PRASAD V. POTLURI
SIDDHARTHA INSTITUTE OF TECHNOLOGY
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KANURU, VIJAYAWADA – 520007
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ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC REGULATIONS AND DETAILED SYLLABUS (PVP 17)

M.TECH TWO YEAR DEGREE PROGRAMME

Sponsored by
Siddhartha Academy of General & Technical Education
Vijayawada

ADMINISTRATION			
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1	Dr.K.Sivaji Babu	Principal	9490958212
2	Dr.K.Ramesh	Head, Department of CE	9849045342
3	Dr. Suresh Chandra Satapathy	Head, Department of CSE	9000249712
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9	Dr. Ch. Padmanabha Raju	Head, Department of FE Chairman, Disciplinary & Anti Ragging Committee	9246400881
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11	Sri R. Madhava Rao	Administrative Officer	9985882742
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18	Sri M.V. Sekhar	Assistant Librarian	9440356984
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20	Sri B.V.R.V. Prasad	Management Representative, ISO	9948592702
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(Autonomous)

Kanuru, Vijayawada – 520 007

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Permanent Affiliation to JNTUK, Kakinada

Academic Regulations for Two Year M. Tech Programme (PVP 17)
(w.e.f. the Academic Year 2017-18)
(Common to all Programmes)

CONTENTS

1. INTRODUCTION

Academic Programmes of the Institute are governed by rules and regulations approved by the Academic Council, which is the highest Academic body of the Institute. These academic rules and regulations are effective from the academic year 2017-18 for students admitted into two year postgraduate programme offered by the Institute leading to Master of Technology (M.Tech) in various specializations offered by respective departments as given in Table 1.

2. PROGRAMMES OFFERED

Currently, the Institute is offering M.Tech programmes in the following disciplines:

Table 1: List of Specializations

Sl. No.	Specialization	Offering Department
1	Computer Science and Engineering	Computer Science and Engineering
2	Microwave & Communication Engineering	Electronics and Communication Engineering
3	Power System Control & Automation	Electrical and Electronics Engineering
4	Machine Design	Mechanical Engineering

3. DURATION OF THE PROGRAMME

The duration of the programme is two academic years consisting of four semesters. A student is permitted to complete the M.Tech programme in a stipulated time frame of 4 years from the date of admission. Otherwise they shall forfeit their seat in M.Tech programme and their admission shall stand cancelled.

4. MINIMUM INSTRUCTION DAYS

Each semester normally consists of a minimum of 90 instruction days.

5. ELIGIBILITY CRITERIA FOR ADMISSION

The eligibility criteria for admission into M.Tech programme shall be as per the guidelines of Andhra Pradesh State Council of Higher Education (APSCHE) & AICTE from time to time.

6. REGISTRATION

A student shall register for courses in each semester at the beginning of every semester according to the choice provided and courses offered by the concerned department.

7. MEDIUM OF INSTRUCTION

The medium of instruction and examination is English.

8. PROGRAMME STRUCTURE

Every specialization of M.Tech programme shall have theory courses and practical courses along with Term Paper/ Mini project/ Seminar in the first and second semesters. Pedagogy training / Industrial training shall be for a period of 4 weeks at the beginning of third semester followed by a Dissertation in third and fourth semesters.

8.1 Course Code and Course Numbering Scheme

Course Code consists of 9/10 characters which is specified by Regulation, department, programme, semester number, type of course, course number & elective code. The details are described in Tables 2, 3, 4 & Figure-1.

Table 2: Third and Fourth Characters description

Characters	Name of the Department
CS	Computer Science and Engineering
EC	Electronics & Communication Engineering
EE	Electrical & Electronics Engineering
ME	Mechanical Engineering

Table 3: Fifth and Sixth Characters description

Characters	Name of the Programme
CS	Computer Science and Engineering
MC	Microwave & Communication Engineering
PC	Power System Control & Automation
MD	Machine Design

Table 4: Course Type description

Course Type Character	Description
T	Theory course
L	Laboratory /Practice course
TR	Pedagogy training/ Industrial training
DS-A	Dissertation Part-A
DS-B	Dissertation Part-B

For example, the annotation of the course **17MEMD1T5A is** as given in Figure-1below.

1	7	M	E	M	D	1	T	5	A
Year of Framing the Regulations		Department Code		Specialization code		Semester number	Course type	(optional) Course number	(optional) Elective code

Figure – 1: Course code description

8.2 Contact Hours and Credits

The Course Credits are broadly fixed based on the following norms.

- Theory – One Lecture period is assigned 1 credit
- Laboratory – Three periods are assigned 2 credits and two periods are assigned 1 credit
- Mini project /Term Paper/Seminar is assigned 2 credits
- Pedagogy training/Industrial training is conducted for four weeks and is assigned 2 credits
- Dissertation is assigned 16 credits
- However, some courses are prescribed with fixed number of credits depending on the complexity of the subject and relative importance.

8.3 Theory classes

Each course is prescribed with fixed number of lecture periods per week. During lecture periods, the course instructor shall deal with the concepts of the course.

8.4 Laboratory Courses

A minimum prescribed number of experiments/ programs have to be performed by the students, who shall complete these in all respects and get each experiment evaluated by course instructor concerned and certified by the Head of the Department concerned at the end of the semester.

8.5 Programme Credits

Each discipline of the M.Tech programme is designed to have a total of 74 credits and the student shall have to register for all the courses prescribed in the curriculum and secure all 74 credits for award of the degree.

9. SYLLABUS

As approved by the BOS of concerned department and ratified by Academic Council.

10. ELIGIBILITY REQUIREMENT FOR APPEARING AT SEMESTER END EXAMINATION AND CONDONATION

10.1 A candidate shall be deemed to have eligibility to write his end semester examinations if he has put in at least 75% of attendance in all the courses in that semester, which is computed by totalling the number of periods of lectures, practical courses and Dissertation (as the case may be), held in that semester with the total number of periods attended by the student in all the courses put together.

10.2 Condonation of shortage in attendance may be recommended by respective Heads of Departments on genuine medical grounds, provided the student puts in at least 65% attendance as calculated above and provided the Principal is satisfied with the genuineness of the reasons and the conduct of the student.

10.3 Students, having shortage of attendance percentage less than 75 and greater than or equal to 65, shall have to pay requisite fee towards condonation.

10.4 A student who gets less than 65% attendance in that semester shall not be permitted to take the end semester examinations. His registration for those courses in that semester will be cancelled. The student shall re register for that semester and repeat those courses of that semester as and when they are offered next.

10.5 The candidate should secure a minimum of 50% aggregate marks in internal examinations conducted for theory and laboratory courses in that semester, to be eligible to write semester end examinations.

10.6 A student, who does not satisfy the attendance and/or internal marks requirement, shall have to repeat that semester.

