medical sector

UNIT – V

Security in IoT: Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze and security issues in IoT
- Understand the concept of governance
- Understand the security measures involved in IoT

Text Books:

1. Millman, Charalampos Doukas , “Building Internet of Things with the Arduino”, Create space, April 2002.
2. Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011.

References:

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
3. Cuno Pfister, “Getting Started with the Internet of Things”, O_Reilly Media, 2011.

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(AUTONOMOUS)

2025514: VLSI SIGNAL PROCESSING

(Professional Elective - III)

I Year M.Tech (ES) II – Sem. **L T P C**

3 0 0 3

Course Objectives:

- Understand the pipelining and parallel processing techniques to the VLSI systems
- Analyze the retiming, unfolding & folding concepts for register minimization
- Understand the systolic architectures
- Understand the various arithmetic architectures for signal processing
- Apply the convolution algorithms for signal processing applications

Course Outcomes:

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

- Explain DSP algorithms, its DFG representation, pipelining and parallel processing approaches.
- Describe iteration bound, retiming techniques.
- Acquire knowledge on folding and unfolding algorithms.
- Outline the systolic architecture design.
- Explain different convolution techniques and features of DSP processors.

UNIT-I

DSP systems and algorithms: Introduction to DSP systems: Introduction, Overview of typical DSP Algorithms, Representation of DSP Algorithms: Block Diagrams, Signal-Flow Graph, Data-Flow Graph, Dependence Graph. Pipelining and parallel processing: Introduction, Pipelining of FIR Digital Filters, Parallel Processing.

Learning Outcomes: At the end of the unit, the student will be able to:

- Summarize the different representations of DSP Algorithms
- Describe the pipelining for Low Power
- Illustrate the parallel processing for Low Power

UNIT-II

Iteration Bound and Retiming: Introduction to Iteration bound, Data-Flow Graph Representations, Loop Bound and Iteration Bound, Algorithms for Computing Iteration Bound, Iteration Bound of Multirate Data-Flow Graphs. Introduction to retiming, Definitions and Properties, Solving Systems of Inequalities, Retiming Techniques.

Learning Outcomes: At the end of the unit, the student will be able to

- Derive Loop Bound and Iteration Bound
- Formulate the iteration bound of multirate data-flow graphs
- Describe Retiming Techniques

UNIT-III

Folding and Unfolding: Unfolding**-** Introduction, an Algorithm for Unfolding, Properties of Unfolding, Critical Path, Unfolding and Retiming. Folding: Introduction, Folding transformation, Register Minimization Techniques, Register Minimization in Folded Architectures.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the concept of unfolding
- Summarize the folding and folding transformation
- Analyze the unfolding and folding concepts for register minimization

UNIT-IV

Systolic architecture design: Introduction, systolic Array Design Methodology, FIR Systolic Arrays, Selection of Scheduling Vector, Matrix-Matrix Multiplication and 2D Systolic Array Design, Systolic Design for Space Representations Containing Delays.

Learning Outcomes: At the end of the unit, the student will be able to

- Discuss systolic array design methodology
- Summarize FIR Systolic Arrays
- Model 2D Systolic Array and Systolic design for space representations containing delays.

UNIT-V

Convolution and Digital Signal Processors: Introduction, Fast Convolution: Cook-Toom Algorithm, Winograd Algorithm, Iterated Convolution and Cyclic Convolution. Programmable Digital Signal Processors: Introduction, Evolution of Programmable Digital Signal Processors, Features of DSP Processors.

Learning Outcomes: At the end of the unit, the student will be able to

- Apply fast convolution algorithms for signal processing applications
- Summarize performance improvements and evolution of Programmable DSPs
- Discuss features of DSP Processors

Text Books:

1. Keshab K. Parthi., VLSI Digital Signal Processing- System Design and Implementation, 2nd edition, 1998, Wiley, 1999.
2. Kung S. Y, H. J. While House, T. Kailath, VLSI and Modern Signal processing, Prentice Hall, 1985.

References:

1. Mohammad Isamail, Terri Fiez., Analog VLSI signal and information processing, McGraw Hill, 1994.
2. Bayoumi**,** Magdy, Swartzlander**.,** VLSI Signal Processing Technology, 1st edition, Springer, 1994.
3. B.Venkataramani, M.Bhaskar., Digital Signal Processors: Architecture, Programming and Applications, Tata McGraw-Hill Education, 2002.

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(AUTONOMOUS)

2015515: SOC ARCHITECTURE

(Professional Elective – III)

I Year M.Tech. (ES) II – Sem.

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Pre-requisite: Knowledge on Microcontrollers and digital programmable processors.

Course Objectives:

- Design, optimize, and program a modern System-on-a-Chip.
- Analyze a computational task,
  (i) characterize its computational requirements, (ii) identify performance bottlenecks, (iii) identify, explore, and evaluate a rich design space of solutions, and (iv) select and implement a design that meets engineering requirements.
- Decompose the task into parallel components that cooperate to solve the problem
- Characterize and develop real-time solutions.
- Implement both hardware and software solutions, formulate hardware/software tradeoffs, and perform hardware/software code design

Course Outcomes:

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

- Understand the basics of SoC
- Solve issues and synthesize the SoC designs
- Understand the routing issues in SoCs
- Understand the system on a chip from gates to application software, including on-chip memories and communication networks, I/O interfacing, RTL design of accelerators, processors, firmware and OS/infrastructure software
- Understand and estimate key design metrics and requirements including area, latency, throughput, energy, power, predictability, and reliability

UNIT – I

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, an approach for SOC Design, System Architecture and Complexity.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concepts of system approach with its architecture design
- Understand the system components like hardware and software
- Analyze System Architecture and its Complexity

