ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

ACADEMIC REGULATIONS (R19), COURSE STRUCTURE AND SYLLABI

For the students admitted to

M. Tech., Regular Two Year Degree Programme from the Academic Year 2019-20

VISION AND MISSION OF THE INSTITUTION

Vision

We impart futuristic technical education and instil high patterns of discipline through our dedicated staff who set global standards, making our students technologically superior and ethically strong, who in turn shall improve the quality of life of the human race.

Mission

Our mission is to educate students from the local and rural areas and from other states so that they become enlightened individuals, improving the living standards of their families, industry and society. We provide individual attention, world-class quality of Technical education and take care of character building.

ACADEMIC RULES AND REGULATIONS OF TWO -YEAR M. TECH REGULAR DEGREE PROGRAMME

APPLICABLE FOR THE STUDENT BATCHES ADMITTED FROM THE ACADEMIC YEAR 2019-20

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1. PREAMBLE

Annamacharya Institute of Technology and Sciences (Autonomous), Rajampet, relentlessly aims to achieve academic excellence by implementing new initiatives in teaching-learning and evaluation processes. Based on the directions of the University Grants Commission (UGC), New Delhi, All India Council for Technical Education (AICTE), New Delhi and Jawaharlal Nehru Technological University Anantapur (JNTUA) Anantapuramu, the institute adopted AICTE model curriculum, with minor modifications to match the needs, expectations, and skillsets of students of the region, in the post-graduate programmes offered from the academic year 2019-20.

2. APPLICATION AND COMMENCEMENT

- The regulations are quite comprehensive and include definitions of key terms, semester system, credit system, grading system and other relevant details.
- The regulations detailed herein shall apply to all the regular post-graduate programmes offered by the Institute.
- The regulations shall be applicable and come into force to the student batches admitted from the academic year 2019-20
- The Institute may revise, amend or change the regulations, scheme of examinations and syllabi, from time to time, if found necessary and on approval by the Academic Council of the Institute, keeping the recommendations of the Board of Studies in view.
- Any or all such amendments shall be effective from such date and to such batches of students including those already undergoing the programme, as may be approved through Academic Council of the Institute.
- These regulations shall be called R19 Regulations.

3. PROGRAMMES OFFERED BY THE INSTITUTE

The following M. Tech. programmes are offered as specializations by the Institute from 2019-2020.

SNo	Name of the Program	Programme
1	Structural Engineering	1
2	Electrical Power Systems	2
3	Machine Design	3
4	Embedded Systems	4
5	Computer Science and Engineering	5

4. ELIGIBILITY FOR ADMISSION

The eligibility criteria for admission into engineering Post Graduate programmes offered at AITS shall be as prescribed by the Government of Andhra Pradesh. The criteria are given below:

- Admission to the above programmes shall be made subject to the eligibility and qualifications as prescribed from time to time.
- Admissions shall be made on the basis of Rank / Percentile earned by the candidate in the relevant GATE examination / merit rank obtained by the qualifying candidate in the entrance test (PGECET) conducted by the Government of Andhra Pradesh for M.Tech. programmes or as decided by APSCHE subject to the reservations as prescribed by the university / State Government / on the basis of any other order of merit as decided by APSCHE from time to time
- Seats in each programme in the Institute are classified into two categories i.e., **Category – A** and **Category – B** as per the GOs of Andhra Pradesh.

Category – A Seats

These seats shall be filled through counselling as per the rank secured by a candidate in the Common Entrance Test (PGECET) conducted by the Government of Andhra Pradesh and as per other admission criteria laid down in the GOs.

Category – B Seats

These seats shall be filled by the Institute as per the GOs issued by the Government of Andhra Pradesh from time to time

5. MEDIUM OF INSTRUCTION

The medium of instruction shall be **English** for all the courses including their content delivery and examinations, seminars, presentations and project evaluation as prescribed in the programme curriculum.

6. M.TECH. PROGRAMME STRUCTURE

The structure of the M.Tech. Programmes on offer at AITS are based on the **Choice Based Credit System (CBCS)** as defined by the UGC and the curriculum / course structure as suggested by the AICTE in its Model Curriculum.

Semester Scheme

- The M. Tech Programmes offered at AITS follow **semester scheme** pattern.
- The duration of a M. Tech. Programme shall be of 2 **academic** years**.**
- Each academic year shall have **2 semesters** i.e., odd and even semesters and shall be

counted as first semester, second semester, and so on up to fourth semester.

- Each semester shall consist of **16 weeks** of academic work excluding internal examinations.
- Each semester is structured to provide credits totalling to **68 credits** for the entire M.Tech. Programme.
- Each semester shall have **Continuous Internal Evaluation (CIE)** and **Semester End Examination (SEE)** for both Theory and Lab courses.
- A student after securing admission into a 2 year M.Tech Programme at AITS shall pursue and acquire the M.Tech. Degree in a **minimum period of two academic years i.e., 4 semesters** and a **maximum period of four academic years i.e., 8 semesters** starting from the date of commencement of I year I semester, failing which the student shall forfeit the seat in M.Tech. Programme.

7. COURSES AND CREDIT STRUCTURE

Credit: A credit is a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work/project per week.

Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

Choice Based Credit System (CBCS): CBCS provides choice for students to select from the prescribed courses.

Each course is assigned certain number of credits based on following criterion

Type of Class	Semester	
	Periods per	Credits
Theory (Lecture/Tutorial)	01	01
	02	02
	03	03
	04	04
Practical	02	01
	03	1.5
	04	02
Project Work Stage 1	-	10
Project Work Stage 2	-	16

Every course of the M. Tech. programme shall be offered by a specific section / department. The unique codes of the section / department offering the courses are given in the Table.

Course offering Department	Code
Basic Science Courses	C
Humanities Courses	

Management Courses	E
Civil Engineering	1
Electrical and Electronics Engineering	2
Mechanical Engineering	3
Electronics & Communication Engineering	4
Computer Science & Engineering	5

Every M. Tech. Programme of study shall be designed to have theory and laboratory courses. In addition, a student shall carry out project phase-1, project phase-2, other mandatory courses and audit courses as prescribed in the curriculum of the Programmes.

7.1 Types of Courses:

Type of courses	Course category	Code	Range of credits				
			SE	EPS	MD	ES	CSE
Compulsory courses	Professional Core	PC	12	12	12	12	12
	Project / Dissertation Work	PW	26	26	26	26	26
	Mini-Project with Seminar	PS	2	2	2	2	2
	Laboratory Courses	PL	8	8	8	8	8
Elective courses	Professional Electives	PE	15	15	15	15	15
	Open Elective	OE	3	3	3	3	3
Mandatory Learning Course		MLC	2	2	2	2	2
Audit Course	Audit Course	AU	Non-Credit				

7.1.1 Foundation Courses

Engineering Science courses, Basic Science Courses and Humanities courses are termed as Foundation Courses and are mostly offered at I and II Year.

7.1.2 Professional Core Courses

Professional Core Course is to be completed by all students of respective programme before they can move on to the next semester.

7.1.3 Professional Core Electives

University Grants Commission has come up with the Choice Based Credit System (CBCS) in which the students have a choice to choose from the prescribed courses, which are referred as Professional

elective and Open Elective courses.

Students have to register for a total of 5 professional core electives courses (PE-1 to PE-5) from the list of track-wise professional elective course as prescribed in the course structure of the programme. The following points are considered for a Professional Elective Course.

- The selection of course based on the choice for students shall be on 'first come first serve' through on line and off line registration.
- The Head of the department or concerned shall decide, whether or not to offer such course keeping in view the resources available in the department offering the course.

7.1.4 Open Electives

Choice Based Credit System (CBCS) is promoted in such a way that different open elective courses should be offered by every department in engineering to other departments. This interdisciplinary of learning open elective courses by other department students will have learning awareness and job-oriented benefits. Students require the opportunity to choose any open elective course from different departments and apply their knowledge to acquire jobs in that field of course. Learning and employment benefits are not only through their own course subjects but also through open elective courses.

Every student shall earn prescribed credits by choosing one of the open elective courses from the list of Open Electives given in the Curriculum. Further students from a particular program/branch can opt for one Open Elective (OE1) offered by their concerned department. However, two Open Electives are inter-disciplinary and shall be offered by other branches.

8. EVALUATION PROCESS

The performance of a student in each semester shall be evaluated course-wise with a maximum of 100 marks for both Theory and Lab Courses.

- For a Theory course, the distribution shall be 40 marks for Internal Evaluation and 60 marks for End-Examinations. The distribution is detailed in 8.1.1.
- For a Lab course, the distribution shall be 40 marks for Internal Evaluation and 60 marks End- Examinations. The distribution is detailed in 8.1.2
- For a mini-project with seminar course shall be evaluated for 100 marks, the evaluation procedure is detailed in 8.1.3
- For Audit Course, the evaluation procedure is detailed in 8.1.4
- For the project work, the evaluation procedure is detailed in 9.0

8.1 Internal Evaluation

8.1.1 Theory Internal Examinations

For a Theory Course, 40 marks are allotted for Internal Evaluation. Two mid-term examinations (Theory Internal Examinations) shall be conducted for a Theory Course during a semester and they shall be evaluated for 30 marks. Remaining 10 marks is for continuous evaluation which includes weekly/ fortnightly class tests, homework assignments, problem solving, group discussions, quiz, seminar, mini-project and other means. The method of allotting these marks will be decided by the teacher dealing that subject in consultation with the Head of the Department. Teacher has to announce the evaluation method in the beginning of the semester. First midterm examination shall be conducted as per the syllabus of I & II units. The second midterm examination shall be conducted as per the syllabus of III, IV and V units.

Note: Final Internal marks for a total of 30 marks shall be arrived at by considering the best marks secured by the student in both the internal examinations

8.1.2 Laboratory Internal Examinations

For Lab Course, there shall be a continuous internal evaluation during the semester for 40 marks. Out of the 40 marks, day-to-day performance of the student in the laboratory shall be evaluated for 30 marks by the concerned laboratory teacher based on experimental correctness/record/viva. Two Lab Internal examinations shall be conducted for 10 marks by the concerned teacher. Performance of one best out of two tests to be considered.

8.1.3 Mini-project with Seminar

- A student shall undergo a mini-project with seminar during the I year II Semester of the M.Tech Programme
- A student under the supervision of a faculty member, shall collect literature on an allotted project topic of his/her choice, critically review the literature, carry out the mini-project and submit it to the department in a form of report as prescribed the Academic section and shall make an oral presentation before the Departmental Project Review Committee.
- Evaluation of the mini-project shall consist of Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) and shall be done by a Departmental Committee (DC) consisting of the Head of the Department, faculty supervisor and a senior faculty member of the specialization / department for a total of 100 marks.
- CIE shall be carried out for 40 marks on the basis of review presentation as per the academic calendar and evaluation format provided by Academic Section.
- SEE shall be carried out at the end of semester for 60 marks on the basis of an oral

presentation and submission of mini-project report after clearing the plagiarism check.

- A student has to secure a minimum of 50 % marks to be declared successful.
- Prior to the submission of mini-project report to the DC, its soft copy shall be submitted to the Research and Development Cell for PLAGIARISM check.
- The mini-project report shall be accepted for submission to the DC, if the similarity index is less than 30%. If the similarity index is more than the required percentage, the student shall be advised to modify the content accordingly and re-submit the soft copy of the report after one week.
- The maximum number of re-submissions of mini-project report after plagiarism check is limited to TWO. After this, the student shall be deemed to secure 'Fail' grade in the mini-project and shall re-register for it in the next semester.