11. EXAMINATIONS AND SCHEME OF EVALUATION

11.1 INTERNAL EXAMINATIONS:

11.1.1 Theory Courses

Each course is evaluated for 4**0** marks (a+b).

a) Two mid term examinations each for 30 marks will be conducted for 90 minutes duration in every theory course in a semester. The First mid examination will be conducted in Units 1 & 2 of the syllabus, and the second mid examination will be conducted in Units 3 & 4 of the syllabus. The mid examination marks shall be awarded by calculating the average of the marks secured in the two mid term examinations.

There shall be two questions from each unit of syllabus prescribed. Any one question from each unit has to be answered. Each question carries 15 marks.

b) Two home assignments each for 10 marks are to be conducted for each course after completion of First & Third units of Syllabus. The assignment marks shall be awarded by calculating the average of the marks secured in the two Assignments.

Students shall be informed regarding the home assignment and they have to submit the completed assignment within the prescribed period.

NOTE: A student who is absent for any Mid Term Exam or non submission of assignment, for any reason whatsoever, shall be deemed to have scored zero marks in that Exam/ Assignment.

11.1.2 Laboratory Courses:

For Laboratory courses there shall be continuous evaluation during the semester for 25 internal marks. The distribution of internal marks is given below:

Criteria	Marks
Day to Day work	10
Record	05
Internal Examination	10

11.1.3 Term Paper/ Mini Project/ Seminar:

Two internal reviews are to be conducted for Term Paper/ Mini Project/ Seminar. The distribution of internal marks is given below:

Criteria	Marks
Review -1	10
Review -2 & Viva – Voce	15

11.2 SEMESTER END EXAMINATIONS

11.2.1 Theory Courses: 60 marks

- The Semester end examinations shall be conducted for 3 hours duration at the end of the semester. The question paper shall be given in the following pattern:

Each course shall consist of four units of syllabus. There shall be two questions from each unit of syllabus prescribed. Any one question from each unit has to be answered. Each question carries 15 marks.

11.2.2 Laboratory Courses: 50 marks

- 40 marks are allotted for experiments & 10 marks are allotted for viva-voce examination.
- Each Semester-end Laboratory Examination shall be evaluated by an External Examiner along with an Internal Examiner.

11.2.3 Term Paper/ Mini Project/ Seminar:

The distribution of Semester end examination marks are given below.

Criteria	Marks
Report	30
Seminar & Viva – Voce	20

11.2.4 Pedagogy training/ Industrial training:

- Pedagogy training shall be for a period of at least 4 weeks and evaluation shall be totally internal for 75 marks based on the performance during the training.
- Industrial training shall be for a period of at least 4 weeks and a report has to be submitted by the end of the third semester. The assessment shall be carried out for 75 marks during fourth semester by an internal evaluation committee comprising Head of the Department and two faculty of the department including the project supervisor.

11.2.5 MOOCS

- MOOCS Course can be chosen either from the listed electives III or IV as the case may be, or can be chosen by the student from other sources without having a conflict with the already offered courses of the programme.
- The course will be finalized by a committee constituted at the Department level.
- A mentor has to be identified in the department who would monitor the MOOCS course work from time to time and submit interim reports to the HOD duly signed by the mentor and the student.
- The duration of the course must be within 40-60 contact hours.
- Apart from the online certification the student would be evaluated for 40 marks for internals and 60 marks for external examination.
- The MOOCS course has to be completed as per the academic calendar for the concerned semester.

11.2.6 Dissertation:

Dissertation shall be for a period of at least 40 weeks. There shall be two parts for evaluation:

Part-A: A Status report has to be submitted by the end of third semester which shall be evaluated for 50 marks by the Project Review Committee (PRC) based on the presentation made by student on the topic selected, literature survey and the progress of the work.

Part-B: The Project assessment shall be further carried out for 150 marks during fourth semester by an internal & external evaluation committee comprising Head of the Department, Project Supervisor and an External Examiner appointed by the Principal.

EVALUATION OF DISSERTATION WORK:

Every candidate shall be required to submit the dissertation after taking up a topic approved by the PRC.

a) The PRC shall be constituted with the Head of the Department as the Chairman and two senior faculty as Members along with the supervisor to oversee the proceedings of the dissertation work from allotment of topic to submission.

b) Registration of Dissertation Work: A candidate shall register for the Dissertation work in the beginning of the second year. The duration of the Dissertation work is for two semesters.

c) After satisfying point b, a candidate has to submit, in consultation with his supervisor, the title, objective and plan of action of his Dissertation to the PRC for its approval. Only after obtaining the approval of PRC the student can initiate the Dissertation work.

d) If a candidate wishes to change his supervisor or topic of the Dissertation work he can do so with the approval of the PRC. If so, his date of registration for the Dissertation work shall start from the date of change of supervisor or topic as the case may be whichever is earlier.

e) Evaluation of the Dissertation shall be done twice, one at the end of the third Semester and the other during the fourth Semester.

f) The evaluation at the end of third semester shall be carried out by PRC for 50 marks based on the presentation made by student on the topic selected, literature survey and the progress of the work. The student shall be permitted to proceed for the remaining work in fourth semester if he gets at least 25 marks. Otherwise, the student shall reappear before the PRC with improved work within four weeks.

g) The evaluation during fourth semester shall be carried out twice each for 25 marks.

h) Dissertation is said to be completed only if the work done by the student leads to publication in Peer Reviewed international journal, national journal, international conference and national conference (Preferably in IEEE, ASME, Elseiver, Springer etc proceedings) while evaluating the Dissertation.

i) The candidate shall make an oral presentation before the PRC for the approval to submit a draft copy of the Dissertation. A candidate shall be permitted to submit his Dissertation not earlier than 40 weeks from the date of registration of the Dissertation.

j) Three copies of the Dissertation certified by the supervisor shall be submitted to the Institute after approval by the PRC.

k) For the purpose of adjudication of the Dissertation, an external examiner shall be selected by the Principal from a panel of 5 examiners who are experienced in that field and proposed by the Head of the Department in consultation with the supervisor.

l) The final evaluation, i.e., viva-voce examination, for 100 marks, shall be conducted by a board consisting of the supervisor, Head of the Department and the external examiner.

m) A student is deemed to be failed, if he secures less than 50 marks in the external viva-voce examination and/or less than 100 marks from both internal and external viva-voce examination put together and shall be awarded Fail grade (F).

n) If any candidate fails or does not submit his thesis due to ill health or any other reason permitted by the head of the institution, he will be given another chance to attend for the viva-voce examination conducted separately at a later date. The expenditure for conducting the viva-voce is completely borne by the candidate. If the candidate still fails to complete the project he should reregister into the second year and has to repeat the Dissertation.

12. CONDITIONS FOR PASS AND AWARD OF CREDITS FOR A COURSE

12.1 Conditions for Pass and award of Grades & Credits:

a) A candidate shall be declared to have passed in individual theory course if he secures a minimum of 50% aggregate marks (Internal & semester end examination marks put together), subject to a minimum of 40% marks in semester end examination.

b) A candidate shall be declared to have passed in individual laboratory/project course if he/she secures a minimum of 50% aggregate marks (Internal & semester end examination marks put together), subject to a minimum of 50% marks in semester end examination.

c) The student has to pass the failed course by appearing at the supplementary examination as per the requirement for the award of degree.

d) On passing a course of a programme, the student shall earn assigned credits in that Course.