UNIT – II

Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concepts of processor selection for SoC
- Familiar with the elements of Soc processors
- Understand the limitations of different architectures of computer

UNIT – III

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at

miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation, SOC Memory System, Models of Simple Processor – memory interaction.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concepts of memory sharing processing
- Design memory suitable for SoC
- Conclude the use of different memory design techniques

UNIT - IV

Interconnect Customization and Configuration: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance-Specific design, Customizable Soft Processor, Reconfiguration, overhead analysis and trade-off analysis on reconfigurable Parallelism.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the communication networks and I/O interfacing
- Understand and estimate key design metrics and requirements
- Characterize and develop real-time solutions

UNIT – V

Application Studies / Case Studies: SOC Design approach, AES algorithms, Design and evaluation, Image compression, JPEG compression.

Learning Outcomes: At the end of the unit, the student will be able to

- formulate and perform hardware/software code design
- Decompose the task into parallel components and solve the problems
- Design RTL of accelerators, processors, firmware and OS/infrastructure software

Text Books:

1. Computer System Design System-on-Chip by Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2nd Eed., 2000, Addison Wesley Professional.

References:

1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., Springer, 2004.
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes.
3. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, Kluwer Academic Publishers, 2001.

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(AUTONOMOUS)

2015516: HARDWARE SOFTWARE CO-DESIGN

(Professional Elective - IV)

I Year M.Tech (ES) II – Sem. **L T P C**

3 0 0 3

Course Objectives:

- Differentiate the various prototyping and emulation techniques for co-design models
- Understand the compilation techniques for embedded processor architecture
- Use verification tools for verification of co-design
- Understanding of the specific requirement of Hardware and soft ware integration for embedded system
- Understand validation methods and adaptability

Course Outcomes:

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

- Design environment that helps the reader to perform experiments in hardware/software code sign
- Partition a system into hardware and software components by using techniques
- To understand various system level specifications
- Understand design Issues, Trends, and Considerations
- Acquire the knowledge of firmware development process and tools

UNIT – I

Co-Design Issues: Co-design models, architectures, languages and a generic co-design methodology; Co-synthesis algorithms: hardware software synthesis algorithms: Hardware, software partitioning distributed system co-synthesis.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze and design the different types of co design models
- Understand the concept of different languages
- Identify the different types of hard ware and software co design tools

UNIT – II

Prototyping and Emulation: Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure.

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.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of Synopsys and Quick turn
- Analyze and design the Boolean equation
- Identify different types of system specialization techniques

UNIT – III

Compilation Techniques and Tools for Embedded Processor Architectures: Modern embedded architectures, embedded software development needs. Compilation technologies, practical consideration in a compiler development environment.

Learning Outcomes: At the end of the unit, the student will be able to

- Explain modern embedded Architectures
- Understand the concept of Compilation Technologies

- Conclude the use of ASIP develop compiler and soft ware support tools

UNIT – IV

Design Specification and Verification: Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, and interface verification.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of different types of languages
- Analyze and design of verification and verification tools
- Acquire knowledge on Coordinating Concurrent Computations

UNIT – V

Languages for System: Level specification and Design-I system, level specification, design representation for system level synthesis, system level specification languages, Level specification and design-II: Heterogeneous specifications and multi-language co-imulation, cosyma system and Lycos system.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze and design of Representation for System Level Synthesis
- Explain the operation of homogeneous and heterogeneous specification
- Understand the concept of Cosyma architecture

Text Books:

1. Jorgen Staunstrup, Wayne Wolf, “Hardware / Software Co-Design Principles and Practice”, Springer, 2nd Edition, 2009
2. Giovanni De Micheli, Mariagiovanna Sami, “Hardware / Software Co-Design”, Kluwer Academic Publishers, 1st Edition, 2012.
3. Jean-Michel Bergé, Oz Levia, Jacques Rouillard · 2013’’ Hardware/Software Co-Design and Co-Verification’’.

References:

1. Patrick R. Schaumont , “A Practical Introduction to Hardware/Software Co-design,” Springer Issues and Practices”, Elsevier, 1st Edition, 2005.
2. Giovanni De Micheli, M.G. Sami Hardware/Software Co-Design.
3. Ralf Niemann ‘’Hardware/Software co design for data flow’’.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2025517: NETWORK SECURITY AND CRYPTOGRAPHY

(Professional Elective – IV)

I Year M.Tech (ES) II – Sem. **L T P C**

3 0 0 3

Pre-requisite: Nil

Course Objectives:

- To make students know about importance confidentiality, integrity and availability
- To give the students an elaborate idea about various cryptographic algorithms
- To introduce the basic categories of threats to computers and networks
- To make the students know about fundamental ideas of public-key cryptography.
- To study about Web security and Firewall

Course Outcomes:

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

- Identify and utilize different forms of cryptography techniques
- Incorporate authentication and security in the network applications
- Distinguish among different types of threats to the system and handle the same
- Identify information system requirements for both client and server
- Understand the current legal issues towards information security

UNIT – I:

Security: Need, security services, Attacks, OSI Security Architecture, one time passwords, Model for Network security, Classical Encryption Techniques like substitution ciphers, Transposition ciphers, Cryptanalysis of Classical Encryption Techniques.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze various attacks in computer network
- Analyze the performance of encryption techniques
- Understand the concept of cryptanalysis

UNIT – II

Number Theory: Introduction, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm, Modular Arithmetic.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the application of number theory in cryptography.
- Understand various theorems and algorithms in cryptography.
- Acquire knowledge on modular arithmetic.