8.1.4 Internal Evaluations of Audit Courses

- A student shall pursue Audit courses as specified in the course structure of the M.Tech. Programme.
- These courses are among the compulsory courses and do not carry any credits.
- A student has to secure 50 marks out of 100 in the Internal Examination, shall be necessary requirement for the student to qualify for the **award of Degree**.
- Result of mandatory courses shall be declared with **"Pass"** or **"Fail"** performance in the Comprehensive Marks Memo.
- No marks or letter grade shall be allotted.
- Attendance in the Audit course shall be considered while calculating aggregate attendance.

8.2 End Evaluation

8.2.1 Theory End Examinations

As specified in 8.0, Theory End Evaluation is done for 60 marks. End examination of theory subjects shall be conducted at the end of semester. There shall be Regular and Supplementary End Examinations. Theory End Examination shall be conducted for 60 marks and is of 3 hours duration. The question paper shall be of subjective type with 5 questions, one question from each unit, with internal choice. All questions carry equal marks of 12 each.

8.2.2 Laboratory End Examinations

As specified in 8.0, Lab End Evaluation is done for 60 marks, in the form a Lab End Examination that shall be conducted for 3 hours in respective Laboratory. Each lab course will have its own evaluation procedure and weightage.

8.2.3 Evaluation of Mandatory Learning Courses

Mandatory Learning Course (Research Methodology and IPR) is offered with 2 credits. For a Theory course, the distribution shall be 40 marks for Internal Evaluation and 60 marks for End-Examinations. For internal evaluation and external evaluation refer 8.1.1 and 8.2.1 respectively.

8.2.4 Supplementary Theory/Laboratory End Examinations

- Supplementary examination shall be conducted along with regular semester end examinations.
- During Semester End Examinations of even semester, supplementary examinations of odd semester shall be conducted and during semester end examinations of odd semester, supplementary examinations of even semester shall be conducted.
- The same schedule is applicable to Supplementary Lab End Examinations. Supplementary examination shall be conducted along with the next batch of students or separately.
- In case of seminars and comprehensive viva-voce examinations, supplementary seminar / comprehensive viva-voce will be conducted along with the next batch of students. If the next batch of students is not available, a separate supplementary examination will be conducted.

8.2.5 Revaluation and Recounting

Students may visit Examination Section Webpage for Norms and Procedures for Revaluation and Recounting of Answer Scripts.

- The students who wishes to apply for Revaluation/Recounting of his/her answer-books(s) must submit his/her application on the prescribed form together with the requisite fee to the Controller of Examinations before expiry of 15 days excluding the date of the declaration of his/her examination result. Application not received in the prescribed form or by the due date or without the requisite fee shall be rejected.
- After Recounting / Revaluation, records are updated with changes if any and the student will be issued a revised memorandum of marks. If there are no changes, the student shall be intimated the same through a notice.
- No Revaluation / Recounting for Laboratory Examination.
- The students are informed to be more careful in furnishing the information while applying for Recounting / Revaluation. The applications with insufficient information will be summarily rejected and the student has to forfeit the amount paid in this connection.

8.2.6 Challenge Evaluation

- Applications are invited from the students, who wish to apply for Challenge Valuation in the subjects of the M.Tech Regular and Supplementary examinations
- The student will apply for Challenge valuation in a specified application and should be routed through the HOD concerned.
- The students who have applied for the revaluation for a paper(s) of an examination are only eligible for the Challenge Valuation of that paper(s) of that examination.
- A Fee of Rs. 10000/- (Ten Thousand Rupees Only) for each paper is to be paid within the last date for challenge valuation.
- A Xerox copy of the answer script will be provided to the student on receipt of the payment of fee and date and time of the valuation will be informed to the student, so that valuation will be done in the presence of the teacher attended in support of the student nominated by the HOD concerned.
- The HOD concerned will nominate a teacher of the concerned subject to observe the valuation in support of the student. This will be done on the request of the student.
- If the marks obtained in the challenge valuation are more than or equal to 15% of the maximum marks with respect to the original marks obtained in the first valuation, then the marks obtained in the Challenge valuation will be awarded to the student and the institute will pay back Rs 9,000 (Nine thousands rupees only) to the student. If the student status changes from fail to pass, an amount of Rs. 5000 will be refunded to the student. Otherwise there will not be any change in the result of the student and original marks will be retained and the student will forfeit the fee paid.
- No Challenge valuation for Laboratory Examination

9.0 PROJECT EVALUATION

Every student shall be required to submit thesis/dissertation after taking up a topic approved by the Departmental Committee

- The Departmental Committee (DC) consisting of HOD, Project supervisor and two internal senior experts shall monitor the progress of the project work. A project Review committee (PRC) shall be constituted with Principal as a Chair person, Heads of the Departments of the M.Tech programs and two other senior faculty members, as members of PRC. PRC will come into action when DC is not able to resolve the issues.
- Registration of project work: A student is permitted to register for the project work after satisfying the attendance requirements of all the courses (theory, practical and seminars)

- After satisfying above point, a student has to submit in consultation with his supervisor, the title, objective plan of action of his project work to the DC for approval. Only after obtaining the approval of DC, the student can initiate the project work
- The work on the project shall be initiated in the penultimate semester and continued in the final semester. The duration of the project is for two semesters. The student can submit project thesis with the approval of DC after 36 weeks from the date of registration at the earliest but not later than one calendar year from the date of registration for the project work. Extension of time within the total permissible limit for completing the programme is to be obtained from the Head of the Institute
- The internal evaluation shall be made by the DC to grade, on the basis of two seminars presented by the student on the topic of his project.

- The student must submit the status of thesis/dissertation only after passing all the prescribed subjects such as theory, practical's, seminar and project internal evaluation
- A Student has to prepare four copies of the thesis/dissertation certified in the prescribed format by the supervisor and HOD. Out of which three copies shall be submitted in the examination section.
- Viva Voce examination shall be conducted by a board consisting of the supervisor, Head of the department and the External examiner. The Board shall jointly report student work as:

A- Outstanding
B- Very Good
C- Good
D- Satisfactory
E- Not Satisfactory

Head of the Department shall coordinate and make arrangements for the conduct of viva-voce.

- If the report of the viva-voce is failure, the student will retake the viva-voce examination after three months. If he/she fails to get a satisfactory report at the second viva-voce examination, he/she will not be eligible for the award of the degree.

10. ATTENDANCE REQUIREMENTS AND DETENTION POLICY

- A student shall maintain a minimum required attendance of 75% in AGGREGATE.
- Shortage of attendance up to 10% i.e., attendance between 65% to 75% in aggregate, may be condoned by the Institute Academic Committee based on the rules prescribed by the

Academic Council of the Institute from time to time.

- A stipulated fee shall be payable towards condonation of shortage of attendance.
- Shortage of attendance below 65 % shall in no case be condoned. A stipulated fee shall be payable towards condonation of shortage of attendance to the Institute as per following slab system

  1stSlab: Less than 75% attendance but equal to or greater than 70% a normal condonation fee can be collected from the student.

  2ndSlab: Less than 70% but equal to or greater than 65%, double the condonation fee can be collected from the student.

- Students whose shortage of attendance is not condoned OR who have not paid the stipulated fee OR who have not cleared any other due to the Institute in any semester are not eligible to write the Semester End Examination (SEE).
- Students, who do not meet the minimum required attendance of 65% in a semester, shall be detained in that semester and their registration for that semester shall stand cancelled. They shall not be promoted to the next semester.
- Students detained in a semester shall seek re-admission into that semester as and when offered.
- Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student.
- In case, there are any professional electives and /or open electives, the same may also be re-registered, if offered. However, if those electives are not offered in the later semesters, then alternate electives may be chosen from the same set of elective courses offered under that category.

  Any student against whom any disciplinary action is pending shall not be permitted to attend semester end examination (SEE) in that semester.

11. Minimum Academic Requirements and Award of the Degree

The following Academic Requirements have to be satisfied in addition to the attendance requirements mentioned in section 10.

11.1 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory or practical and Audit courses and Research methodology and Intellectual Property Rights course, if he secures

- A minimum of 40 % marks for each theory course in the Semester End Examination (SEE), and

- A minimum of 50 % marks for each theory course considering both CIE and SEE taken together.

11.2 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits allotted to mini-project courses, if he secures

- A minimum of 50 % marks for mini-project with seminar in the Continuous Internal Evaluation (CIE)

11.3 A student shall be treated as failed, if he

- Does not submit a report of mini-project with seminar and report of project phase courses OR
- Does not make a presentation of the same before the evaluation committee as per the schedule, or
- Secures less than 50 % marks in evaluation.

11.4 If a student fails to secure a pass grade in a particular course, it is mandatory that he shall register and re-appear for the examination in that course during the next semester when SEE is conducted in that course. It is mandatory that he should continue to register and re-appear for the examination till he secures a pass grade.

11.5 A student detained in a SEMESTER due to shortage of attendance, may be re-admitted when the same semester in the next academic year for fulfillment of academic requirements.

11.6 Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student.

11.7 A student shall be given one chance to re-register, after completion of the course work, for each course, provided the internal marks (CIE) secured by a student are less than 50% and he has failed in the SEE. In such a case, a student may re-register for the course(s) with prior permission and secure the minimum required attendance. Attendance in the re-registered course(s) shall be calculated separately to become eligible to write the semester end examination (SEE) in the re-registered course(s).

11.8 Re-registration is allowed only in those cases where the student doesn't have any course(s) yet to pass other than the re-registration course(s) where the CIE marks are less than 50%. However, in the case of re-registration of course(s) by a student, academic regulations applicable at the time of student admission in the programme shall be applicable.

11.9 In the event of re-registration, the internal evaluation marks as well as the End Semester Examinations marks secured in the previous attempt (s) for those subjects stand cancelled.

11.10 For each subject re-registered, the student has to pay a fee equivalent to one third of the semester tuition fee

11.11 A student shall register and put up minimum academic requirement of all 68 credits and earn all 68 credits for the award of M. Tech degree

11.12 Students who fail to earn 68 credits as indicated in the course structure within four academic years from the year of their admission shall forfeit their seat in M. Tech. course and their admission shall stand cancelled.

12. SEMESTER GRADE POINT AVERAGE (SGPA) AND CUMULATIVE GRADE POINT AVERAGE (CGPA)

The performances of students in each of the courses in the Programme are expressed in terms of letter grades based on an absolute grading system. We use 10-point grading system with letter grades. They are given in the following table.

Marks Obtained	Letter Grade	Description	Grade Points (GP)
≥90	S	Superior	10
≥80 and ≤89.99	E	Excellent	9
≥70 and ≤79.99	A	Very Good	8
≥60 and ≤69.99	B	Good	7
≥50 and ≤59.99	C	Average	6
≥40 and ≤49.99	D	Pass	5
≤40	F	Fail	--
Absent in the exam(s)	AB	Absent	--

A student is eligible for the award of the M.Tech. Degree with the class as mentioned in the following table

CGPA	Class
≥7.5	First class with Distinction
≥6.5 and <7.5	First Class
≥5.5 and <6.5	Second Class

≥5.0 and <5.5	Pass

For mandatory courses, student shall be awarded "pass" or "fail "without any credit. This shall not be counted for the computation of SGPA/CGPA

12.1 Computation of SGPA

The performance of each student at the end of each semester shall be indicated in terms of SGPA. The

SGPA shall be calculated as follows:

$$SGPA = \frac{Total\ earned\ weighted\ grade\ points\ in\ a\ semester}{Total\ credits\ in\ a\ semester}$$

$$SGPA = \frac{\sum_{i=1}^{p} C_{i.}.G_i}{\sum_{i=1}^{p} C_i}$$

Where

$C_{i.}$ = Number of credits allotted to a particular curse 'i'

G_i= Grade point corresponding to the letter grade awarded to the course i

$i = 1, 2,\ldots$.p represent the number of courses in a particular semester.