12.2 Method of Awarding Letter Grades and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system shown in Table - 5.

Table - 5: Grading System for M.Tech Programme

Theory/Drawing	Laboratory/Project	Grade Points	Letter Grade
90% - 100%	90% - 100%	10	S
80% - 89%	80% - 89%	9	A+
70% - 79%	70% - 79%	8	A
60% - 69%	60% - 69%	7	B+
*50% - 59%	*50% - 59%	6	B
< 50%	< 50%	0	F (Fail)

* Pass mark

12.3 Calculation of Semester Grade Points Average (SGPA)

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$\textbf{SGPA} = \frac{\sum(CR\ X\ GP)}{\sum \text{CR}}$$

Where CR= Credits of a course

GP = Grade points awarded for a course

12.4 Calculation of Cumulative Grade Point Average (CGPA) and Award of Division for Entire Programme:

The CGPA is calculated as below:

$$\textbf{CGPA} = \frac{\sum(CR\ X\ GP)}{\sum \text{CR}}$$ (for entire programme)

Where CR= Credits of a course
GP = Grade points awarded for a course

12.5 Award of Divisions

Award of divisions is as per the following criteria.

Table 6: Award of Divisions

CGPA	DIVISION
≥ 8.00	First class with distinction
≥ 6.00 - <8.00	First class
≥5.00 - <6.00	Second class
<5.00	Fail

13. SUPPLEMENTARY EXAMINATIONS

Supplementary examinations will be conducted along with regular semester end examinations.

14. READMISSION CRITERIA

A candidate, who is detained in a semester due to lack of attendance/marks/credits, has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling all the required norms stipulated by the Institute in addition to paying an administrative fee of Rs. 1,000/-

15. RE-REGISTRATION

A candidate, who is unable to secure 50% marks in any course due to lack of internal marks, can re-register for that course(s) of that semester along with subsequent batches of admitted students for one attempt. However he should attend the class work and appear for the internal & external examinations of that course(s) of the semester. Attendance in the re-registered courses(s) has to be calculated separately to become eligible to write the end examination in the re-registered course(s). In the event of taking another chance, the internal marks and end examination marks obtained in the previous attempt are nullified. The re-registration courses for a student at a time should not exceed one course during course work semester and two courses during Dissertation period. An administrative fee of Rs. 2000/- per each semester has to be paid.

16. BREAK IN STUDY

Student, who discontinues the studies for reasons what so ever, can get readmitted into appropriate semester of M.Tech programme only with the prior permission of the Principal of the Institute. However the academic regulations under which he was first admitted shall continue to be applicable to him. An administrative fee of Rs. 2000/- per each year of break in study in addition to the prescribed tuition and special fee has to be paid by the candidate to condone his break in study.

17. TRANSITORY REGULATIONS

A Candidate, who is detained or discontinued in the semester, on readmission will have to continue his studies in the same academic regulations under which he was first admitted.

18. ELIGIBILITY FOR AWARD OF M.TECH DEGREE

The M.Tech Degree shall be conferred on a candidate who has satisfied the following requirement.

- A Regular student (two year programme) should register himself for 74 Credits and has to secure all 74 academic credits.

19. CONDUCT AND DISCIPLINE

- Students shall conduct themselves within and outside the premises of the Institute in a manner befitting the ethical code of the Institute.
- As per the order of Honorable Supreme Court of India and AICTE guidelines, ragging in any form is considered a criminal offence and is banned. Ragging within or outside any educational institution is prohibited. Ragging means doing an act, that causes or is likely to cause insult or annoyance or fear of apprehension or threat or intimidation or outrage of modesty or injury to a student. Any form of ragging will be severely dealt with as per AP Prohibition of Ragging Act-1997 section-4.

Table 7: Punishments for Ragging

Nature of ragging	Punishment
Teasing, embarrassing and humiliating	Imprisonment upto 6 months or fine upto Rs.1,000/- or both
Assaulting or using criminal force or criminal intimidation	Imprisonment upto 1 year or fine upto Rs.2,000/- or both
Wrongfully restraining or confining or causing hurt	Imprisonment upto 2 years or fine upto Rs.5,000/- or both
Causing grievous hurt kidnapping or raping or committing unnatural offence	Imprisonment upto 5 years and fine upto Rs.10,000/-
Causing death or abetting suicide	Imprisonment upto 10 years and fine upto Rs.50,000/-

- A student convicted of an offence under this act and punished with imprisonment for a term of more than six months shall not be admitted in any other educational institution.
- Whenever any student complains of ragging to the head or manager of an educational institution, such head or manager should inquire into the complaint and if the complaint in prima-facie found true, should suspend the student or students complained against.
- If the head or manager of an educational institution fails or neglects to take action in the manner specified in the Act, the person shall be deemed to have abetted the offence and shall be punished for the offence.
- If a student commits suicide due to or in consequence of ragging, the person who commits such ragging shall be deemed to have abetted such suicide.

The following acts of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures.

i. Lack of courtesy and decorum; indecent behavior anywhere within or outside the campus.
ii. Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

The following activities are not allowed within the campus:

- Mutilation or unauthorized possession of library books.
- Noisy and unruly behavior, disturbing studies of fellow students.
- Hacking computer systems (such as entering into other person's areas without prior permission, manipulation and/or damage of computer hardware and software or any other cyber crime etc.)

- Use of mobile phones in the campus.
- Plagiarism of any nature.
- Any other act of gross indiscipline as decided by the Institute from time to time.
- Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debarment from an examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.
- For an offence committed in (i) a hostel, (ii) a department or in a class room and (iii) elsewhere, the Chief Warden, the Head of the Department and the Principal, respectively, shall have the authority to reprimand or impose fine.
- Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Principal for taking appropriate action.
- Unauthorized collection of money in any form is strictly prohibited.
- Detained and break-in-study candidates are allowed into the campus for academic purposes only with permission from authorities.
- Misconduct committed by a student outside the Institute campus but having the effect of damaging, undermining & tarnishing the image & reputation of the institution will make the student concerned liable for disciplinary action commensurate with the nature and gravity of such misconduct.
- The disciplinary action committee constituted by the Principal, shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.
- Grievance redressal committee, constituted by the Principal, shall deal with all grievances pertaining to the academic / administrative and disciplinary matters.
- All the students must abide by the code and conduct rules of the Institute.

20. MALPRACTICES

The Principal shall refer the cases of malpractice by students in internal assessment tests and end semester examinations, to a malpractice enquiry committee constituted for the purpose. The committee shall follow the approved scales of punishment.