UNIT – III

Private-Key (Symmetric) Cryptography: Block Ciphers, Stream Ciphers, RC4 Stream cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, RC5, IDEA, Linear and Differential Cryptanalysis.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of symmetric key cryptography
- Explain various encryption standards
- Differentiate between linear and differential cryptography

UNIT – IV

Public-Key (Asymmetric) Cryptography: RSA, Key Distribution and Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, hash functions, message digest algorithms: MD4 MD5, Secure Hash algorithm, RIPEMD-160, HMAC.

Learning Outcomes: At the end of the unit, the student will be able to

- Explain the concept of public key cryptography
- Understand key distribution and management
- Analyze various public key algorithms

UNIT – V

Authentication: IP and Web Security Digital Signatures, Digital Signature Standards, Authentication Protocols, Kerberos, IP security Architecture, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

System Security: Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Countermeasures, Firewalls, Firewall Design Principles, Trusted Systems.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze various digital signature standards
- Understand secure electronic transaction
- Explain the principles of firewall design

Text Books:

1. William Stallings, “Cryptography and Network Security, Principles and Practices”, Pearson Education, 3rd Edition.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security, Private Communication in a Public World”, Prentice Hall, 2nd Edition.

Reference Books:

1. Forouzan, Mukhopadhyay “Cryptography and Network Security”, Mc Graw Hill, 3rd Edition.
2. Christopher M. King, Ertem Osmanoglu, Curtis Dalton, “Security Architecture, Design Deployment and Operations”, RSA Press.
3. Stephen Northcutt, Leny Zeltser, Scott Winters, Karen Kent, and Ronald W. Ritchey, “Inside Network Perimeter Security”, Pearson Education, 2nd Edition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2025518: PHYSICAL DESIGN AUTOMATION

(Professional Elective-IV)

I Year M.Tech (ES) II – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To introduce Design methodologies and design automation tools
- To understand the different search algorithms on area and speed
- To understand the Modeling and simulation methods
- Design algorithms to meet the critical design parameters
- To understand physical design automation of FPGA's and MCM's

Course Outcomes: At the end of the course, students will be able to

- Study automation process for VLSI System design.
- Understanding of fundamentals for various physical design CAD tools.
- Develop and enhance the existing algorithms and computational techniques for physical design process of VLSI systems.
- Understand the relationship between design automation algorithms and various constraints posed by VLSI fabrication and design technology.
- Identify layout optimization techniques and map them to the algorithms.

UNIT – I

VLSI Physical Design Automation: VLSI design cycle, new trends in VLSI design cycle, Physical design cycle, Design styles, System packing styles- Die packing and attachment styles.

Learning outcomes: At the end of this unit, the student will be able to

- Describe the concept of VLSI Physical Design Automation
- Illustrate new trends in VLSI design cycle
- Discuss System packing styles

UNIT – II

Layout compaction: Standard cell layout, Layout compaction, Design rules, symbolic layout, problem formulation, Algorithms for constraint-graph compaction.

Learning outcomes: At the end of this unit, the student will be able to

- Summarize the concept of Standard cell layout
- Demonstrate Layout compaction and Design rules
- Differentiate different Algorithms for constraint-graph compaction

UNIT – III

Discrete methods in global placement: Design style placement problems; Classification of placement algorithms, Simulation based placement algorithms and Partitioning based placement algorithms. Timing-driven placement.

Learning outcomes: At the end of this unit, the student will be able to

- Describe methods in global placement
- Discuss Design style placement problems
- Illustrate Partitioning based placement algorithms

UNIT – IV

Global Routing: Design Style specific global routing problems, classification of global routing algorithms, Maze routing algorithms, Line-Probe algorithms. Via Minimization- Constrained and unconstrained via minimizations.

UNIT – V

Over the cell Routing: Single layer and two-layer routing, Clock Routing: clocking schemes, Design consideration for the clocking systems, problem formulation, Clock routing algorithms, Skew and delay reduction by pin assignment, multiple clock routing. Power Routing, Compaction algorithms-Design style specific compaction problem, classification of compaction algorithms, one-dimension compaction.

Learning outcomes: At the end of this unit, the student will be able to

- Discuss the concept of Cell Routing
- Interpret Design consideration for the clocking systems
- Differentiate compaction algorithms

Text Books:

1. Sarrafzadeh, M. and Wong, C.K, “An Introduction to VLSI Physical Design”, 4th Edition, Mc Graw-Hill
2. Wolf. W, “Modern VLSI Design System on Silicon”, 2nd Ed., Pearson Education.

References:

1. William Stallings, “Cryptography and Network Security, Principles and Practices”, Pearson Education, 3rd Edition.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security, Private Communication in a Public World”, Prentice Hall, 2nd Edition.
3. Christopher M. King, ErtemOsmanoglu, Curtis Dalton, “Security Architecture, Design Deployment and Operations”, RSA Press.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2025523: RTL Simulation and Synthesis with PLDs Lab

I Year M.Tech (ES) II – Sem. **L T P C**

0 0 3 2

Course Objectives:

- To get familiar with the industry standard EDA tools like Xilinx, Mentor Graphics, etc.
- To study various programming logic styles in Verilog HDL
- To implement various digital system design blocks using Verilog HDL
- To study the hardware aspects of FPGA, ASIC and PLD's through the implementation of various digital system blocks.
- To solve the problems in the applications of signal processing and computing using RTL simulation tools

Course Outcomes:

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

- Design, simulate and synthesize combinational circuits using Verilog.
- Design, simulate and synthesize sequential circuits using Verilog
- Demonstrate EDA tools like Mentor Graphics, Xilinx, etc.
- Develop various applications of signal processing and computing systems on FPGAs
- Estimate different performance metrics like power, delay, and area for various system design blocks