Note: SGPA is calculated and awarded to those students who pass all the courses in a semester.

12.2 Computation of CGPA

The performance of a student shall be obtained by calculating Cumulative Grade Point Average (CGPA), which is weighted average of the grade points obtained on all courses during the course of study

$$CGPA = \frac{Total\ earned\ weighted\ grade\ points\ for\ the\ entire\ programme}{Total\ credits\ for\ the\ entire\ program}$$

$$CGPA = \frac{\sum_{j=1}^{m} C_{j.}.G_j}{\sum_{j=1}^{m} C_j}$$

Where

$C_{j.}$ = Number of credits allotted to a particular semester 'j'

G_j = Grade point corresponding to the letter grade awarded to the semester j

$j = 1,2,\ldots$.m represent the number of semester of the entire programme.

12.3 Grade Card

The grade card issued shall contain the following

- The credits for each course offered in that semester
- The letter grade and grade point awarded in each course

- The SGPA and CGPA
- Total number of credits earned by the student up to the end of that semester

Example: - Computation /calculation of SGPA

Course name	Credits (C)	Letter grade	Grade point (GP)	Credit point (CP=C*GP)
Course 1	4	A	9	4x9=36
Course 2	3	S	10	3*10=30
Course 3	2.5	S	10	2.5*10=25
Course 4	1.5	C	6	1.5*6=9
Course 5	1	D	5	1*5=5
Total	12			105

Therefore, SGPA= $\frac{105}{12}$ 8.75

Example Illustration of CGPA

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5
Credit: 20 SGPA : 8.75	Credit : 20 SGPA : 8.25	Credit : 22 SGPA : 7.89	Credit: 23 SGPA : 8.21	Credit : 22 SGPA : 7.86

Thus, CGPA = $\frac{20*8.75+20*8.75+22*7.89+23*8.21+22*7.86}{107} = 8.34$

Similarly, compute CGPA obtained at the end of 4th semester shall be the final CGPA secured by the student for the entire programme.

12.4 Conversion of SGPA into percentage

In case of a specific query by students/employers regarding Semester Grade Point Average (SGPA)/ Cumulative Grade Point Average (CGPA) into percentage, the following formulae will be adopted for notional conversion of CGPA into percentage.

Percentage = 9.5 * CGPA

13. TRANSCRIPTS

After successful completion of the entire programme of study, a transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued, if required, after payment of requisite fee. Partial transcript will also be issued up to any point of study to a student on request.

14. TRANSITORY REGULATIONS

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the

course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 11 and they will follow the academic regulations into which they are readmitted. Students who are permitted to avail gap year shall be eligible for re-joining into the succeeding year of their M.Tech from the date of commencement of class work, subject to Section 11 and they will follow the academic regulations into which they are readmitted.

15. MINIMUM INSTRUCTION DAYS FOR A SEMESTER

The minimum instruction days for each semester shall be 16 weeks.

16. STUDENT TRANSFERS

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the affiliating University from time to time.

17. ANNOUNCEMENT OF RESULTS

- Results review committee comprising of University nominee, Principal, Dean Academics, Chairman of various boards of studies, Controller of Examinations and Deputy Controller of Examinations will monitor the results and gives the permission for announcement of results.
- After review meeting results are loaded in to Institution website from which students can access their results by entering Hall Ticket number. And also results in form of hard copy are available with respective Heads of the departments.

18. GENERAL INSTRUCTIONS:

- The academic regulations should be read as a whole for purpose of any interpretation.
- Malpractices rules-nature and punishments are appended.
- Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.
- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal / Governing body is final.
- Any legal issues are to be resolved in Rajampet Jurisdiction.
- The Institute may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Institute.

APPENDIX I: Rules for Disciplinary Action for Malpractices / Improper Conduct in Examinations

Malpractices identified by squad or special invigilators or invigilators

Punishments shall be given to the students as per the above guidelines. The case is to be referred to the malpractice committee.

Malpractice committee

1. The Principal, Chairman
2. Dean, Academics, Member
3. Invigilator, Member
4. Subject expert, Member
5. Concerned Head of the Department, Member
6. Controller of Examinations, Member Secretary

Note:

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fill all the norms required for the award of Degree.

	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 of the 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 any matter.	Expulsion from the examination hall and cancellation of 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 University.
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 for four consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated,

		shall be cancelled in all the subjects of the examination (including practical's 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 four consecutive semesters from class work and all University examinations, if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all University 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 University 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 only.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant — Superintendent / 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 officer-in charge 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 officer-in-charge, 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 College campus 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 student 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. If the candidate physically assaults the invigilator/officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. 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 University 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 students of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in nay malpractice or improper conduct mentioned in class 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 does 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 only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 12 shall be reported to the University for further action to award suitable punishment.	

I Year I Semester

SNo.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19B411T	Modern digital system design	3		--	3
2	PC	19B412T	Micro computer system design	3	--	--	3
3	Elective-I	19B41AT	Advanced Digital signal processing	3	--	--	3
4		19B41BT	Embedded system concepts				
5		19B41CT	DSP processors and architectures				
6	Elective-II	19B41DT	Advanced computer architecture	3		--	3
		19B41ET	System modelling and simulation				
		19B41FT	System on chip architecture				
	MLC	19BE11T	Research methodology and IPR	2			1
	AU	19B114T	Disaster Management				
Lab Courses							
7	PL	19B411L	Digital system design lab	--	--	4	2
8	PC	19B413L	Microcontrollers and interfacing lab	--	--	4	2
						Total	18

I Year II Semester

SNo.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19B421T	Internet of things and its applications	3		-	3
2	PC	19B422T	Embedded software design	3		-	3
3	Elective-III	19B42AT	Hardware software co-design	3		-	3
4		19B42BT	Nano materials and Nano technology				
5		19B42CT	Communication buses and interfaces				
6	Elective-IV	19B42DT	MEMS	3			3
		19B42ET	Artificial Intelligence				
		19B42FT	Real time operating System				
7	MLC	19B423P	Mini project with Seminar	2			2
8	AU	19BC21T	Academic and Research Report writing				

Lab Courses							
9	PC	19B424L	Internet of things lab	--	--	4	2
8	PC	19B425L	Advanced Microcontroller Laboratory	--	--	4	2
						Total	18

II Year I Semester

SNo.	Category	Course Code	Course .Title	Hours per week			Credits
				L	T	P	
1	Elective-VPE	19B43AT	Digital Communication techniques	3	-	-	3
		19B43BT	Soft Computing Techniques				
		19B43CT	Robotics Engineering				
2	Open Elective OE	19B43DT	Wireless communications	3	-	-	3
		19B53DT	Business Analytics				
		19B3BDT	Operations Research				
		19B13ET	Industrial Safety				
		19BE3AT	Cost Management of Engineering Projects				
		19B33ET	Composite Materials				
		19B23ET	Energy Conversion systems				
3	PW	19B431P	Dissertation Phase –I	10	-	-	10
						Total	16

II Year II Semester

SNo.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PW	19B441P	Dissertation Phase –II	16	-	-	16
						Total	16

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M.Tech. I Year I Semester

(19B411T) MODERN DIGITAL SYSTEM DESIGN

L	T	P
3	0	0

COURSE OBJECTIVES:

1. To study about different cmos characteristics and it's design.
2. Verify different methods to reduce the size and power consumption of CMOS IC.
3. To understand the design of subsystems and layout of cmos chip.

COURSE OUTCOMES

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

1. Illustration of the different characteristics of cmos ic ‘s
2. Understand the design aspects of cmos.
3. Formulation of the logical size and power efficiency of cmos design.
4. Analyse the design of cmos layout.

UNIT I

DESIGN OF DIGITAL SYSTEMS: ASM charts, Hardware description language and control sequence method, Reduction of state tables, state assignments. SEQUENTIAL CIRCUIT DESIGN: design of Iterative circuits, design of sequential circuits using ROMs and PLAs.

UNIT II

FAULT MODELING: Fault classes and models – Stuck at faults, bridging faults, transition and intermittent faults.

TEST GENERATION: Fault diagnosis of Combinational circuits by conventional methods – Path Sensitization technique, Boolean difference method, Kohavi algorithm. D – Algorithm, PODEM, Random testing, transition count testing, Signature analysis and testing for bridging faults.

UNIT III

FAULT DIAGNOSIS IN SEQUENTIAL CIRCUITS: State identification and fault detection experiment. Machine identification, Design of fault detection experiment

UNIT IV

PROGRAMMING LOGIC ARRAYS & TESTING: Design using PLA’s, PLA minimization and PLA folding. Fault models, Test generation and Testable PLA design.

UNIT V

ASYNCHRONOUS SEQUENTIAL MACHINE: fundamental mode model, flow table, state reduction, minimal closed covers, races, cycles and hazards.

TEXTBOOKS

1. Z. Kohavi – “Switching & finite Automata Theory” (TMH)
2. N. N. Biswas – “Logic Design Theory” (PHI)

3. Nolman Balabanian, Bradley Calson – "Digital Logic Design Principles" – Wiley Student Edition 2004.

REFRENCES

1. M. Abramovici, M. A. Breues, A. D. Friedman – "Digital System Testing and Testable Design", Jaico
Publications
2. Charles H. Roth Jr. – "Fundamentals of Logic Design".
3. Frederick. J. Hill & Peterson – "Computer Aided Logic Design" – Wiley 4th Edition.

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MTech. I Year I Semester

(19B412T) MICRO COMPUTER SYSTEM DESIGN

L	T	P
3	0	0

COURSE OBJECTIVES:

1. The course aims to provide the student with the ability to learn advanced microprocessors and microcontrollers.
2. The objective of this course is to provide the knowledge of microcomputer based system design

COURSE OUTCOMES:

Upon completion of the course, students can
1. An ability to comprehend the knowledge of microcomputer/microcontroller based systems.
2. An ability to use PIC instruction set architecture for assembly language programming
3. An ability to design a system or component through a hardware.

UNIT I

REVIEW OF 8086 AND 80286 PROCESSORS: Architecture, Register organization, Addressing Modes and Instruction Set (Brief treatment only), Difference between 8086 and 8088 with rest to pin structures. Architecture, Register Organization, Addressing Modes and instruction sets of 80286 (brief treatment only)

UNIT II

THE 80386, AND 80486 MICRO PROCESSORS: Architectural features, Register Organization, Memory management, Virtual 8086 mode, The Memory Paging Mechanism, Pin Definitions of 80386 and 80486 (brief treatment).

UNIT III

THE PENTIUM AND PENTIUM PRO PROCESSORS: The Memory System, Input/output system, Branch Prediction Logic, Cache Structure, Pentium Registers, Serial Pentium pro features.

THE PENTIUM IV AND DUAL CORE MICRO PROCESSORS: Architecture, Special Registers and Pin Structures (brief treatment only)

UNIT IV

I/O PROGRAMMING: Fundamentals of I/O Considerations Programmed I/O, Interrupt I/O, Block Transfers and DMA, I/O Design Example.