The committee consists of:

1. Heads of Department (Three)
2. Controller of Examinations
3. Deputy Controller of Examinations

Table 11: Disciplinary action for malpractices/improper conduct in examinations

	Nature of Malpractices/Improper conduct	Punishment
1 (a)	If the candidate possesses or keeps accessible, any paper, note book, programmable calculators, mobile phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in the examination hall but has not made use of (material shall include any marks on the student's body that 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)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through mobile 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 the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the candidate 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 Dissertation. He 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.
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and Dissertation) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all 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	If the candidate smuggles in an answer book or additional sheet or takes out or	Expulsion from the examination hall and cancellation of performance in that subject

	arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	and all the other subjects the candidate has already appeared including practical examinations and Dissertation 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 other examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	If the candidate uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	If the candidate 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 results in damage to or destruction of property in the examination hall or any part of the Institute 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 students of the Institute, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case will be registered against them.
7	If the candidate 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 Dissertation 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 other examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8	If the candidate possesses 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 Dissertation and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the Institute, who is not a candidate for the particular examination or any person not connected with the Institute indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the Institute: 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 Dissertation. He shall not be permitted for the remaining examinations of the subjects of that semester/ year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the Institute: Will be handed over to police and a police case will be registered against them.
10	If the candidate 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 Dissertation. He shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and Dissertation of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11, shall be awarded suitable punishment.	

Note: Special squads may be formed to oversee the proper conduct of examinations.

21. WITHHOLDING OF RESULTS

- If the candidate has not paid any dues to the Institute or if any case of indiscipline is pending against him, the result of the candidate shall be withheld and he will not be allowed into the next higher semester. The recommendation for the issue of the degree shall be liable to be withheld in all such cases.

22. OTHER MATTERS

22.1 The physically challenged students who have availed additional examination time and a scribe during their Intermediate/ EAMCET (AP) examinations will be given similar concessions on production of relevant proof/documents.

22.2 Students who are suffering from contagious diseases are not allowed to appear for internal or end semester examinations.

22.3 The students who have participated in coaching/tournaments held at State/ National/ International levels through University/ Indian Olympic Association during end semester external examination period will be promoted to subsequent semesters till the entire course is completed as per the guidelines of University Grants Commission Letter No. F.1-5/ 88(SPE/PES), dated 18-08-1994.

22.4 The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the Heads of the Departments in an appropriate manner and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the Departments, shall be reported to the Academic Council of the Institute for ratification.

23. GENERAL

- The Academic Council may, from time to time, revise, amend or change the regulations, schemes of examination and/or syllabus and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institute.
- Wherever the words “he”, “him”, “his”, occur in the regulations, they may include “she”, “her”, “hers” also.
- The academic regulations should be read as a whole for the purpose of any interpretation.
- In case of any doubt or ambiguity in the interpretation of above rules, the decision of the principal is final.

24. INSTITUTE RULES AND REGULATIONS

- Use of Mobile phones is strictly prohibited inside the Institute academic area.
- Students should come to Institute in proper dress.
- All students should wear identity cards in the Institute campus.
- Students should be present in their respective classrooms by start time of class sharply.
- Students should not leave the Institute campus without prior permission of their respective Heads during Institute hours.
- Students should maintain silence in the class rooms during working periods.
- Sitting / wandering of the students at the stair cases, corridors, cycle stands or the areas within the Institute premises is strictly prohibited.
- Vehicle horn inside the campus is prohibited.

PROGRAM STRUCTURE
&
DETAILED SYLLABUS

Department of Electronics and communication Engineering
M.Tech Microwave & Communication Engineering
PVP17 - Program structure
First Semester

Code	Course	Contact hours		Marks			Credits
		L	P	Int	Ext	Total	
17ECMC1T1	Detection and estimation theory	4	-	40	60	100	4
17ECMC1T2	Advanced digital communications	4	-	40	60	100	4
17ECMC1T3	Adaptive and smart antennas	4	-	40	60	100	4
17ECMC1T4	Solid state microwave devices	4	-	40	60	100	4
17ECMC1T5	Elective - I	4	-	40	60	100	4
17ECMC1T6	Elective - II	4	-	40	60	100	4
17ECMC1L1	Telecom lab	-	3	25	50	75	2
17ECMC1L2	Term Paper	-	3	25	50	75	2
Total		24	6	290	460	750	28

Second Semester

17ECMC2T1	Computational Electro-magnetics	4	-	40	60	100	4
17ECMC2T2	Signal processing for communications	4	-	40	60	100	4
17ECMC2T3	Microwave Networks	4	-	40	60	100	4
17ECMC2T4	Optical Networks	4	-	40	60	100	4
17ECMC2T5	Elective - III	4	-	40	60	100	4
17ECMC2T6	Elective - IV / MOOCS	4	-	40	60	100	4
17ECMC2L1	Microwave Lab	-	3	25	50	75	2
17ECMC2L2	Mini project	-	3	25	50	75	2
Total		24	6	290	460	750	28

Third Semester

17ECMC3TR	Pedagogy Training/Industrial Training		75	---	75	2
17ECMC3DS-A	Dissertation Part - A		50	---	50	6
	Total		125		125	8

Fourth Semester

Code	Subject		Int	Ext	Total	Credits
17ECMC4DS-B	Dissertation Part – B		50	100	150	10
	Total		50	100	150	10

Elective – I

17ECMC1T5A	Cognitive Radio
17ECMC1T5B	Wireless channel modelling
17ECMC1T5C	Secure Communications
17ECMC1T5D	Multimedia Communications

Elective – II

17ECMC1T6A	EMI/EMC
17ECMC1T6B	Soft computing Techniques
17ECMC1T6C	Microwave integrated circuits
17ECMC1T6D	Microwave and Satellite Communications

Elective – III

17ECMC2T5A	Wireless MIMO Communications
17ECMC2T5B	Coding Theory
17ECMC2T5C	DSP Processors
17ECMC2T5D	Advanced Computer Networks

Elective – IV

17ECMC2T6A	Electromagnetic Meta Materials
17ECMC2T6B	RF IC Design
17ECMC2T6C	Phased Arrays
17ECMC2T6D	Radar Signal Processing

DETECTION AND ESTIMATION THEORY

17ECMC1T1 **Credits: 4**

Lecture: 4periods/week **Internalassessment:40 marks**

Semester end examination: 60 marks

Prerequisites:**Linear Algebra, Random Process**

Course Objectives:

- To Analyse the need for estimation techniques in Communication and Signal Processing To analyseestimation problems and apply suitable estimation and detection techniques.
- To Analyse signal or parameter estimation techniques are preferred and develop estimation techniques that are suitable for the context from a wider perspective
- To Analyse impact of white Gaussian noise on Detection of Signals

Course Outcomes:

At the end of the course Student will be able to

- Implement the estimation techniques in Communication and Signal Processing problems and acquire expertise in Classical and Bayesian estimation techniques for parameters and signals, and Detection of signals in the presence of white Gaussian noise
- Conduct in-depth analysis of estimation problems and apply suitable estimation and detection techniques that meet the constraints of the problem such as performance, bandwidth and power overheads and computational complexity
- Judge the scenarios under which signal or parameter estimation techniques are preferred and develop estimation techniques that are suitable for the context from a wider perspective
- Design and implement the solutions to problems that are critical to humanity

UNIT I

Fundamentals of Estimation Theory: Role of Estimation in Signal Processing, Unbiased Estimation, Minimum variance unbiased(MVU) estimators, Finding MVU Estimators, Cramer-Rao Lower Bound, Linear Modelling-Examples, Sufficient Statistics, Use of Sufficient Statistics to find the MVU Estimator .