List of Experiments:

1. Combinational Logic Design 1: Verilog implementation of 1-bit Full Adder, 1-bit Full Subtractor, 8:1 Mux, 8:1 Demux.
2. Combinational Logic Design 2: Verilog implementation of 3 to 8 Decoder, 8 to 3 Encoder, 4-bit magnitude comparator.
3. Sequential Logic Design 1: Verilog Implementation of Latches and Flip-flops (D, SR, JK, and T).
4. UART/ USART implementation in Verilog. Sequential Logic Design 2: Verilog Implementation of 4 Bit Shift Registers (SISO, SIPO, PISO, PIPO), Synchronous /Asynchronous counters.
5. Verilog implementation of Sequence generator using Mealy and Moore FSM.
6. Verilog implementation of traffic light controller.
7. Realization of single port SRAM in Verilog.
8. Verilog implementation of arithmetic's circuits like Serial Adder/ Subtractor, Parallel Adder/ Subtractor.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2025524: Advanced Digital Signal Processing Lab

I Year M.Tech (ES) II – Sem. **L T P C**

0 0 3 2

Course objectives:

- Understand the basic concept of discrete time signals and their representation in time domain
- Learn the implementation of IIR and FIR filters for the given specifications
- Understand how Improve the quality of an image in spatial domain and Frequency Domain
- Learn about image segmentation using edge detection with the help of derivative operators
- Know the importance of Image Compression using discrete cosine transform

Course outcomes:

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

- Design different digital filters
- Apply various transforms in time and frequency domain
- Perform decimation and interpolation operations
- Analyze stability and group delay
- Realization of II R Filters

List of Assignments:

1. Basic Signal Representation
2. Auto Correlation and Cross Correlation of sequences
2. Stability Using Routh's Hurwitz Criterion
3. Sampling FFT of Input Sequence
4. Butterworth Low pass And High pass Filter Design
5. Chebychev Type I, II Filter
6. State Space Matrix from Differential Equation
7. Normal Equation Using Levinson Durbin
8. Decimation and Interpolation Using Rationale Factors
9. Maximally Decimated Analysis DFT Filter
10. Cascade Digital IIR Filter Realization
11. Convolution and M Fold Decimation &PSD Estimator
12. Estimation of PSD
13. Inverse Z Transform
14. Group Delay Calculation
15. Separation of T/F
16. Parallel Realization of IIR filter

NOTE:

1. Minimum of 12 experiments to be conducted.
2. The students are required to simulate the following experimental parts on the MATLAB environment by consider the relevant application based examples.

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(AUTONOMOUS)

2020005: CONSTITUTION OF INDIA IN PRACTICE
(Audit Course – II)

I Year M.Tech (ES) II – Sem.

L	T	P	C
2	0	0	0

Prerequisite: Nil

Course Objectives:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
- Acquaint students with latest intellectual property rights and innovation environment with related regulatory framework.
- Make students learn about role of engineering in business organizations and e-governance.

Course Outcomes:

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

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956
- Discover and apply different laws and regulations related to engineering practices

UNIT-I

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working),
Philosophy of the Indian Constitution: Preamble**,** Salient Features.

Learning Outcomes: At the end of this unit, the students will be able to

- Discuss meaning and importance of Constitution.
- Describe Making of Indian Constitution
- Demonstrate Salient features of Indian Constitution

UNIT-II

Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational Rights**,** Right to Constitutional Remedies, Directive Principles of State Policy**,** Fundamental Duties.

Learning Outcomes: At the end of this unit, the students will be able to

- Define Fundamental Rights
- Illustrate Fundamental Duties
- Analyze Directive Principles

UNIT-III

Organs of Governance: Parliament**,** Composition**,** Qualifications and Disqualifications**,** Powers and Functions**,** Executive**,** President**,** Governor**,** Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

Learning Outcomes: At the end of this unit, the students will be able to
- Discuss President of India – Election and Powers
- Examine Prime Minister and Council of Ministers
- Describe Lok Sabha – Composition and Powers

UNIT-IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayati raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

Learning Outcomes: At the end of this unit, the students will be able to
- Discuss Governor – Powers
- Describe Chief Minister and Council of Ministers
- Illustrate Legislative Assembly – Composition and powers.

UNIT-V

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Learning Outcomes: At the end of this unit, the students will be able to
- Understand Features of Election commission system in India
- Demonstrate state election commission
- Develop Institute and bodies for SC/ST/OBC

TEXT BOOKS:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

REFERENCES:

1. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
3. N. Chandhoke & Priyadarshini (eds), "Contemporary India: conomy, Society, Politics," New Delhi: Oxford University Press, 2009

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2020006: PEDAGOGY STUDIES
(Audit Course – II)

I Year M.Tech (ES) II – Sem.

L	T	P	C
2	0	0	0

Pre-requisite: Nil

Course Objectives:

:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers
- Identify critical evidence gaps to guide the development
- Identify teacher education (curriculum and practicum) and the school curriculum and guidance materials best support for effective pedagogy
- Disseminate how research findings within a country are not always well known or understood
- Resources and large class sizes, Teachers attitudes and beliefs and pedagogic strategies

Course Outcomes:

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

- What is meant by pedagogy and policy background? aims of pedagogy
- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
- Various pedagogic strategies

UNIT – I

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

Learning Outcomes: At the end of the unit, the student will be able to:

- Analyze different types of Policy background, Conceptual framework and terminology Theories of learning
- Understand curriculum and teacher education
- Identify Research questions and research gaps

UNIT – II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Learning Outcomes: At the end of the unit, the student will be able to

- What are the curriculum materials and policy background?
- What is the evidence on the effectiveness of pedagogical practices, in what conditions, and with what population of learners?
- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

UNIT – III

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Learning Outcomes: At the end of the unit, the student will be able to

- What is the evidence on the effectiveness of pedagogical practices, in what conditions, and with what population of learners?
- Strength and nature of the body of evidence for effective pedagogical practices
- Identify the Methodology for the in-depth stage: quality assessment of included studies

UNIT – IV

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Learning Outcomes: At the end of the unit, the student will be able to:

- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
- Analyze and critique the theories of learning that underpin the different pedagogical approaches.
- What are the limited resources and large class sizes for barriers to learning?