MULTIPROGRAMMING: Process Management, Semaphores Operations, Common Procedure Sharing, Memory Management, Virtual Memory Concept of 80286 and other advanced Processors.

UNIT V

ARITHMETIC COPROCESSOR, MMX AND SIMD TECHNOLOGIES: Data formals for Arithmetic Coprocessor, Internal Structure of 8087 and Advanced Coprocessors. Instruction Set (brief treatment).

TEXTBOOKS:

1. Barry, B. Brey, "The Intel Microprocessors,"8th Edition Pearson Education, 2009.
2. A.K. Ray and K.M. Bhurchandi,"Advanced Microprocessor and Peripherals," TMH

REFERENCES:

1. YU-Chang, Glenn A. Gibson, "Micro Computer Systems: The 8086/8088 Family Architecture, Programming and Design" 2nd Edition, Pearson Education, 2007.
2. Douglas V. Hall, "Microprocessors and Interfacing," Special Indian Edition, 2006.

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M.Tech. I Year I Semester

(19B41AT) ADVANCED DIGITAL SIGNAL PROCESSING
(Elective-I)

L	T	P
3	0	0

COURSE OBJECTIVES:

1. To provide the knowledge on analysis of discrete time signals and systems.
2. To study digital filter design techniques including advanced digital signal processing algorithms.
3. To learn the basics of Multi rate signal processing

COURSE OUTCOMES:

After completion of this course student will able to

1. Analyze the discrete time signals and systems in time and frequency domain
2. Understand the design procedure of digital filter along with structure
3. Understand the modern digital signal processing algorithm
4. Analyze the methods for power spectrum estimation
5. Explain the fundamentals of multi rate signal processing

UNIT I

INTRODUCTION: Discrete-Time Signals, Sequences and sequence Representation, Discrete-Time Systems, Time-Domain Characterization and Classification of LTI Discrete-Time Systems. The Continuous-Time Fourier Transform, The discrete-Time Fourier Transform, energy Density Spectrum of a Discrete-Time Sequence, Band-Limited Discrete-Time signals, The Frequency Response of LTI Discrete-Time System. Complementary Transfer Function. Inverse Systems, System Identification, Digital Two-Pairs.

UNIT II

DIGITAL FILTER SRTUCTURE AND DESIGN: All pass filters, Tunable IIR Digital Filter, Polyphase Structures, Digital Sine-Cosine Generator, Computational Complexity of Digital Filter Structures, Design of IIR Filter using pade approximation, Least Square Design Methods, Design of Computationally Efficient FIR Filters.

UNIT III

DSP ALGORITHMS: Fast DFT algorithms based on Index mapping, Sliding Discrete Fourier Transform, DFT Computation Over a narrow Frequency Band, Split Radix FFT, Linear filtering approach to Computation of DFT using Chirp Z-Transform.

UNIT IV

NON PARAMETRIC & PARAMETRIC METHODS FOR POWER SPECTRUM ESTIMATION: Barlett and weltch methods. Relation between auto correlation & model parameters, Yule-Waker & Burg Methods, MA & ARMA models for power spectrum estimation.

UNIT V

MULTI RATE SIGNAL PROCESSING: Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Filter design & Implementation for sampling rate conversion.

TEXTBOOKS:

1. Digital Signal Processing by Sanjit K Mitra, Tata McGraw Hill Publications.
2. Digital Signal Processing Principles, Algorithms, Applications by J G Proakis, D G Manolokis, PHI.
3. Digital Signal Processing Emmanuel C Ifeachor, Barrie W Jervis, Pearson Education

REFERENCES:

1. Discrete-Time Signal Processing by A V Oppenheim, R W Schafer, Pearson Education.
2. Modern spectral Estimation techniques by S. M. Kay, PHI, 1997
3. Theory and Applications of DSP L.R Rabiner and B gold.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
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M.Tech. I Year I Semester

(19B41BT)EMBEDDED SYSTEM CONCEPTS
(Elective-I)

L	T	P
3	0	0

COURSE OBJECTIVES:

1. To know the basic difference between embedded system and general systems
2. Learn the concepts of different embedded system designs
3. Understand the different tools for real time system

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

1. Learn embedded system core with applications.
2. Write assembly language programs including interfacing concepts.
3. Explore software utility tools for testing and implementation

UNIT I

AN INTRODUCTION TO EMBEDDED SYSTEMS AND RTOS : An Embedded System, Embedded hardware units, Embedded Software in a System, , Embedded System -On-Chip (SOC) and in VLSI Circuit, Classification of Embedded systems, Architecture of kernel**,** Interrupt Servicing Mechanism, Interprocess Communication and Synchronization of Processes.

UNIT II:

PROCESSOR AND MEMORY ORGANIZATION: Structural Units In a Processor, Processor Selection for an Embedded System, Memory Devices, Memory Selection for an Embedded Systems, Allocation of Memory to Program Cache and Memory Management Links, Segments and Blocks and Memory Map of a System, DMA, Interfacing Processors, Memories and Input Output Devices.

UNIT III

DEVICES AND BUSES FOR DEVICE NETWORKS AND SOFTWARE ARCHITECTURE: CPU bus, networks for embedded systems, Computer Parallel Communication between the Networked I/O Multiple Devices using the ISA, PCI, PCI-X and Advanced Buses, Communication Interfacings: RS 232/UART, RS 422/RS 485, IEEE 488 bus,

Software Architectures-Round robin, Round robin with interrupts, Function queue scheduling, RTOS.

UNIT IV

HARDWARE–SOFTWARE CO-DESIGN IN AN EMBEDDED SYSTEM: Design methodologies ,Embedded System Project Management, Embedded System Design and Co-Design Issues in System Development Process, Design Cycle in the Development Phase for an Embedded System, use of Target Systems, use of Software Tools for Development of an Embedded System, use of Scopes and Logic Analysis for System, Hardware Tests. Issues in Embedded System Design.

UNIT V

DESIGN EXAMPLES/ Case Studies: Automatic chocolate vending machine, Digital camera, Adaptive cruise control in a car, Smart cards

TEXTBOOKS:

1. Rajkamal, "Embedded systems: Architecture, Programming and Design" TMH.
2. wayne wolf, "Computers as a component: principles of embedded computing system design".

REFERENCES:

1. Embedded system design by Arnold S Burger, CMP
2. An embedded software primer by David Simon, PEA
3. Embedded systems design:Real world design be Steve Heath; Butterworth Heinenann, Newton mass USA 2002
4. Data communication by Hayt..

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M.Tech. I Year I Semester

(19B41CT)DSP PROCESSORS & ARCHITECTURES
(Elective-I)

L	T	P
3	0	0

COURSE OBJECTIVES:

The course aims to provide the student with the ability

1. To give an exposure to the various fixed point & a floating point DSP architectures and to develop applications using these processors.
2. To understand the key theoretical principles underpinning DSP in a design procedure through design examples and case studies.

COURSE OUTCOMES:

Upon completion of the course, students can

1. Recognize the fundamentals of fixed and floating point architectures of various DSPs.
2. Learn the architecture details and instruction sets of fixed and floating point DSPs
3. Infer about the control instructions, interrupts, and pipeline operations.
4. Illustrate the features of on-chip peripheral devices and its interfacing along with its programming details.

UNIT I

INTRODUCTION TO DIGITAL SIGNAL PROCESING: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT II

ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT III

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

UNIT IV

IMPLEMENTATIONS OF BASIC DSP ALGORITHMS: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

IMPLEMENTATION OF FFT ALGORITHMS: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT V

INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al.S. Chand & Co, 2000.

REFERENCES:

1. Digital Signal Processors, Architecture, Programming and Applications-B.Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

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M.Tech. I Year I Semester

(19B41DT)ADVANCED COMPUTER ARCHITECTURE
(Elective-II)

L	T	P
3	0	0

COURSE OBJECTIVES:

1. To learn Program, Network Properties of various parallel computer models.
2. To know about new trends in Operating and designing various parallel computers

COURSE OUTCOMES

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

1. Ability to calculate performance measures of different parallel computers.
2. Ability to find the difference between parallel computer with and without shared memory organization.

UNIT I

FUNDAMENTALS OF COMPUTER DESIGN: Technology trends, cost- measuring and reporting performance quantitative principles of computer design, classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing- operations in the instruction set, instructions for control flow, encoding an instruction set, the role of compiler

UNIT II

INSTRUCTION LEVEL PARALLELISM (ILP): overcoming data hazards- reducing branch costs, high performance instruction delivery, hardware based speculation, limitation of ILP,ILP SOFTWARE APPROACH: compiler techniques- static branch protection, VLIW approach, H.W support for more ILP at compile time- H.W verses S.W solutions

UNIT III

MEMORY HIERARCHY DESIGN: cache performance, reducing cache misses penalty and miss rate, virtual memory, protection and examples of VM, MULTIPROCESSORS AND THREAD LEVEL PARALLELISM: symmetric shared memory architectures, distributed shared memory, Synchronization, multi-threading.

UNIT IV

STORAGE SYSTEMS- Types, Buses, RAID, errors and failures, bench marking a storage device, designing a I/O system.

UNIT V

INTER CONNECTION NETWORKS AND CLUSTERS: interconnection network media, practical issues in interconnecting networks- examples, clusters, designing a cluster

TEXT BOOKS:

1. Computer Architecture A quantitative approach John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier), 3rd edition

REFERENCES:

1. Kai Hwang and A.Briggs "Computer Architecture and parallel processing", International Edition McGraw-Hill.

2. Dezso Sima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architectures", Pearson.

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M.Tech. I Year I Semester

(19B41ET)SYSTEM MODELLING & SIMULATION
(Elective-II)

L	T	P
3	0	0

COURSE OBJECTIVES:

1. Introduce various system modelling and simulation techniques, and highlight their applications in different areas.
2. This course includes modelling, design, simulation, verification and validation.
3. Introduce concepts of modelling time driven systems.
4. Build tools to view and control simulations and their results.

COURSE OUTCOMES:

After completion of the course the student is asks to

1. Acquire the basic knowledge of simulation modelling and systems.
2. To create simulation models of various types.
3. Have a clear understanding of Event driven models.

UNIT I

Basic Simulation Modeling, Systems, Models and Simulation, Discrete Event Simulation, Simulation of Single Server Queuing System, Simulation of Inventory System, Alternative approach to Modeling and Simulation.

UNIT II

SIMULATION SOFTWARE: Comparison of Simulation Packages with Programming Languages, Classification of Software, Desirable Software Features, General Purpose Simulation Packages – Arena, Extend and Others, Object Oriented Simulation, Examples of Application Oriented Simulation Packages.

UNIT III

BUILDING SIMULATION MODELS: Guidelines for Determining Levels of Model Detail, Techniques for Increasing Model Validity and Credibility, MODELING TIME DRIVEN SYSTEMS**:** Modeling Input Signals, Delays, System Integration, Linear Systems, Motion Control Models, Numerical Experimentation.

UNIT IV

EXOGENOUS SIGNALS AND EVENTS: Disturbance Signals, State Machines, Petri Nets & Analysis, System Encapsulation, MARKOV PROCESS**:** Probabilistic Systems, Discrete Time Markov Processes, Random Walks, Poisson Processes, the Exponential Distribution, Simulating a Poison Process, Continuous-Time Markov Processes.