UNIT II

Estimation Techniques

Deterministic Parameter Estimation: Least Squares Estimation-Batch Processing, Recursive Least Squares Estimation, Best Linear Unbiased Estimation, Likelihood and Maximum Likelihood Estimation

Random Parameter Estimation: Bayesian Philosophy, Selection of a Prior PDF, Bayesian linear model, Minimum Mean Square Error Estimator, Maximum a Posteriori Estimation

State Estimation: Prediction, Single and Multistage Predictors, Filtering, TheKalman Filter

UNITIII

Fundamentals of Detection Theory :

Hypothesis Testing: Bayes' Detection, MAP Detection, ML Detection, Minimum Probability of Error Criterion, Min-Max Criterion, Neyman-Pearson Criterion, Multiple Hypothesis, Composite Hypothesis Testing: Generalized likelihood ratio test (GLRT), Receiver Operating Characteristic Curves.

UNIT IV

Detection of Signals in White Gaussian Noise (WGN) : Binary Detection of Known Signals in WGN, M-ary Detection of Known Signals in WGN, Matched Filter Approach, Detection of signals with Random Parameters

Learning Resources

Text Book:

1)H. L. Van Trees, "Detection, Estimation and Modulation Theory," Parts 1 and 2, John Wileyand Sons

References:

2) H. V. Poor, "An Introduction to Signal Detection and Estimation", 2nd Edition, Springer-Verlag, 1994.
3. E. L. Lehman, "Testing Statistical Hypothesis," John Wiley, 1986.
4. M. D. Srinath, P. K. Rajasekaran and R. Vishwanathan, "An Introduction to Statistical Signal Processing with Applications," Prentice-Hall, 1996.
5. To Review probability: A. Papoulis, "Probability, random variables, and stochastic processes

ADVANCED DIGITAL COMMUNICATIONS

17ECMC1T2 **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Digital communications

Course Objectives:

- To provide the student with an understanding of modulation and multiple access techniques
- To provide the student with an understanding of Spread Spectrum and spreading sequences
- To provide the student with an understanding of Equalization techniques
- To give the student an understanding of Single and Multiuser detection techniques

Course outcomes:

At the end of the course Student will be able to

- Design different modulation techniques with lower bandwidth
- Analyze different spread spectrum techniques and their performance
- Analyze different equalization techniques and transmits the data
- Able to design optimum filter which use low probability of error

UNIT I

Digital Modulation and Multiple Access Techniques: Digital Modulation Techniques: ASK, FSK, PSK, QPSK, DPSK and QAM Techniques. Multiple Access Techniques: introduction to FDMA, TDMA, CDMA and SDMA Techniques

UNIT II

Spread Spectrum Techniques and Pseudo-Random Code Sequences: Spread Spectrum Techniques: FDMA, TDMA CDMA, Direct-Sequence Spread-Spectrum Systems, Frequency Hopping Systems, and Commercial Applications.

Pseudo-Random Code Sequences: Generation of binary pseudo-random sequences, Maximal-length sequences (m-sequences), preferred pairs of m-sequences, Gold sequences, Kasami sequences, Walsh sequences.

UNIT III

Equalization and Adaptive Equalization Techniques: Equalization Techniques: Linear equalization, Decision – feedback equalization, iterative equalization and decoding- Turbo equalization

Adaptive equalization: Adaptive linear equalizer, adaptive decision feedback equalizer, self recovering (blind) equalization.

UNIT IV

Single user and Multiuser Detection Techniques: Single –user matched filter receiver, optimum receiver structure, sub-optimum linear receiver structures: Decorrelating and MMSE Detectors, sub-optimal nonlinear receiver structures (interference cancellation): successive interference cancellation, parallel interference cancellation.

Learning Resources

Text Books:

1. Simon Haykin "Digital communications" 8th edition Wiley
2. John G.Prokis, "Digital communications" 4th edition, Mc GRAW Hill, 2001
3. Bernard sklar "Digital Communications" Second Edition Communications Engineering Services, Tarzana, and University of California, Los Angeles
4. S.verdu, "multi-user detection" Cambridge university press-1998.

Reference Books:

1. Andrew J.Viterbi, CDMA: "Principles of spread spectrum communications", prenticeHall,USA, 1995
2. Theodore S. Rappaport "wireless communication principles & practice" PHI Pub.

ADAPTIVE & SMART ANTENNAS

17ECMC1T3 **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Antennas & Propagation

Course Objectives:

- To Familiarize with smart and adaptive antennas
- To study about the different adaptive algorithms for the antenna
  - To integrate smart antenna technology with overall communication system design.
  - To analyze the effect of mutual coupling and to study the space time

Course Outcomes:

At the end of the course Student will be able to

- Understand the concepts of smart antenna and adaptive antennas
- Learn different adaptive algorithms for the smart antennas
- Understand the direction of arrival estimation methods to combat fading in mobile communication.
- Learn the time-space processing of the antennas.

UNIT-I

Smart Antennas: Introduction, Need for Smart Antennas, Overview, Smart Antenna Configurations, Space Division Multiple Access (SDMA), Architecture of a Smart Antenna System,Benefits and Drawbacks, BasicPrinciples, Mutual Coupling Effects

DOA Estimation Fundamentals: Introduction, Array Response Vector, Received Signal Model, Subspace-Based Data Model, Signal Autocovariance Matrices, Conventional DOA Estimation Methods, Subspace Approach to DOA Estimation: MUSIC Algorithm, ESPRIT Algorithm.Uniqueness of DOA Estimates.

UNIT-II

Beamforming Fundamentals:Classical Beamformer, Statistically Optimum Beamforming Weight Vectors- Maximum SNR Beamformer, Multiple Sidelobe Canceller and the MaximumSINR Beamformer, Minimum Mean Square Error (MMSE), Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV).Adaptive Algorithms for Beamforming- Least Mean-Square (LMS) Algorithm, Recursive Least-Squares (RLS) Algorithm, Constant-Modulus (CM) Algorithm, Affine-Projection (AP) Algorithm, Quasi-Newton (QN) Algorithm.

UNIT-III

Integration and Simulation of Smart Antennas:Overview, AntennaDesign, MutualCoupling, Adaptive Signal Processing Algorithms, Trellis-Coded Modulation (TCM) for Adaptive Arrays, Smart Antenna Systems for Mobile Ad Hoc NETworks(MANETs).

UNIT-IV

Space–Time Processing: Introduction, Discrete Space–Time Channel and Signal Models, Space–TimeBeamforming, Intersymbol and Co-Channel Suppression, Space–Time Processing for DS-CDMA, Capacity and Data Rates in MIMO Systems.