UNIT – V

Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Learning Outcomes: At the end of the unit, the student will be able to:

- Discuss research gaps identified and future research priorities
- Write a short note on dissemination and research impact.
- Explain the Research design and Peer support

Text Books:

3. J. Ackers AND F. Hardman, "Classroom interaction in Kenyan primary schools Compare," vol. 31, no. 2 pp. 245-261, Nov. 2009.
4. M. Agrawal, "Curricular reform in schools: The importance of evaluation," Journal of Curriculum Studies, vol .36, no. 3, pp. 361-379, Dec. 2004.

Reference Books:

4. K. Akyeampong, "Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1," London: DFID, 2003.
5. K. Akyeampong, k. Lussier, J. Pryor and J. "Westbrook Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? ," International Journal Educational Development, vol .33, no. 3, pp. 272–282. July 2013.
6. R.J. Alexander, "Culture and pedagogy: International comparisons in primary education," Oxford and Boston, Blackwell. 2001.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2020007: STRESS MANAGEMENT BY YOGA
(Audit Course – II)

I Year M.Tech (ES) II – Sem.

L	T	P	C
2	0	0	0

Pre-requisite: Nil

Course Objectives:
- To achieve overall health of body and mind
- To overcome stress
- To improve the physical conditioning related to flexibility through participation in Hatha yoga.
- Develop and maintain a personal yoga practice.
- Recognize and apply the value and benefits of an on-going yoga practice

Course Outcomes:
At the end of this course, the student will be able to
- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency
- Use practical tools for stress management in educational environments
- Improve their emotional intelligence to better deal with stress
- Understand the best relaxation techniques for educators and students

UNIT – I
Definitions of Eight parts of yog. (Ashtanga)

Learning Outcomes: At the end of the unit, the student will be able to:
- To learn Traditional Indian Yoga systems
- To understand The philosophy of the Yoga systems
- To learn new thought in Yoga movement in the country

UNIT – II
Yam and Niyam.

Learning Outcomes: At the end of the unit, the student will be able to:
- To introduce the essential elements of a yogic life style
- Will gain in-depth understanding of fundamental and applied scientific concepts and methods of Yogic Science and allied Science
- yoga sciences & Holistic Health can find a career to teach and spread the knowledge in schools, colleges, health centers

UNIT – III
Do`s and Don't's in life.
i. Ahinsa, satya, astheya, bramhacharya and aparigraha
ii. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Learning Outcomes: At the end of the unit, the student will be able to:
- To introduce a regular and rigorous practice (sadhana) of yoga practices
- Learn the Yogasanas and be able to guide others in practice
- The procedures of executing Bandha and Mudra

UNIT – IV

Asan and Pranayam

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn the procedures of Pranayama and be able to execute these
- The Meditation and be able to guide others in practice
- Explain the basics of Samkhya and Yoga darshanas (Philosophies)

UNIT – V

i. Various yog poses and their benefits for mind & body
ii. Regularization of breathing techniques and its effects-Types of pranayam

Learning Outcomes: At the end of the unit, the student will be able to:

- To give a basic understanding of the human anatomy
- To give a deeper understanding of the human systems
- To learn the mechanism of changes in body due to Yoga practice

Text Books:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Reference Books:

1. Rajayoga - Swami Vivekananda - Ramakrishna Ashrama Publications.
2. The Science of Yoga - Taimini - Theosophical Publishing House, Adyar, Madras.
3. Patanjal Yoga Pradeepa Omananda Tirtha- Geeta Press, Gorakhpur.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2020008: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - II)

I Year M.Tech (ES) II – Sem.

L	T	P	C
2	0	0	0

Prerequisite: None

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students
- To manage competency- mix at all levels for achieving excellence with ethics

Course Outcomes: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students.
- Understand the importance of empathetic listening

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

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(AUTONOMOUS)

TEXT BOOKS:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.
3. Personality Development and Career management: By R.M.Onkar (S Chand Publications).

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2035519: **SCRIPTING LANGUAGES**
(Professional Elective-V)

II Year M.Tech. (ES) I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- The principles of scripting languages
- Motivation for and applications of scripting
- Difference between scripting languages and non- scripting languages
- Types of scripting languages
- Scripting languages such as PERL, TCL/TK, python and BASH

Course Outcomes:

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

- Ability to create and run scripts using PERL/TCl/Python in IC design flow
- Ability to use Linux environment and write programs for automation of scripts in VLSI tool design flow
- Ability to understand the high-performance programs designed to strengthen the practical expertise
- Understand the core programming basics and program design using java
- Able to understand the concept of Basic concepts of Python

UNIT - I

Introduction to Scripts and Scripting: Characteristics and uses of scripting languages, Introduction to PERL, Names and values, Variables and assignment, Scalar expressions, Control structures, Builtin functions, Collections of Data, Working with arrays, Lists and hashes, Simple input and output, Strings, Patterns and regular expressions, Subroutines, Scripts with arguments.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the concepts of control structures and scripts with arguments
- Demonstrate the various scalar expressions and patterns, regular expressions
- Illustrate the programmable instructions and built-in functions

UNIT - II

Advanced PERL: Finer points of Looping, Subroutines, Using Pack and Unpack, Working with files, Navigating the file system, Type globs, Eval, References, Data structures, Packages, Libraries and modules, Objects, Objects and modules in action, Tied variables, Interfacing to the operating systems, Security issues.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the pack and unpack of PERL
- Summarize the operational modes of working files
- Illustrate the various security issues

UNIT - III

TCL: The TCL phenomena, Philosophy, Structure, Syntax, Parser, Variables and data in TCL, Control flow, Data structures, Simple input/output, Procedures, Working with Strings, Patterns, Files and Pipes, Example code.