UNIT V

EVENT DRIVEN MODELS AND SYSTEM OPTIMIZATION: Simulation Diagrams, Queuing Theory, Simulating Queuing Systems, Types of Queues, Multiple Servers, System Identification, Searches, Alpha/Beta Trackers, Multidimensional Optimization, Modeling and Simulation Mythology.

TEXT BOOKS:

1. System Modeling & Simulation, an Introduction – Frank L. Severance, John Wiley & Sons, 2001.

2. Simulation Modeling and Analysis – Averill M. Law, W. David Kelton, TMH, 3rd Edition, 2003.

REFRENCES:

1. Systems Simulation – Geoffrey Gordon, PHI, 1978.

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M.Tech. I Year I Semester

(19B41FT)SYSTEM ON CHIP ARCHITECTURE

L	T	P
3	0	0

COURSE OBJECTIVES:

1. To learn about processor design and arm architecture.
2. Study assembly and high level language programming.
3. Study about different tools and operating systems for architectural support.

COURSE OUTCOMES:

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

1. Able to understand the processor design and architecture for real time implementation.
2. The assembly and high level language programming.
3. Understand the importance of the memory hierarchy and design aspects
4. Acquire the architectural support for operating system.

UNIT I

INTRODUCTION TO PROCESSOR DESIGN, ARM ARCHITECTURE:

Abstraction in hardware design- MUO – a simple processor – Processor Design trade off- Design for low power consumption, Acorn RISC Machine – Architecture Inheritance – ARM Programming Model- ARM Development Tools – 3 and 5 Stage Pipeline ARM Organization - ARM Instruction Execution and Implementation – ARM Co-Processor Interface

UNIT II

ARM ASSEMBLY LANGUAGE PROGRAMMING:

ARM Instruction Types – Data Transfer, Data Processing and Control Flow Instructions - ARM Instruction Set – Co-Processor Instructions

UNIT III

ARCHITECTURAL SUPPORT FOR HIGH LEVEL LANGAUGE:

Data Types – Abstraction in software Design – Expressions – Loops – Functions and Procedures – Conditional Statements

UNIT IV

MEMORY HIERARCHY:

Use of Memory, Memory Size and Speed – On Chip Memory – Caches – Cache Design – an Example- Memory management

ARCHITECTURAL SUPPORT FOR SYSTEM DEVELOPMENT:

Advanced Microcontroller Bus Architecture – ARM Memory Interface – ARM Reference Peripheral Specification – Hardware System Prototyping Tools – Armulator – Debug Architecture.

UNIT V

ARCHITECTURAL SUPPORT FOR OPERTAING SYSTEM:

An Introduction to Operating Systems – ARM System Control Coprocessor- CP15 Protection Unit Registers – ARM Protection Unit – CP15 MMU Registers – ARM MMU Architecture – Synchronization –Context Switching Input and Output.

TEXT BOOKS:

1. Steve Furber, "ARM System on Chip Architecture" Addison- Wesley Professional 2nd Edition, Aug 2000

REFERENCES:

1. Ricardo Reis "Design of System on a Chip: Devices and Components" Springer 1st Edition, July 2004
2. Jason Andrews "Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology)" Newnes, BK and CD-ROM Aug 2004.

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M.Tech. I Year I Semester

(19B411L)DIGITAL SYSTEM DESIGN LAB

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COURSE OBJECTIVES:

1. Understand about fault modelling, diagnosis and test generation.
2. Illustration of the usage of ASM charts and PLA design.

COURSE OUTCOMES:

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

1. Analyse the different tools and languages to design a digital system.
2. Analyse about the fault models and test generation.
3. To know the fault diagnosis in sequential circuit
4. Acquire the knowledge about asynchronous sequential machine.

a) Digital Circuit Modeling using Verilog

b) Functional verification, synthesis and implementation on FPGA

Combinational Logic:

1. Logic Gates.
2. Adders:1-bit Adders, Ripple Carry Adder, Carry Look Ahead Adder and Serial Binary Adder
3. Decoder
4. Multiplexers
5. Binary and Priority Encoders
6. Comparators

Sequential Logic:

1. Flip-Flops with Synchronous and Asynchronous inputs.
2. Counters- Ring Counter, Johnson Counter, and Up- Down Counter, Ripple Counter.
3. Shift Registers: Serial-in Serial-out, Serial in Parallel out, Parallel in Serial out and Parallel in Parallel Out.
4. Sequence Detector (Finite State Machine- Mealy and Moore Machines).
5. ALU to Perform – ADD, SUB, AND-OR, 1's and 2's COMPLIMENT, Multiplication, Division.

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M.Tech. I Year I Semester

(19B413L)MICROCONTROLLERS AND INTERFACING LAB

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COURSE OBJECTIVES:

1. To provide basics of processors and programming skills in assembly level.
2. To provide strong foundation on interfacing of external devices to the processor to solve real time problems.

COURSE OUTCOMES:

After completion of this course student will able to

1. Get familiarity and practice with assembly level programming
2. Design application circuits using microcontrollers

ASSEMBLY / C PROGRAMING:

***All the below experiments should use 8051 Microcontroller Kit.**

1. Addition of two 16 bit numbers.
2. Copy contents of R0, R1, R2 of bank 0 to R5, R6, R7 of bank 3 using stack.
3. Generate a pulse of specified duration at a port pin using Timer0/1
4. A Door Sensor is connected to P1.1 Pin and a Buzzer is connected to P0.7. Write a Program to monitor Door Sensor and when it Open, Sounds the Buzzer by sending a Square Wave to it.
5. Write a Program to Toggle all the Bits of PORT 2 continuously with a 250ms Delay.
6. Switch and LED Interface.
7. Seven Segment Display Interfacing.
8. LCD Interfacing.
9. Key Pad Interfacing.
10. Serial Communication.
11. Analog input Interfacing.
12. Sort RTOS on to 89C51 board.

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M.Tech. I Year I Semester

(19BE11T)RESEARCH METHODOLOGY AND IPR

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COURSE OBJECTIVES:

1. To introduce the characteristics of a good research problem
2. To choose appropriate approaches of investigation of solutions for research problem
3. To familiarize with basic Intellectual Property Rights
4. To understand different Patent Rights

COURSE OUTCOMES:

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

CO-1: Comprehend research problem formulation, analyze research related information and follow research ethics

CO-2: Realize the importance of ideas, concept, and creativity in the present-day context.

CO-3: Recognize the need of Intellectual Property Right in general & engineering in particular.

CO-4: Appreciate IPR protection which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT-I:

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.

UNIT-II:

Literature Survey: Effective literature studies approaches, analysis. Plagiarism, Research ethics.

UNIT-III:

Effective technical writing: How to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-IV:

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.

UNIT-V:

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.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"

2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

3. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.

REFERENCES:

1. Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"

2. Mayall, "Industrial Design", McGraw Hill, 1992.

3. Niebel, "Product Design", McGraw Hill, 1974.

4. Asimov , "Introduction to Design", Prentice Hall, 1962.

5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.

6. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

7. C.R. Kothari and Gaurav Garg, "Research Methodology: Methods and Techniques", New Age International Publishers

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(19B114T) DISASTER MANAGEMENT
(Audit Course-I)

M.Tech. I Year I Semester

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COURSE OBJECTIVES:

1. The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.

COURSE OUTCOMES:

1. The students increase the knowledge and understanding of the disaster phenomenon and, its factors.
2. The students learn various classification of disasters hazard and vulnerability profile of India.
3. The students will learn impacts, global and national disaster trends.
4. The students will learn disaster management cycle and its phases and DRR programmes in India and activities of national disaster management academy.
5. The students should be able to analyze factors affecting vulnerability of developmental projects and environmental modifications for sustainable development.

UNIT-I:

INTRODUCTION - Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, prevention, mitigation).

UNIT-II:

DISASTERS - Disasters classification; natural disasters (floods, draught,cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT-III:

DISASTER IMPACTS - Disaster impacts (environmental, physical, social,ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

UNIT-IV:

DISASTER RISK REDUCTION (DRR) - Disaster management cycle–its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation

for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT-V:

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmentalfriendly recovery; reconstruction and development methods.

Text Books & References:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority).

2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.

4. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.

5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation.

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M.Tech. I Year II Semester

(19B421T)INTERNET OF THINGS AND ITS APPLICATIONS

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COURSE OBJECTIVES:

1. To understand the new paradigm of objects interacting with people, information systems and with other objects.
2. To introduce various IoT protcols
3. To understand the issues in developing specific real time systems on various IoT platforms.

COURSE OUTCOMES:

After completing this course the student will be able to

1. Identify and describe different kinds of internet-connected products developed on various IoT platforms.
2. The challenges involved in establishing user-interaction with connected-objects.
3. Develop IoT application using python.

UNIT-I:

Introduction to Internet of Things: Introduction to Internet of Things, History of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates, Applications of IoT.

UNIT-II:

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT.

IoT Platforms Design Methodology: Introduction, IoT Design Methodology.

UNIT-III:

The Wireless Embedded Internet: Introduction to 6LoWPAN**,**The 6LoWPAN Architecture ,The Basic 6LoWPAN Format, Addressing ,MQ telemetry transport for sensor networks (MQTT-S), ZigBee compact application protocol, Contiki and uIPv6, Wireless RFID Infrastructure.

UNIT-IV:

IoT Systems-Logical Design Using Python: Introduction, Installing Python, Python Data Types and Data Structures, Control Flow, Functions, Modules, Packages and File Handling.

UNIT-V:

IoT Physical Devices and Endpoints: What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers, 2007

3. Building the Internet of Things. Sara Cordoba, WimerHazenberg, Menno Huisman. BIS Publishers. 2011.

REFERENCES:

1. Adrian Mcewen, HakinCassimally Designing the Internet of Things Paperback – 25 Jul 2015.

2. Olivier Hersent, David Boswarthick, Omar Elloumi, and The Internet of Things: Key Applications and Protocols Hardcover – Import, 6 Jan 2012.

3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

4. Keoh, SyeLoong, SahooSubhendu Kumar, and Hannes Tschofenig. "Securing the internet of things: A standardization perspective." Internet of Things Journal, IEEE 1.3 (2014): 265-275

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M.Tech. I Year II Semester

(19B422T) EMBEDDED SOFTWARE DESIGN

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COURSE OBJECTIVES:

1. The goal of the course is to teach the concepts of detailed hardware and software design of embedded design.
2. Introduce Pentium microprocessor and special Pentium registers.
3. This course focuses on how to develop software program for embedded systems.

COURSE OUTCOMES:

1. Basic knowledge of Embedded design concepts
2. Be able to implement hardware and software partitioning of embedded system design.
3. Have a understanding of buffering and data structures of embedded systems.

UNIT I

Pentium processor: Introduction to Pentium microprocessor, Special Pentium Registers, Pentium memory management.

UNIT II

Embedded design life cycle: Introduction, Product specification, Hardware/Software partitioning, Iteration and implementation, Detailed hardware and software design, Hardware/Software integration, Product testing and release, Maintaining and upgrading existing products. Selection Process: packing the silicon, Adequate performance, RTOS availability, Tool change availability, Other issues in the selection process, Partitioning decision: Hardware/Software duality, Hardware trends, ASIIC's and Revision Costs.

UNIT III

Development environment: The execution environment, Memory organization, System start up. Special software techniques: Manipulating the Hardware, Interrupt and Interrupt service routines (ISR's), Watch dog timer, Flash memory, design methodology. Basic tool set: Host-Based debugging, remote debuggers and debug kernels, ROM emulator, Logic analyser.