Learning Resources

Text Books:

1. C. A. Balanis& P. I. Ioannides, "Introduction to smart antennas" Morgan & Claypool Publishers, 2007.

Reference Books:

1. S. Chandran, Adaptive antenna arrays, trends and applications, Springer, 2009.

SOLID STATE MICROWAVE DEVICES

17ECMC1T4 **Credits: 4**
Lecture: 4 periods/week **Internal assessment:40 marks**
Semester end examination: 60 marks

Prerequisites: Microwave Engineering

Course Objectives:

- To understand microwave transistor operations
- To analyze FETs in microwave circuits
- To understand and apply GUNN devices
- To analyze Avalanche Transit-Time Devices

Learning outcomes:

At the end of the course Student will be able to

- Know characteristics of microwave Transistors.
- Apply BJTs and FETs in microwave circuits.
- Use Transferred-Electron Devices for various applications.
- Know the applications of Avalanche Transit-Time Devices

UNIT-I

Microwave Transistors: Introduction, Microwave Transistors- physical structure, Transistor Configurations, principle of operation,V-Icharacteristics, Equivalent circuit, Amplification phenomena, Power- frequency limitations,Hetero-junction Bipolar Transistors (HBTs)-physicalstructure, Operational Mechanism,Applications,MicrowaveTunnel Diode-principle of operation,Microwave characteristics.

UNIT-II

Microwave Field Effect Transistors: Introduction,Junction Field Effect Transistor (JFET)-structure, Principle of operation, V-Icharacteristics, Applications, Metal Semiconductor Field Effect Transistor (MESFET)- structure, principle of operation,Equivalent circuit, Drain current, cut-off frequency and Maximum oscillation frequency, High Electron Mobility Transistor (HEMT)- Structure, operational mechanism, performance characteristics, Applications, MetalOxide Semiconductor Field Effect Transistor (MOSFET)- structure, principle of operation,Equivalent circuit, Drain current and Trans-conductance, Maximum operation frequency, Applications.MOS Transistors and Memory Devices.

UNIT-III

Transferred-Electron Devices: Introduction, Gunn-Effect Diodes- GaAs Diode, Ridley-Watkins-Hilsum Theory, Modes of operation, LSADiodes, InP Diodes, CdTe Diodes, Applications (Microwave Generation and Amplification).

UNIT-IV

Avalanche Transit-Time Devices: Introduction, Read Diode- Structure, Operation, Carrier current and external current, Output power and Quality factor, IMPATT Diode- Structure, Different doping profile structures, Operation, Small-signaltheory , Power output and Efficiency, applications. TRAPATT- Structure, Principle of Operation, Power output and Efficiency, BARITT- Structure, Principle of Operation,Performance and Applications. Parametric Devices - structure, Nonlinear Reactance and Manley –Roew Power Relations, Parametric Amplifiers, and applications.

Learning Resources

Text Books:

1. Samuel Y. Liao, "Microwave Devices and Circuits" , Third Edition, PHI.

References:

1.M.L. Sisodia, Vijay Lakshmi Gupta "Microwaves- Introduction to circuits, Devices and Antennas" New Age International Publishers

COGNITIVE RADIO

17ECMC1T5A **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Course Objectives

- Know the basics of the software defined radio.
- Learn the System – Level Architecture
- Know the basics of Cognitive radio
- Understand the concepts of security, regulations and standardization.

Course Outcomes

At the end of the course Student will be able to

- Describe the basics of the software defined radio.
- Analyze System – Level Architecture.
- Describe the basics of the Cognitive radio
- Deploy the Cognitive Radio Platform and regulations

UNIT I

Software Radio Concepts

Introduction and Overview: The ideal Software Radio, Software Radio Functional Architecture, Basic signal processing streams. Implementation alterations, Acquisition of software radios, Architecture Evolution and Architecture implications.

UNIT II

Systems – Level Architecture Analysis

Diaster – Relief case study, Radio Resource Analysis, Network Architecture Analysis, Analysing the protocol stacks, System level architecture parameters, software Architecture Analysis

UNIT III

Introduction to Cognitive Radio

Software Defined Radio, Cognitive Radio, features and capabilities, Research Challenges in Cognitive Radio |Architecture for next generation networks.

UNIT IV

Cognitive Radio Platforms

Security in Cognitive Radio, Cognitive Radio Platforms Regulations and standardization

Learning Resources

Text Books:

1. Joseph Mitola III, "Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000.
2. JEFFREY H.REED, "Software Radio: A Modern Approach to radio engineering" Reprint by Pearson Education & Inc. 2002.

Reference Books:

1. Essentials of Cognitive Radio – Linda E-Doyle CUP – 2009
2. Principles of Cognitive Radio – Ezio Biglieri, Andrea J. Goldsmith, Larry J. Greenstein, Narayana B. Mandayam and H. Vincent Poor – CUP – 2013
3. Dynamics Spectrum access and Management in Cognitive Radio Networks – Ekram Hossain, Dusit Niyato, Zhu Han, CUP -

WIRELESS CHANNEL MODELLING

17ECMC1T5B **Credits: 4**
Lecture: 4 periods/week **Internal assessment: 40 marks**
Semester end examination: 60 marks

Prerequisites: Digital and Analog Communications, Electromagnetic Theory, Probability & Random Processes.

Course Objectives:

- To understand the fundamentals of free space propagation mechanisms and statistical descriptions
- To study the methods for characterization of wideband wireless channels
- To analyse different models for narrowband and wideband wireless channels
- To learn concepts of channel sounding and antenna aspects in wireless systems

Course Outcomes:

After completion of the course, the student will be able to

- describe the wireless propagation mechanisms
- measure the radio channel properties and evaluate propagation conditions for a certain scenario
- develop a model for a specified wireless channel
- apply the concepts of channel sounding and antenna aspects in designing a wireless communication system

UNIT I

Propagation Mechanisms and Statistical Description of Wireless Channels: Propagation Mechanisms - Free space propagation, reflection and transmission, diffraction, scattering on rough surfaces, wave guiding

Statistical Description of Wireless Channels - The time-invariant two-path model, time-variant two-path model, small-scale fading without line-of-sight, small-scale fading with line-of-sight, Doppler spectra, level crossing rate and random FM, large-scale fading

UNIT II

Wideband Channel Characterizations: Narrowband vs. wideband systems, system-theoretic description of propagation channels, the WSSUS model, description methods for time dispersion, description methods for angular dispersion

UNIT III

Channel Models:Narrowband models, wideband models, spatial models, deterministic models, models for ultra wideband channels

UNIT IV

Channel Sounding and Antenna aspects in wireless systems: Channel Sounding - Time-domain methods, frequency-domain methods, generalizations, spatially resolved methods

Antenna aspects in wireless systems - Requirements for antennas in mobile radio, antennas for mobile stations, antennas for base stations, aspects of multiple antenna systems.