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(AUTONOMOUS)

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the various syntaxes in TCL
- Summarize the working with strings, patterns, files and pipes
- Illustrate the TCL control flow

UNIT - IV

Advanced TCL: The eval, source, exec and up-level commands, Libraries and packages, Namespaces, Trapping errors, Event-driven programs, Making applications 'Internet-aware', 'Nutsand-bolts' internet programming, Security issues, running untrusted code, The C interface.

Learning Outcomes: At the end of the unit, the student will be able to

- Evaluate the namespaces, trapping errors
- Describe the current internet programming, security issues
- Understand the running untrusted code

UNIT - V

TK and JavaScript: Visual tool kits, Fundamental concepts of TK, TK by example, Events and bindings, Geometry managers, PERL-TK.

JavaScript – Object models, Design Philosophy, Versions of JavaScript, The Java Script core language, Basic concepts of Python.

Object Oriented Programming Concepts (Qualitative Concepts Only): Objects, Classes, Encapsulation, Data Hierarchy.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the concepts of TK and Java scripts
- Demonstrate the Java script languages and python programming
- Illustrate the concepts encapsulation

Text Books:

1. David Barron, “The World of Scripting Languages”, Wiley Student Edition, 2010.
2. Brent Welch, Ken Jones and Jeff Hobbs., “Practical Programming in Tcl and Tk” – 4th Edition, Prentice Hall

Reference Books:

1. Clif Flynt, “Tcl/Tk: A Developer's Guide”, 2003, Morgan Kaufmann Series.
2. John Ousterhout, “Tcl and the Tk Toolkit”, 2nd Edition, 2009, Kindel Edition.
3. Herbert Schildt, “Java the Complete Reference”, 7th Edition, TMH.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2035520: **MEMORY TECHNOLOGIES**
(Professional Elective-V)

II Year M.Tech. (ES) I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- Understand the basic device physics of semiconductor memory devices
- Demonstrate a familiarity with major memory device structures and integration technology
- To understand in general the limitations and benefits of the various memory technologies
- Establish a good knowledge base about the emerging advance memory technologies
- Explain the physical processes that determine the functionality of common non-volatile memory

Course Outcomes:

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

- Able to understand the architecture and design semiconductor memory circuits and subsystems
- Identify various fault models, modes and mechanisms in semiconductor memories and their testing procedures
- Know, how of the state-of-the-art memory chip design
- Able to know the memory hierarchy of a modern computer and in detail how its memory components function
- Able to give suggestions on how speed, reliability and energy consumption can be improved in the memory device technologies

UNIT- I

Random Access Memory Technologies: Static Random-Access Memories (SRAMs), SRAM Cell Structures, MOS SRAM Architecture, MOS SRAM Cell and Peripheral Circuit, Bipolar SRAM, Advanced SRAM Architectures, Application Specific SRAMs.

Learning Outcomes: At the end of the unit, the student will be able to

- Overview of the Random-Access Memories and the access mechanisms
- Understand the MOS SRAM architecture
- Understand the state-of-the-art in specific SRAMs

UNIT-II

DRAMs, MOS DRAM Cell, BiCMOS DRAM, Error Failures in DRAM, Advanced DRAM Design and Architecture, Application Specific DRAMs. SRAM and DRAM Memory controllers.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the error failures DRAM
- Introduce Advanced DRAM design
- Define memory controllers

UNIT-III

Non-Volatile Memories: Masked ROMs, PROMs, Bipolar & CMOS PROM, EEPROMs, Floating Gate EPROM Cell, OTP EPROM, EEPROMs, Non-volatile SRAM, Flash Memories.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the Non-Volatile Memories
- Acquire the knowledge on different types of ROMs
- Analyze the flash memories

UNIT-IV

Advanced Memory Technologies and High-density Memory Packing Technologies: Ferroelectric Random Access Memories (FRAMs), Gallium Arsenide (GaAs) FRAMs, Analog Memories, Magneto Resistive Random Access Memories (MRAMs), Experimental Memory Devices.

Learning Outcomes: At the end of the unit, the student will be able to

- Explain the different types of advanced memory technologies
- Understand the concepts of analog memories
- Analyze the experimental memory devices

UNIT-V

Memory Hybrids (2D & 3D), Memory Stacks, Memory Testing and Reliability Issues, Memory Cards, High Density Memory Packaging.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze the different types of memory cards
- Understand the memory hybrids
- Explain the high density memory packaging

TEXT BOOKS:

1. Ashok K Sharma, “Advanced Semiconductor Memories: Architectures, Designs and Applications”, Wiley Interscience
2. Kiyoo Itoh, “VLSI memory chip design”, Springer International Edition

REFERENCES:

1. Ashok K Sharma,” Semiconductor Memories: Technology, Testing and Reliability , PHI
2. Belty Prince, “ Semiconductor Memory Design Handbook”
3. Luecke Mize Care, “Semiconductor Memory design & application”, Mc-Graw Hill