UNIT IV

BDM: Background debug mode, Joint extraction group (JTAG) and Nexus.

ICE- Integrated solution: Bullet proof run control, Real time trac, Hardware Break points, Overlay memory, Timing constraints, usage issue, setting the trigger.

Testing: Why Test? When to Test? Which Test? When to stop? Choosing test cases, testing embedded software, Performance testing maintenance and testing, the future.

UNIT V

Writing software for Embedded systems: The compilation process, Native versus Cross- Compliers, Run Time libraries, Writing a Library, Using Alternative libraries, Using a standard Library, Porting kernels, C extensions for embedded systems, Downloading . Emulation and debugging techniques; Buffering and other data structures: What is a buffer? Linear buffers, Direction buffers, double buffering, Buffer exchange, Linked lists, FIFOS, circular buffers, Buffer under run and overrun, Allocating buffer memory, Memory leakage, Memory and performance Trade-offs.

Text Books:

1. Intel Microprocessor by Barry Brey PHI
2. Embedded system design- Introduction to processes, tools, Techniques, Arnold S Burger,CMP
3. Embedded system design by Steve Heath, Newnes

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M.Tech. I Year II Semester

(19B42AT) HARDWARE SOFTWARE CO-DESIGN
(Elective-III)

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COURSE OBJECTIVES:

Course aims to provide the student with ability

1. To understand the issues of concurrent design Techniques
2. To know the prototyping and emulation of co-design.
3. To learn about verification of co-design

COURSE OUTCOMES:

Upon completion of the course, students will be

1. Understand the essential issues of co-design.
2. Understand the methods and Techniques of prototyping & emulation.
3. Understand the compilation techniques & tools embedded architectures.

UNIT I:

ESSENTIAL ISSUES IN CODESIGN: Models, Architectures, Languages and Generic codesign methodology

CO-SYNTHESIS ALGORITHMS: Architectural Models, Hardware/Software Partitioning, Distributed system co-synthesis

UNIT II

PROTOTYPING AND EMULATION: Techniques, Environments and future developments

TARGET ARCHITECTURE: Architecture specialization Techniques, system communication infrastructure, Target Architectures and application system classes, Architectures for control-dominated systems, Architectures for data dominated systems, Mixed systems and Less specialized systems

UNIT III

COMPILATION TECHNIQUES AND TOOLS FOR EMBEDDED PROCESSOR ARCHITECTURES: Modern Embedded Architectures, Embedded software development needs, Compiler Technologies, practical considerations in a compiler development environment

UNIT IV

DESIGN SPECIFICATION AND VERIFICATION: Design, Co-design, co-design computational model, Concurrency, Coordinating concurrent computations, Interfacing Components, Verification.

UNIT V

LANGUAGES FOR SYSTEM LEVEL SPECIFICATION AND DESIGN: System level specification, Design representation for system level synthesis, System level specification languages, Heterogeneous specification and multi-language co-simulation

TEXT BOOK:

1. Jorgen Staunstrup, Wayne Wolf, "Hardware/Software Co-Design: Principles and Practice" Springer, fourth Indian reprint, 2013.

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M.Tech. I Year II Semester

(19B42BT) NANO MATERIALS AND NANO TECHNOLOGY
(Elective-III)

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COURSE OBJECTIVES:

The course aims to provide the student with the ability

1. To learn the fundamentals of Nano electronics.
2. To understand the applications and limitation of ICs.

COURSE OUTCOMES:

Upon completion of the course, students can

1. Learn the basics of microscopy's and applications.
2. Knows the fundamentals of Quantum electronics
3. Understands the basics of Tunneling devices and SETs

UNIT I

TECHNOLOGY AND ANALYSIS:

Film Deposition Methods, Lithography, Material Removing Technologies, Etching and Chemical, Mechanical Processing, Scanning Probe Techniques.

CARBON NANO STRUCTURES: Carbon Clusters, Carbon Nano tubes, Fabrication, Electrical, Mechanical and Vibrational Properties, Applications of Carbon Nano Tubes.

UNIT II

LOGIC DEVICES: Silicon MOSFETS, Novel Materials and Alternative Concepts, Ferro Electric Field Effect Transistors, Super Conductor Digital Electronics, Carbon Nano Tubes for Data Processing.

UNIT III

RANDOM ACCESS MEMORIES: High Permitivity Materials for DRAMs, Ferro Electric Random Access Memories, Magneto-Resistive RAM.

UNIT IV

MASS STORAGE DEVICES:

Hard Disk Drives, Magneto Optical Disks, Rewriteable DVDs based on Phase Change Materials, Holographic Data Storage.

UNIT V

DATA TRANSIMISSION, INTERFACES AND DISPLAYS:

Photonic Networks, Microwave Communication Systems, Liquid Crystal Displays, Organic Light Emitting Diodes.

TEXTBOOKS:

1. Rainer Waser, "Nano Electronics and Information Technology", Wiley VCH, April 2003.

2. Charles Poole, "Introduction to Nano Technology", Wiley Interscience, May 2003

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M.Tech. I Year II Semester

(19B42CT) Communication Busses and Interfaces
(Elective-III)

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COURSE OBJECTIVES:

Course aims to provide the student with ability

1. Introduce the students to the I/O Interfaces & peripherals for some of the most frequently encountered computational problems

2. To learn functional and operational details of various peripheral devices.

COURSE OUTCOMES:

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

1. Select a particular serial bus suitable for a particular application.
2. Develop APIs for configuration, reading and writing data onto serial bus.
3. Design and develop peripherals that can be interfaced to desired serial bus.

Unit 1: Serial Busses - Physical interface, Data and Control signals, features.

Unit 2: limitations and applications of RS232, RS485, I2C, SPI

Unit 3: CAN - Architecture, Data transmission, Layers, Frame formats, applications

Unit 4: PCIe - Revisions, Configuration space, Hardware protocols, applications

Unit 5: USB - Transfer types, enumeration, Descriptor types and contents, Device driver Data Streaming Serial Communication Protocol - Serial Front Panel Data Port (SFPDP) using fibre optic and copper cable

Text books

- Jan Axelson, “Serial Port Complete - COM Ports, USB Virtual Com Ports, and Ports for
- Embedded Systems ”, Lakeview Research, 2nd Edition
- Jan Axelson, “USB Complete”, Penram Publications
- Mike Jackson, Ravi Budruk, “PCI Express Technology”, Mindshare Press
- Wilfried Voss, “A Comprehensible Guide to Controller Area Network”, Copperhill Media
- Corporation, 2nd Edition, 2005.
- Serial Front Panel Draft Standard VITA 17.1 – 200x
- Technical references on www.can-cia.org, www.pcisig.com, www.usb.org

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M.Tech. I Year II Semester

(19B42DT) MICRO ELECTROMECHANICAL SYSTEMS
(Elective-IV)

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COURSE OBJECTIVES:

Course aims to provide the student with ability

1. Introduces to MEMS and micro fabrication
2. Application to Mechanical engineering, Transducer design
3. To understand MEMS design flow

COURSE OUTCOMES:

Upon completion of the course, students will be

1. Familiar with important concepts applicable to MEMS and their fabrication
2. To design and analyze and testing of MEMS
3. Apply MEMS to different fields of Engineering.

UNIT I

INTRODUCTION, BASIC STRUCTURES OF MEM DEVICES: (Canti Levers, Fixed Beams diaphragms). Broad Response of Micro Electromechanical Systems (MEMs) to Mechanical (force, pressure etc.) Thermal, Electrical, Optical and Magnetic stimuli, Compatability of MEMS from the point of Power Dissipation, Leakage etc.

UNIT II

REVIEW OF MECHANICAL CONCEPTS: Stress, Strain, Bending Moment, Deflection Curve. Differential Equations Describing the Deflection under Concentrated Force, Distributed Force, Deflection Curves for Canti Levers – Fixed Beam. Electrostatic Excitation – Columbic Force between the Fixed and Moving Electrodes. Deflection with Voltage in C.L, Deflection Vs Voltage Curve, Critical Fringe Fields – Field Calculations using Laplace Equation. Discussion on the Approximate Solutions – Transient Response of the MEMS.

UNIT III

TWO TERMINAL MEMS: Capacitance Vs Voltage Curve – Variable Capacitor. Applications of Variable Capacitors. Two Terminal MEM Structures. Three Terminal MEM Structures – Controlled Variable Capacitors – MEM as a Switch and Possible Applications.

UNIT IV

MEM CIRCUITS & STRUCTURES FOR SIMPLE GATES: AND, OR, NAND, NOR, Exclusive OR, simple MEM Configurations for Flip-Flops Triggering, Applications to Counters, Converters. Applications for Analog Circuits like Frequency Converters, Wave Shaping. RF Switches for Modulation. MEM Transducers for Pressure, Force Temperature. Optical MEMS.

UNIT V

MEM TECHNOLOGIES: Silicon Based MEMS – Process Flow – Brief Account of Various Processes and Layers like Fixed Layer, Moving Layers, Spacers Etc., Etching Technologies. Metal Based MEMS: Thin and Thick Film Technologies for MEMS. PROCESS flow and Description of the Processes. Status of MEMS in the Current Electronics scenario.

TEXT BOOKS:

1. Gabriel.M.Review, "R.F. MEMS Theory, Design and Technology", John Wiley & Sons, 2003.
2. Thimo Shenko, "Strength of Materials", CBS Publishers & Distributors., 2000.
3. Ristic L. (Ed.), "Sensor Technology and Devices", Artech House, London 1994.
4. Servey E.Lyshevski, "MEMS and NEMS, Systems Devices; and Structures", CRC Press, 2002.

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M.Tech. I Year II Semester

(19B42ET) ARTIFICIAL INTELLIGENCE
(Elective-IV)

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Course Objectives:

The objective of the course is

1. To present an overview of artificial intelligence (AI) principles and approaches.
2. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents.
3. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

Course Outcomes:

Upon successful completion of this course student will

1.be able to design a knowledge based system
2.be familiar with terminology used in this topical area
3.have read and analysed important historical and current trends addressing artificial intelligence.

UNIT-I:

What is AI (Artificial Intelligence)?: The AI Problems, The Underlying Assumption, What are AI Techniques, The Level Of The Model, Criteria For Success, Some General References, One Final Word Problems.

State Space Search & Heuristic Search Techniques: Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, Generate- And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means- Ends Analysis.

UNIT-II:

Knowledge Representation Issues: Representations and Mappings, Approaches To Knowledge Representation. Using Predicate Logic: Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning.

Symbolic Reasoning Under Uncertainty: Introduction to No monotonic Reasoning, Logics For Non-monotonic Reasoning. Statistical Reasoning: Probability and Bays' Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, Dempster Shafer Theory.

UNIT-III:

Fuzzy Logic. Weak Slot-and-Filler Structures: Semantic Nets, Frames. Strong Slot-and-Filler Structures: Conceptual Dependency, Scripts, CYC

UNIT-IV:

Game Playing: Overview, And Example Domain: Overview, Mini Max, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.

Understanding: What is understanding? What makes it hard? As constraint satisfaction.

UNIT-V:

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Spell Checking Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI.

Text books

1. Elaine Rich and Kevin Knight "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 2005.

2. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall, 2009.