Learning Resources

Textbook

1. Andreas Molisch, Wireless communications, 2nd Ed, Wiley-IEEE Press, 2009.

References

1. T. S. Rappaport , Wireless Communications - Principles and Practice, 2nd Ed. Prentice Hall, 2001.
2. D. Tse and P. Viswanath, Fundamentals of Wireless Communication, Cambridge Univ. Press, 2005.
3. A. Paulraj, R. Nabar, and D. Gore, Introduction to Space-Time Wireless Communications, Cambridge University Press, 2003.
4. J.G. Proakis and Salehi, Digital Communications, 5th Ed., McGraw-Hill, 2008.

Web Resource

1. http://www.wiley.com/legacy/wileychi/molisch/secondedition.html

SECURE COMMUNICATIONS

17ECMC1T5C **Credits: 4**
Lecture: 4 periods/week **Internal assessment: 40 marks**
Semester end examination: 60 marks

Prerequisites: Digital Communications, Wireless Communications.

Course Objectives:

Upon completion of this course, students will be able to:

- Conceptualize the necessity of Security.
- Will understand the process involved in data modelling.
- Will be able to analyze and handle security risks.
- Will be able to understand latest technologies on security.

Course Outcomes:

At the end of the course Student will be able to

- Conceptualize the necessity of Security.
- Will understand the process involved in data modelling.
- Will be able to analyze and handle security risks.
- Will be able to understand latest technologies on security.

UNIT-I

Security concepts: Introduction to the Concept of Security, threats, security services, security mechanisms.Basic encryption techniques, Concept of cryptanalysis, Shannon's theory , Perfect secrecy, Block ciphers, Cryptographic algorithms, Features of Data Encryption Standard, Linear and Differential Cryptanalysis, Advanced Encryption Standard, Stream ciphers, Pseudo random sequence generators.

UNIT-II

Database Security: Security policies, Policy enforcement & related issues, Design principles, Multilevel relational data models, Security impact on database function, inference problem Public Key Infrastructure (PKI), Internet Security Protocols, Network Security.

UNIT-III

Software Security: Defining a discipline, A Risk Management Framework, Code review with a tools, Architectural risk analysis, Software penetrating testing, Risk Based security Testing, An Enterprise S/W security program, Security knowledge.

UNIT-IV

Intrusion detection: Defining Intrusion Detection, Security concepts intrusion Detection concept, determining strategies for Intrusion Detection, Responses, Technical issues.

Biometric Security: Biometric Fundamentals, Types of Biometrics, Fingerprints and Hand Geometry, Facial and Voice Recognition, Iris and Retina scanning, Signature Recognition and Keystroke Dynamics, Behavioural and Esoteric Biometric Technologies, Issues Involving Biometrics, Privacy.

Learning Resources

Text Books:

1.William Stallings, " Cryptography and Network Security", 4 th edition, Pearson Education, 2006

References:

1. Douglas A. Stinson, "Cryptography, Theory and Practice", 2nd edition, Chapman & Hall, CRC Press Company, Washington.

2. Wade Trappe, Lawrence C. Washington, " Introduction to Cryptography with Coding Theory" Second edition – Pearson Education, 2006

3." Biometric Security and Privacy: Opportunities & Challenges in The Big Data Era ", by Richard Jiang, Somaya Al-Madeed, Ahmed Bouridane, Danny Crookes, AzeddineBeghdadi, Springer 2017.

MULTIMEDIA COMMUNICATIONS

17ECMC1T5D **Credits: 4**
Lecture: 4 periods/week **Internal Assessment: 40 Marks**
Semester End Examination: 60 Marks

Pre-requisites: Concepts of Signal and image processing, Computer Networks, Data Communications

Course objectives

- Analyzing the fundamental concepts of Multimedia
- Understanding the multimedia communication standards and compression techniques.
- Understand the Internet protocols.
- Understand the Multimedia communication across the networks.

Learning Outcomes
At the end of the course the will be able to

- Analyze the concepts of Multimedia
- Implement the standards and compression techniques utilized in Multimedia
- Analyze the internet protocols
- Analyze the Multimedia communication across the networks

UNIT-I
Introduction: Multimedia information representation, multimedia networks, multimedia applications, Application and network terminology
Multimedia Information Representation- Introduction Text, images, Audio, Video

UNIT-II
Text and Image Compression: Introduction, Compression principles, Text Compression, Image Compression
Audio and Video Compression: Introduction, Audio Compression, Video Compression

UNIT-III
Multimedia enterprise networks: Introduction, LANs, Ethernet, Token ring, Bridges, FDDI, High-Speed LANs
The Internet: Introduction, IP datagrams, Fragmentation and Reassembly, IP addresses, ARP and RARP, Routing Algorithms, QOS Support, IPV6

UNIT-IV

Broadband ATM Networks: Introduction, Cell format and switching Principles, switching Architectures, Protocol architecture, ATM LANs, ATM MANs, Wide area ATM Networks.

Transport Protocols: Introduction, TCP/IP protocol suite, TCP, UDP, RTP and RTCP

Learning Resources

Text Book(s)

1. Fred Halsall, "Multimedia Communications: Applications, Networks,Protocols and Standards", Pearson Education, Asia, Seventh Indian Reprint, 2005

References

1. K .R. Rao, Zaron S. Bojkovic, Dragorad A. Milocanovic, Multimedia Communication Systems, Prentice Hall India, 2002. ISBN: 81-203-2145-6
2. Nalin K Sharda "Multimedia Information Networking", PHI,2003
3. Ralf Steinmetz, Klara Narstedt, " Multi Media Fundumantals: Vol.I –Media coding and Content Processing" , Pearson Education, 2004.
4. Prabhat K. Andleigh, Kiran Thakur," Multimedia Systems Design", PHI, 2004.

EMI/EMC

ECMC1T6A **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Basic knowledge of electronic components, circuits, electromagnetic fields and systems.

Course Objectives:

- To understand EMI problems in subsystem and system level design.
- To measure the emission. immunity level from different systems to couple with the prescribed EMC standards
- To introduce the concepts of electromagnetic interference and electromagnetic compatibility
- It presents different kinds of electromagnetic interference coupling principles.
- To study the electromagnetic interference control techniques
- To discuss electromagnetic interference measurements and standards

The goal of this course is to provide specialist level expertise on electromagnetic compatibility, leading to full understanding of the aspects related to generating mechanisms of electromagnetic interferences and to their propagation.

On successful completion of this module, the student should be able to evaluate EMC problems in electrical, electronic devices and equipments, according to their technical characteristics and functionalities, and to provide solutions.

Course Outcomes:

At the end of the course Student will be able to

1. Find solution to EMI Sources, EMI problems in PCB level / Subsystem and system level design.
2. To measure emission immunity level from different systems to couple with the prescribed EMC standards

UNIT-I

BASIC THEORY: Introduction to EMI and EMC, Intra and inter system EMI, Elements of Interference, Sources and Victims of EMI, Conducted and Radiated EMI emission and susceptibility, Case Histories, Radiation hazards to humans, Various issues of EMC, EMC Testing categories, EMC Engineering Application.