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2035521: WIRELESS SENSOR NETWORKS
(Professional Elective-V)

II Year M.Tech. (ES) I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To acquire the knowledge about various architectures and applications of Sensor Networks
- To understand issues, challenges and emerging technologies for wireless sensor networks
- To learn about various routing protocols and MAC Protocols
- To understand various data gathering and data dissemination methods
- To Study about design principals, node architectures, hardware and software required for implementation of wireless sensor networks

Course Outcomes: At the end of the course, students will be able to

- Analyze and compare various architectures of wireless sensor networks
- Understand design issues and challenges in wireless sensor networks
- Analyze and compare various data gathering and data dissemination methods
- Design, simulate and compare the performance of various routing and MAC protocol
- Read and present technical papers on various issues in sensor networks, opening a path to research in this area

UNIT – I

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks.

Learning Outcomes: At the end of the unit, the student will be able to

- Overview of the modulation techniques and multiple access mechanisms
- Understand the medium access control protocols and address physical layer issues
- Understand the state-of-the-art in network protocols, architectures and applications

UNIT – II

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the state-of-the-art in network protocols, architectures and applications
- Introduce elements of distributed computing and network protocol design and will learn to apply these principles in the context of wireless sensor networks
- Define wireless sensor networks with scientific precision and learn the various hardware, software platforms that exist for sensor networks

UNIT – III

Routing protocols, MAC Protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee.

Learning Outcomes: At the end of the unit, the student will be able to

- Evaluate the routing protocols in wireless sensor networks
- Describe the current research and development issues in wireless sensor networks
- Manage the information generated with adhoc networks/ Sensor Networks

UNIT – IV

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

Learning Outcomes: At the end of the unit, the student will be able to

- Explain the different types of protocols for WSNs

- Understand the concepts of data dissemination and fusion for WSNs
- Analyze the various security protocols for Real-time traffic support

UNIT – V

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze and design the different types of WSNs
- Understand various Operating systems and execution environments for WSN
- Explain the Communication from WSN to Internet and Internet to WSN

Text Books:

1. C. Siva Ram Murthy and B. S. Manoj, “Ad-hoc Wireless Networks,” Pearson Education, 2008.
2. Kaveh PahLaven and P. Krishna Murthy, “Principles of Wireless Networks,” Pearson Education, 2002.

Reference Books:

1. Kamilo Feher, “Wireless Digital Communications,” PHI, 1999,
2. Andrea Goldsmith, “Wireless Communications,”Cambridge University Press, 2005.
3. GottapuSasibhushana Rao,“Mobile Cellular Communication,” Pearson Education, 2012.

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(AUTONOMOUS)

2035501: Overview of VLSI & Embedded Systems
(Open Elective)

II Year M.Tech (ES). I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To acquire the knowledge about various architectures and applications of processors
- To understand issues, challenges implementation of VLSI chips
- To learn about synthesis of DSP architecture
- To understand various processors and component datasheets
- To be familiar with working on a team to create and apply embedded systems

Course Outcomes:

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

- Analyze combinational and sequential circuit design
- Analyze and develop various FSMs & ASMs for the given problems.
- Demonstrate semiconductor IC design such as PLA's, PAL, FPGA, CPLDs
- Demonstrate VHDL synthesis, simulation, design captures tools, design verification tools.
- Prototype digital Systems using FPGA

UNIT I

Essential features of Instruction set architectures of CISC, RISC and DSP processors and their implications for implementation as VLSI chips; CISC Instruction-set implementation and RT-Level optimization through hardware flow-charting (without/with pipelining concepts).

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the Architecture of CISC, RISC and DSP Processors
- Summarize the operational modes of different processors
- Illustrate the various applications of DSP processor

UNIT II

Implementation of DSP Instruction sets, Programmable and function specific architectures; Synthesis of DSP architectures; Scheduling and resource allocation for DSP architectures.

Learning Outcomes: At the end of the unit, the student will be able to

- Illustrate the concepts of programmable and specific architectures
- Demonstrate various DSP Instruction sets
- Discuss the concepts of resource allocation for DSP Processors

UNIT III

Different abstraction levels in VLSI design, Design flow as a succession of translations among different abstraction levels, Gajski's Y-Chart; Need for manual designing to move to higher levels of abstraction with automatic translation at lower levels of abstraction.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concepts of different abstraction levels
- Understand the abstraction is advantageous to implement low power techniques
- Synthesize digital circuit targeting state of the art VLSI design

UNIT IV

Bus architectures, communication protocols, microcontroller and FPGA architectures and instruction sets, low-power design.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze the different types of FPGA architectures

- Understand the concept of communication protocols
- Identify the different types of low-power designs

UNIT V

Hardware, models of hardware –FSM, controller, micro-programmed etc., architecture synthesis, design space exploration.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of FSM
- Analyze the design space exploration
- Identify different types of hardware models for FSM

Text Books:

1. A.M. Dewey, Analysis and Design of Digital Systems with VHDL, PWS Kent, 1996.
2. A.A. Jerraya, H. Ding and P. Kission, Behavioral Synthesis and Component Reuse with VHDL, Kluwer, 1996.

Reference Books:

1. K.C. Chang, Digital System Design with VHDL and Synthesis: An Integrated Approach, Wiley India Pvt. Ltd., New Delhi
2. W. Wolf, Computers as Components: Principles of Embedded Computing System Design (The Morgan Kaufmann Series in Computer Architecture and Design),Elsevier Inc. 3rd edition, 2016.
3. W.H.Wolf, “Computers as Components: Principles of Embedded Computing System Design”, Elsevier, 2008.