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M.Tech. I Year II Semester

(19B42FT) REAL TIME OPERATING SYSTEMS
(Elective-IV)

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Course Objectives:

The objective of the course is

1. Real-time scheduling and schedulability analysis.
2. Formal specification and verification of timing constraints and properties.
3. Design methods for real-time systems.
4. Development and implementation of new techniques to advance the state-of-the-art real-time systems research.

Course Outcomes:

1. An ability to understand advanced concepts in theory of computer science.
2. An ability to understand advanced concepts in applications of computer science.
3. An ability to apply knowledge of advanced computer science to formulate the analyze problems in computing and solve them.

UNIT I

INTRODUCTION TO UNIX: Overview of Commands, File I/O. (Open, Create, Close, Lseek, Read, Write), Process Control (Fork, Vfork, Exit, Wait, Waitpid, Exec), Signals, Inter Process Communication (Pipes, FIFOs, Message Queues, Semaphores, Shared Memory).

UNIT II

REAL TIME SYSTEMS: Typical Real Time Application, Hard Vs Soft Real Time Systems, a Reference Model of Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency Functional Parameters, Resource Parameters of Jobs and Parameters of Resources.

UNIT III

APPROACHES TO REAL TIME SCHEDULING: Clock Driven, Weighted Round Robin, Priority Driven, Dynamic Vs State Systems, Effective Release Times and Dead Lines, Offline Vs Online Scheduling.

UNIT IV

OPERATING SYSTEMS: Overview, Time Services and Scheduling Mechanisms, other Basic Operating System Function, Processor Reserves and Resource Kernel. Capabilities of Commercial Real Time Operating Systems.

UNIT V

FAULT TOLERANCE TECHNIQUES: Introduction, Fault Causes, Types, Detection, Fault and Error Containment, Redundancy: Hardware, Software, Time. Integrated Failure Handling.

PROGRAMMING IN RT Linux: Overview of Unix/Linux, Shell Programming, System programming, Core RT linux.

TEXT BOOKS:

1. Richard Stevens, "Advanced Unix Programming".
2. Jane W.S. Liu, "Real Time Systems", Pearson Education.
3. C.M.Krishna, KANG G. Shin, "Real Time Systems", McGraw.Hill
4. Dr.K.V.K.K.Prasad,"Embedded/Realtimesystems:Concepts,Design & Programming", Dreamtech Press

REFERENCES:

1. VxWorks Programmers Guide
2. www.tidp.org
3. www.kernel.org
4. http://www.xml.com/ldd/chapter/book

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M.Tech. I Year II Semester

(19B424L) INTERNET OF THINGS LAB

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Objectives:

1. To understand the terminology, technology and its applications of IoT.
2. To memorize the software platforms which are used for developing the applications.
3. To learn the concepts of python programming language which was used to develop the IoT projects.
4. To learn the concepts of Arduino IDE which is used to develop the IoT projects in Arduino Kits.
5. To know the hardware platforms which is necessary to develop the IoT applications.

NAME OF THE EXPERIMENTS

1. **Start Raseberry Pi, and try Various Linix Commands in Command Terminal Windows :**

(is,cd,touch,mv,nm,man,mkdir,tar,gzip,cat,more,less,ps,sido,cron,chown,chgrp,ping etc)

2. **Run some Python Programs On Pi like**

- Read your Name and Print Hello Message With name read two numbers , and Print their
- Sum ,difference ,Product and Division .
- Word and character count of a given String
- Area of a given Shape (rectangles , Triangle and Circle) Reading Shape and appreciate
- Values from Standard input
- Print a name “n” Times where name and n are read from standard input , using for and While loops .
- Handle divided by Zero Exception
- Print current time for ten minutes with an interval of 10 seconds

3. **Light an LED Through Python Programs.**

4. **Flash an LED At a Given on Time And OFF Time Cycle ,where the Two Times are Taken From a File.**

5. **Access an Image Through a Pi Web Cam**

6. Detect the motion of an object using the PIR sensor.

7. Blinking a multiple LED’s Blink using ARDUINO IDE.

8. Controlling the traffic light signals using ARDUINO IDE.
9. Calculate the distance of an object with the help of UltraSonic Sensor in ARDUINO IDE.
10. Detect the Moisture of an Soil using Soil Moisture sensor in Arduino IDE.
11. Controlling the Led blink using Switch.
12. Measure the Temperature and humidity using DHT11 Sensor.

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M.Tech. I Year II Semester

(19B425L)Advanced Microcontroller Laboratory

L	T	P
3	0	0

COURSE OBJECTIVES:

1. To provide basics of processors and programming skills in assembly level.
2. To provide strong foundation on interfacing of external devices to the processor to solve real time problems.
3. To benefit the students with the basic knowledge for life-long learning needed for successful professional carrier.

COURSE OUTCOMES:

After completion of this course student will able to

1. Get familiarity and practice with assembly level programming
2. Design application circuits using microcontrollers
3. Gain knowledge of applying the concepts to obtain the solutions for real time problems

LIST OF EXPERIMENTS:

***All the below experiments should use Advanced RISC Machine(32-bit)**

1. 12-bit ADC
2. Elevator control
3. Keypad Interfacing
4. Logic controller
5. Stepper motor interfacing
6. Traffic light interfacing
7. Relay Programming
8. Model Train/RTOS implementation
9. Temperature Transducer
10. Graphical LCD

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M.Tech. I Year II Semester

(19BC21T) ACADEMIC AND RESEARCH PAPER WRITING
Audit Course-II

L	T	P
3	0	0

Section 1: Introduction

- Introduction to Academic & Research Report writing
- The language of Academic & Research Reports
- Thesis and Research Paper writing – A brief

Section 2: Tools and Techniques

- Introduction to Computer Aided Text Processing
- Basic Document Preparation with Latex- Part 1
- Basic Document Preparation with Latex- Part 2
- Writing Mathematical Equation with Latex
- Writing Symbolic Expression with Latex
- Preparing Tables in a Document with Latex
- Inserting Figures in a Document with Latex

Section 3: Thesis Writing-I

- Layout of the Thesis
- Contents Prior to the Chapters
- Preparation of Abstract
- Introduction section for a Thesis
- Literature review for a Thesis

Section -4: Thesis Writing-II

- Computational methodology/Experimental details
- Preliminary studies for a Thesis
- How to write Results and Discussion for a Thesis part – I
- Data Analysis (How to write Results and Discussion for a Thesis part –I
- Writing Conclusions, References and other information for a thesis

Section-5: Research Paper Writing

- Writing a Research Paper
- The Structure of a Research paper
- Abstract for a Paper
- Introduction and Methodology sections for a Paper
- How to Incorporate Figure, Tables, Equations in a Research Paper
- How to write Results and Discussion, Conclusion sections for a Paper
- Different formats for referencing
- Ways of communicating a Research Paper

Section 6: Academic and Research Report Presentation

Section 7: Mini Project on Thesis Writing (with presentation)

Section 8: Mini project on Research Paper writing (with presentation)

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M.Tech. II Year I Semester

(19B43AT) DIGITAL COMMUNICATION TECHNIQUES
(Elective-IV)

L	T	P
3	0	0

Course objectives:

Students will be able to:

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand and analyze the signal flow in digital communication system.
- To understand the orthogonal frequency division multiplexing (OFDM) method.

UNIT I INTRODUCTION: Probability-Random variables – Probability Density Functions – Gaussian, Rayleigh, Rician, and Binomial - Chebyshev's inequality – Random Processes – Classification of Random Processes.Signal space representations- Vector Space Concepts, Signal Space Concepts, Orthogonal Expansion of Signals – Gram-Schmidt Procedure

UNIT II DIGITAL MODULATION SCHEMES AND AWGN: Memory less Modulation Methods – PAM, Phase Modulation, QAM – Multidimensional Signaling – Signaling Schemes with Memory- CPFSK,CPM, Waveform & Vector AWGN Channel – Optimal Detection for the vector AWGN Channel – Implementation of Optimum Receiver for AWGN Channel

UNIT III FADING CHANNELS: Characterization of fading multipath channels - Statistical Models for fading channels – Frequency-non Selective slowly fading channels – Rayleigh & Nakagami fading – Diversity Techniques for fading Multipath Channels, RAKE Demodulator & Performance – Generalised RAKE demodulator- A tapped delay line channel modulator.

UNIT IV COMMUNICATION OVER BAND LIMITED CHANNELS: Characterization of band limited Channels- Signal design for Band limited channel - Nyquist criterion for zero ISI, partial response signaling- Equalization Techniques- linear Equalization: Peak Distortion and MSE, Decision feedback equalization.

UNIT V ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM): Introduction to OFDM, Modulation & Demodulation in OFDM – FFT algorithm implementation of OFDM System – Filter bank implementation of of OFDM Receiver.

TEXT BOOKS:

1. J. Proakis, Masoud salehi, Digital Communications, McGraw Hill, Fifth edition, 2008.
2. Herbert Taub, Donald Schilling, Gowtham Saha , Principles of Communications Systems, 3rd Edition TMH, 2008.

REFERENCE BOOKS:

1. Ahmad R S Bahai ,Burton R Saltzberg ,Mustafa Ergen, "Multi-carrier Digital Communications: Theory and Applications of OFDM." Springer Publications.
2. Edward. A. Lee and David. G. Messerschmitt, "Digital Communication", Allied Publishers (second edition).
3. J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, "Digital Communication Techniques", PHI.
4. William Feller, "An introduction to Probability Theory and its applications", Vol 11, Wiley 2000.

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M.Tech. II Year I Semester

(19B43BT) SOFT COMPUTING TECHNIQUES
(Elective-IV)

L	T	P
3	0	0

Course Objectives:

After completion of this course the students will be able to

1. Learn about the Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

Course Outcomes:

1. Know about Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm.
2. Learn about Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification.

UNIT –I

Introduction:

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II

Artificial Neural Networks:

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madeline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III

Fuzzy Logic System:

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Selforganizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system

UNIT-IV

CLASSIFIERS

Kernel based approaches - clustering methods - Maximum Likelihood Estimation- Bayesian approach- Pattern Classification

UNIT-V

VIDEO OBJECT EXTRACTION

Back ground subtraction – Frame difference - Static and dynamic background modeling - optical flow techniques-Handling occlusion- scale and appearance changes - Shadow removal.

TEXT BOOKS:

1..A.Bovik, “Handbook of Image and Video Processing”, 2nd Edition, Academic Press, 2005.

2.. Mark Nixon and Alberto Aguado, “Feature Extraction and Image Processing”, Academic Press,

2008.

REFERENCE BOOKS:

1. A.K.Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall, 2002.

2. R.C.Gonzalez and R.E.Woods, „Digital Image Processing‟, Second Edition, Pearson Education, 2002.

3. John C.Russ, “The Image Processing Handbook”, CRC Press, 2007.

4. Richard O. Duda, Peter E. Hart and David G. Stork., “Pattern classification”, Wiley, 2001

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M.Tech. II Year I Semester

(19B43CT) ROBOTICS ENGINEERING
(Elective-IV)

L	T	P
3	0	0

Course Objectives:

After completion of this course the students will be able to

1. Learn about the Approaches to intelligent control, Architecture for intelligent control of robotics, Symbolic reasoning system, Rule-based systems, the AI approach, and Knowledge representation - Expert systems.

Course Outcomes:

1. Know about Basic concept of Robotics and their kinematic structures.
2. Learn about Introduction to Drive systems and sensors.

UNIT I-Introduction History of robots, Classification of robots, Present status and future trends. Basic components of robotic system. Basic terminology- Accuracy, Repeatability, Resolution, Degree of freedom. Mechanisms and transmission, End effectors, Grippers-different methods of gripping, Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, Cam type gripper, Magnetic grippers, Vacuum grippers, Air operated grippers; Specifications of robot.

UNIT II- Drive systems and Sensors Drive system- hydraulic, pneumatic and electric systems Sensors in robot – Touch sensors, Tactile sensor, Proximity and range sensors, Robotic vision sensor, Force sensor, Light sensors, Pressure sensors.

UNIT III- Kinematics and Dynamics of Robots 2D, 3D Transformation, Scaling, Rotation, Translation, Homogeneous coordinates, multiple transformation, Simple problems. Matrix representation, Forward and Reverse Kinematics Of Three Degree of Freedom, Homogeneious Transformations, Inverse kinematics of Robot,Robot Arm dynamics, D-H representationof robots, Basics of Trajectory Planning.

UNIT IV-Robot Control, Programming and Applications Robot controls-Point to point control, Continuous path control, Intelligent robot, Control system for robot joint, Control actions, Feedback devices, Encoder, Resolver, LVDT,Motion

UNIT V Interpolations, Adaptive control. Introduction to Robotic Programming, On-line and off-line programming, programming examples. Robot applications-Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting.

Text Books:

Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012. Craig. J. J. “Introduction to Robotics- mechanics and control”, Addison- Wesley, 1999.

Reference Books:

S.R. Deb, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education., 2009.

Richard D. Klafter, Thomas .A, ChriElewski, Michael Negin, "Robotics Engineering an Integrated Approach", PHI Learning. 2009.

Francis N. Nagy, Andras Siegler, "Engineering foundation of Robotics", Prentice Hall Inc., 1987.

P.A. Janaki Raman, "Robotics and Image Processing an Introduction", Tata McGraw Hill Publishing Company Ltd., 1995.

Carl D. Crane and Joseph Duffy, "Kinematic Analysis of Robot manipulators", Cambridge University press, 2008.

Fu. K. S., Gonzalez. R. C. & Lee C.S.G., “Robotics control, sensing, vision and intelligence”, McGraw Hill Book co, 1987

OPEN ELECTIVES
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M.Tech. II Year I Semester

(19B43DT) WIRELESS COMMUNICATIONS
Open elective I

L	T	P
3	0	0

COURSE OBJECTIVES:

1. To study about concepts of wireless communication systems and their applications.
2. To gain the knowledge on mobile radio propagation techniques and detailed understanding in wireless mobile communication
3. To study about different multiple access techniques and wireless channels.

COURSE OUTCOMES:

Upon completion of the course the students able to

1. Understand concepts of wireless communication systems and their applications.
2. Know the mobile radio propagation techniques and detailed understanding in wireless Mobile communication techniques.
3. Understand concepts of different multiple access techniques and wireless channels.
4. Understand the different protocols used for wireless communication systems

UNIT I

INTRODUCTION TO WIRELESS COMMUNICATIONS SYSTEMS AND STANDARDS : Evolution of mobile radio communications, Examples of Wireless Communication systems, Comparison, Second Generation Cellular Networks, Third Generation Cellular Networks , Wireless Local Loop(WLL), Bluetooth and Personal Area Networks.

UNIT II

MOBILE RADIO PROPAGATION:

Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating power to electric field, the three basic Propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering.

Small-Scale Fading and Multipath: Small scale multipath propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements.

UNIT III

DIVERSITY AND SPREAD SPECTRUM MODULATION TECHNIQUES:

Derivation of selection diversity and maximal ratio combining improvement, Polarization diversity, Frequency diversity, Time diversity, RAKE Receiver, Pseudo-Noise (PN) sequences, Direct sequence spread spectrum (DS-SS), Frequency Hopped spread spectrum (FH-SS), Performance of Direct sequence spread spectrum and Frequency Hopped spread spectrum.

UNIT IV

MULTIPLE ACCESS TECHNIQUES:

Introduction, Frequency division multiple access, Time division multiple access, Spread spectrum multiple access, Space division multiple access, Capacity of cellular systems: capacity of cellular CDMA, capacity of CDMA with multiple cells, capacity of space division multiple access

UNIT V

CAPACITY OF WIRELESS CHANNELS AND MULTIPLE ANTENNAS:

Capacity in AWGN, Capacity of flat fading channels, Capacity of frequency selective fading channels Multiple Input Multiple output (MIMO) systems- Narrow band MIMO model, Parallel Decomposition of the MIMO Channel, MIMO channel capacity: Static channels, fading channels.

TEXT BOOKS:

1. Theodore.S. Rappaport, "Wireless Communication, principles & practice", 2nd Edition, Pearson

2. Andrea Goldsmith, "Wireless Communications", Cambridge University press-2005

REFERENCES:

1. Kamilo Feher, 'Wireless digital communication', PHI, 1995.

2. John G.Proakis."Digital Communication",4th edition

3. A.J.Viterbi, "CDMA- Principles of Spread Spectrum", Addison Wesley, 1995.

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M.Tech. II Year I Semester

(19B53DT) BUSINESS ANALYTICS
Open elective II

L	T	P
3	0	0

Course objectives:

1. Understand the role of business analytics within an organization.
2. Analyse data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.

COURSE OUTCOMES:

1. Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modelling to support business decision-making.

Unit1:

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.

Unit 2:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit 3:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4:

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte

Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit 5:

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Reference:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

2. Business Analytics by James Evans, persons Education.

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M.Tech. II Year I Semester

(19B33DT) OPERATIONS RESEARCH
Open elective III

L	T	P
3	0	0

Course prerequisites: Engineering mathematics, Industrial Management.

Course Objectives:

1. To enable the students to the nature and scope of various decision making
2. Situations within business contexts understand and apply operations research techniques to industrial applications.
3. To learn the fundamental techniques of Operations Research and to choose a suitable OR technique to solve problem.

Course Outcomes:

Student will be able to:

1. Create mathematical models of the real life situations and capable of obtaining best solution using Graphical Methods.
2. Solve the special cases of LPP such as Transportation, Assignment and Travelling salesmen problems.
3. Find optimal replacement period of a machine or group of parts.

UNIT – I

INTRODUCTION: Development – Definition– Characteristics and Phases – Types of operation and Research models– applications.

LINEAR PROGRAMMING: Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques -Two–phase method, Big-M method – Duality Principle.

UNIT – II

TRANSPORTATION PROBLEM: Formulation – Optimal solution, unbalanced transportation problem –Degeneracy.

ASSIGNMENT PROBLEM: Formulation – Optimal solution - Variants of Assignment Problem-Travelling Salesman problem.

UNIT – III

REPLACEMENT MODELS: Introduction – Replacement of items that deteriorate with time – with change in money value - without change in money value – Replacement of items that fail completely, group replacement.

THEORY OF GAMES: Introduction – minimax - maximin – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – m X 2, 2 X n & m x n games –Graphical method, Dominance principle.

UNIT – IV

WAITING LINES: Introduction – single channel – Poisson arrivals – exponential service times – with infinite queue length models.

SIMULATION: Definition – Types of simulation models – phases of simulation– applications of simulation – Queuing problems – advantages and disadvantages – Simulation languages.

UNIT – V

INVENTORY: Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks.

DYNAMIC PROGRAMMING: Introduction – Bellman's Principle of optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

Text Books:

1. S.D. Sharma, Operations Research, Kedarnath and Ramnath Publications
2. Taha, Introduction to Operations Research. PHI
3. Hiller & Libermann, Introduction to Operations Research. TMH.

References:

1. A.M. Natarajan, P.Balasubramani, A. Tamilarasi, Operations Research. Pearson Edu.
2. Maurice Saseini, ArhurYaspan& Lawrence Friedman, Operations Research: Methods & Problems.
3. R. Panneerselvam, Operations Research. PHI Publ.

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M.Tech. II Year I Semester

(19B13ET) INDUSTRIAL SAFETY
Open elective IV

L	T	P
3	0	0

Course Objectives:

1. To enable the students to the nature and scope of industrial safety techniques.
2. Definition and aim of maintenance engineering
3. To learn the Fault tracing and Periodic and preventive maintenance

Course Outcomes:

Student will be able to:

1. Identify hazard and potential hazard areas.
2. Develop safety programs to prevent or mitigate damage or losses.
3. Assess safety practices and programs.
4. Conduct safety audits.
5. Improve safety practices.

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Books & Reference:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

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M.Tech. II Year I Semester

(19BE3AT) Cost Management of Engineering Projects
Open elective V

L	T	P
3	0	0

Course Objectives:

1. To Prepare engineering students to analyze cost/revenue data and carry out make economic analyses in the decision making process to justify or reject alternatives/projects on economic basics.

Course Outcomes:

1. To Be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
2. To be able to perform and evaluate payback period and capitalized cost on one or more economic alternatives.
3. To be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.

Unit-I:

Introduction and Overview of the Strategic Cost Management Process

Unit-II:

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Unit-III:

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Unit-IV:

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making

problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Unit-V:

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

References:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

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M.Tech. II Year I Semester

(19B33ET) COMPOSITE MATERIALS
Open elective VI

L	T	P
3	0	0

Course Objectives:

1. Ability to solve mechanics of composite materials problems using classical methods Assignments: Weekly problem sets are assigned.
2. Ability to do research and present on an advanced material topic Assignment: Students submit a research paper and present it in class.

Course outcomes:

1. Some understanding of types, manufacturing processes, and applications of composite materials
2. Ability to analyze problems on micromechanical behavior of lamina
3. Ability to analyze problems on macro mechanical behavior of laminate

UNIT–I: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight Strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.

2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

1. Hand Book of Composite Materials-ed-Lubin.

2. Composite Materials – K.K.Chawla.

3. Composite Materials Science and Applications – Deborah D.L. Chung.

4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

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M.Tech. II Year I Semester

(19B23ET) ENERGY CONVERSION SYSTEMS
Open elective VII

L	T	P
3	0	0

Course Objectives:

1. Understand the sources of energy and their contributions to the energy and power needs of the nation and the world.
2. Understand the differences between large quantities of fuel and waste vs. minuscule quantities of each, but with high potential for causing harm or inconvenience

Course Outcomes:

1. Problems assigned from text, with emphasis on the environmental effects
2. Special problems assigned regarding current events in the energy field

Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digesters

Unit-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India

References:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.

2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.

4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: RAJAMPET
(AN AUTONOMOUS INSTITUTION)

M.Tech. II Year I Semester

(19B431P) (Dissertation) Dissertation Phase – I

Teaching Scheme

Lab work: 20 hrs/week

Course Outcomes:

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

1. synthesize knowledge and skills previously gained and applied to an in-depth Study and execution of new technical problem.

.**Syllabus Contents:**

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain
- The student should complete the following:
- Literature survey and Problem Definition
- Motivation and Objectives of the study.

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M.Tech. II Year II Semester

(19B441P) (Dissertation) Dissertation Phase – II

Teaching Scheme

Lab work: 32 hrs/week

Course Outcomes:

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

1. suitable research design, and justify their design.
2. Ability to present the findings of their technical solution in a written report.
3. Presenting the work in International/ National conference or peer-reviewed journals.

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Implementation and Verification
- Report and presentation
- The dissertation stage II is based on a report prepared by the students on dissertation allotted to

  them. It may be based on:
- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – I and II - M. Tech. (ECE):

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases .
- The dissertation may be carried out preferably in-house i.e. departments laboratories and centres OR in industry allotted through departments T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.