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(AUTONOMOUS)

2035502: Principles of Electronic Communications
(Open Elective)

II Year M.Tech (ES). I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- To acquire the knowledge about modulation of various analog and digital modulation schemes.
- Understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.
- Acquire theoretical knowledge of each block in AM/FM transmitters and receivers
- Understand the concepts of baseband transmissions and various source & channel coding techniques
- Study of various noise sources and SNR/Figure of Merit calculations

Course Outcomes:

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

- List and discuss needs and types of modulations.
- Describe analog pulse modulation techniques and digital modulation technique.
- Explain and apply the concepts telecommunication switching, traffic and network fundamentals.
- To provide an in-depth illustration of different concepts used in a satellite communication system and summarize the basic elements of optical fibre transmission link.
- Discuss various wireless and cellular, mobile and telephone communication systems.

UNIT - I

Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

UNIT - II

Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

UNIT - III

Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.

Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT - IV

Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.

Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT - V

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, WCDMA.

Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

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TEXT BOOKS

1. Louis E. Frenzel, “Principles of Electronic Communication Systems”, 3rd Ed., McGraw Hill publications, 2008.
2. Kennady, Davis, “Electronic Communications systems”, 4Ed., TMH, 1999

REFERENCE BOOKS

1. Tarmo Anttalainen, “Introduction to Telecommunications Network Engineering”, Artech House Telecommunications Library.
2. Theodore Rappaport, “Wireless Communications-Principles and practice”, Prentice Hall, 2002.
3. Roger L. Freeman, “Fundamentals of Telecommunications”, 2 Ed. Wiley publications.
4. Wayne Tomasi, “Introduction to data communications and networking”, Pearson Education, 2005.

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2035503: Fundamentals of Nano Technology
(Open Elective)

II Year M.Tech (ES). I – Sem. **L T P C**

3 0 0 3

Course Objectives:

- Imparting the basic knowledge in Nano Science and Technology.
- Discuss how nanotechnology can help in the global energy crisis
- Describe how nanoscale particles (quantum dots) can be synthesised, characterised and utilised.
- Understand and predict nanoscale devices and behaviour and communicate
- Learn independently and self-critically.

Course Outcomes:

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

- Analyze combinational and sequential circuit design
- To familiarize about the various properties of nanostructures.
- To bring out the differences between nano and macro structures.
- To discuss applications specific properties of nano materials.
- Will give insight into many aspects of Nanoscience, technology and their applications in the prospective of materials science.

UNIT- I:

Over View of Nanotechnology: Definition – historical development – properties, design and fabrication Nanosystems, working principle, applications and advantages of nano system. Nanomaterials – ordered oxides – Nano arrays – potential health effects

UNIT –II:

Nanodefects, Nano Partiles and Nanolayers: Nanodefects in crystals – applications – Nuclear Track nano defects. Fabrication of nano particles – LASER ablation – sol gels – precipitation of quantum dots. Nano layers – PVD, CVD, Epitaxy and ion implantation – formation of Silicon oxide- chemical composition – doping properties – optical properties

UNIT- III:

Nanostructuring: Nanophotolithography – introduction – techniques – optical – electron beam – ion beam – X-ray and Synchrotron – nanolithography for microelectronic industry – nanopolishign of Diamond – Etching of Nano structures – Nano imprinting technology – Focused ion beams - LASER interference Lithography nanoarrays –Near-Field Optics - case studies and Trends

UNIT- IV:

Science and Synthesis of Nano Materials: Classification of nano structures – Effects of nano scale dimensions on various properties – structural, thermal, chemical, magnetic, optical and electronic properties fluid dynamics –Effect of nano scale dimensions on mechanical properties - vibration, bending, fracture Nanoparticles, Sol-Gel Synthesis, Inert Gas Condensation, High energy Ball Milling, Plasma Synthesis, Electro deposition and other techniques. Synthesis of Carbon nanotubes – Solid carbon source-based production techniques – Gaseous carbon source-based production techniques – Diamond like carbon coating. Top down and bottom up processes

UNIT –V:

Characterization of Nano Materials: Nano-processing systems – Nano measuring systems – characterization – analytical imaging techniques – microscopy techniques, electron microscopy scanning electron microscopy, confocal LASER scanning microscopy - transmission electron microscopy,

transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, diffraction techniques – spectroscopy techniques – Raman spectroscopy, 3D surface analysis – Mechanical, Magnetic and thermal properties – Nano positioning systems.

TEXT BOOKS:

1. Tai-Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata-McGraw Hill, New Delhi, 2002.
2. Fahrner W.R., Nanotechnology and Nanoelectronics, Springer (India) Private Ltd., 2011.
3. Mark Madou, Fundamentals of Microfabrication, CRC Press, New York, 1997.
4. Norio Taniguchi, Nano Technology, Oxford University Press, New York, 2003.

REFERENCE BOOKS:

1. Mohamed Gad-el-Hak, MEMS Handbook, CRC press, 2006, ISBN: 8493-9138-5.
2. Waqar Ahmed and Mark J. Jackson, Emerging Nanotechnologies for Manufacturing, ElsevierInc., 2013, ISBN: 978-93-82291-39-8 29.
3. Sami Franssila, Introduction to Micro fabrication, John Wiley & sons Ltd, 2004. ISBN: 470-85106-6.
4. Charles P Poole, Frank J Owens, Introduction to Nano technology, John Wiley and Sons, 2003.
5. Julian W. Hardner Micro Sensors, Principles and Applications, CRC Press 1993.

***Open Elective** – Students should take Open Electives from List of Open Electives Offered by Other Departments/Branches Only.

Ex: - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.