UNIT-II

COUPLING MECHANISM: Electromagnetic field sources and Coupling paths, Coupling via the supply network, Common mode coupling, Differential mode coupling, Impedance coupling,

Inductive and Capacitive coupling, Radiative coupling, Ground loop coupling, Cable related emissions and coupling, Transient sources, Automotive transients.

UNIT-III :

EMI MITIGATION TECHNIQUES: Working principle of Shielding and Murphy's Law, LF Magnetic shielding, Apertures and shielding effectiveness, Choice of Materials for H, E, and free space fields, Gasketting and sealing, PCB Level shielding, Principle of Grounding, Isolated grounds, Grounding strategies for Large systems, Grounding for mixed signal systems, Filter types and operation, Surge protection devices, Transient protection.

UNIT-IV:

STANDARDS AND REGULATION: Need for Standards, Generic/General Standards for Residential and Industrial environment, Basic Standards, Product Standards, National and International EMI Standardizing Organizations; IEC, ANSI, FCC, AS/NZS, CISPR, BSI, CENELEC, ACEC. Electro Magnetic Emission and susceptibility standards and specifications, MIL461E Standards.

EMI Test Methods and Instrumentation

Fundamental considerations, EMI Shielding effectiveness tests, Open field test, TEM cell for immunity test, Shielded chamber, Shielded anechoic chamber, EMI test receivers, Spectrum analyser, EMI test wave simulators, EMI coupling networks, Line impedance stabilization networks, Feed through capacitors, Antennas, Current probes, MIL -STD test methods, Civilian STD test methods.

Learning Resources

Text Book

1. Clayton Paul, "Introduction to Electromagnetic Compatibility", Wiley Interscience, 2006

References

1. V Prasad Kodali, "Engineering Electromagnetic Compatibility", IEEE Press, Newyork, 2001.

2. Henry W. Ott, "Electromagnetic Compatibility Engineering", John Wiley & Sons Inc, Newyork, 2009

3. Daryl Gerke and William Kimmel, "EDN"s Designer"s Guide to Electromagnetic Compatibility", Elsevier Science & Technology Books, 2002

4. W Scott Bennett, "Control and Measurement of Unintentional Electromagnetic Radiation", John Wiley & Sons Inc., (Wiley Interscience Series) 1997.

5. Dr Kenneth L Kaiser, "The Electromagnetic Compatibility Handbook", CRC Press 2005,

SOFT COMPUTING TECHNIQUES

17ECMC1T6B **Credits: 4**
Lecture: 4 periods/week **Internal assessment: 40 marks**
Semester end examination: 60 marks

Course Objectives:

- To Introduce the Ideas of Neural networks
- To Expose to Fuzzy Logic
- To Learn Genetic Programming
- To Familiarize with Soft computing Concepts

Learning Outcomes:

At the end of the course Student will be able to

- Apply various soft computing frame works.
- Design of various neural networks.
- Use fuzzy logic.
- Apply genetic programming.

UNIT-I

Artificial Neural Network-I: Introduction – Fundamental concept – Evolution of Neural Networks – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network. Supervised Learning Network: Perceptron Networks – Adaline – Multiple Adaptive Linear Neurons – Back-Propagation Network – Radial Basis Function Network.

UNIT-II

Artificial Neural Network-II: Associative Memory Networks: Training Algorithms for Pattern Association – Auto associative Memory Network – Hetero associative Memory Network – Bidirectional Associative Memory – Hopfield Networks – Iterative Auto associative Memory Networks – Temporal Associative Memory Network. Unsupervised Learning Networks: Fixed weight Competitive Nets – Kohonen Self-Organizing Feature Maps – Learning Vector Quantization – Counter propagation Networks – Adaptive Resonance Theory Networks – Special Networks.

UNIT-III

Fuzzy Set Theory: Introduction to Classical Sets and Fuzzy sets – Classical Relations and Fuzzy Relations – Tolerance and Equivalence Relations – Noninteractive Fuzzy sets – Membership Functions: Fuzzification – Methods of Membership Value Assignments – Defuzzification – Lambda-Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods.

UNIT-IV

Genetic Algorithm: Introduction – Basic Operators and Terminologies in GAs – Traditional Algorithm vs. Genetic Algorithm – Simple GA – General Genetic Algorithm – The Scheme Theorem – Classification of Genetic Algorithm – Holland Classifier Systems – Genetic Programming. Applications

of Soft Computing: A Fusion Approach of Multispectral Images with SAR Image for Flood Area Analysis – Optimization of Travelling Salesman Problem using Genetic Algorithm Approach – Genetic Algorithm based Internet Search Technique – Soft Computing based Hybrid Fuzzy Controllers – Soft Computing based Rocket Engine – Control.

Learning Resources

Text Book:

1. S.N. Sivanandan and S.N. Deepa, Principles of Soft Computing, Wiley India, 2007. ISBN: 10: 81-265-1075-7.

Reference Books:

1. S. Rajasekaran and G.A.V.Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI, 2003.

2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, 1997.

3. J.S.R.Jang, C.T.Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing, PHI, 2004, Pearson Education.

MICROWAVE INTEGRATED CIRCUITS

17ECMC1T6C **Credits: 4**
Lecture: 4 periods/week **Internal assessment: 40 marks**
Semester end examination: 60 marks

Prerequisites: **Computer Networks**.

Course Objectives:

- To understand the basic concepts of microstrip lines
- To gain knowledge on various microstrip passive components.
- To be familiar with design concepts of microwave amplifier.
- To provide an insight on the design of microwave oscillators.

Course Outcomes:

At the end of the course Student will be able to

- Analyze various characteristics of microstrip lines.
- Learn the circuit models of various microstrip passive components.
- Design microwave amplifiers for the required specifications.
- Study and analyzing microwave oscillators.

UNIT-I

Introduction of Strip Lines: Review of development and application of the modem transmission line structure as interconnect and as a medium for realization of components for the MIC and MMIC: quasi – static and frequency dependent medium closed form models of microstrip line for effective relative permittivity, capacitance ,characteristic impedance analysis and dielectric and conductor losses: Effect of conductor thickness, top shield and side walls on the propagation characteristics of a microstrip line.

UNIT-II

Microstrip Passive Components: Circuit models of discontinuities in microstrip lines and the coplanar waveguide,open ended, short ,gaps, step, bent, T- junction, Hybrid line coupler, parallel coupled line and directional couplers, filters.

UNIT-III

Microwave Amplifier Design: Microwave transistors, Stability considerations, Power-gain definitions, Simultaneous conjugate matching, Consideration for unilateral design.

UNIT-IV

Microwave Oscillator Design: Negative Resistance Oscillators, Transistor Oscillators .

Learning Resources

Text Book:

1. Bharathi Bhat &Shiban K.Koul,"Stripline – like Transmission Lines for Microwave Integrated Circuits," John Wiley.

References:

1. E.H Fooks& R.A. Zakarevicuis," Microwave Engineering using Microstrip Circuits." Prentice Hall. T.C.Edwards ,"Foundation for Microstrip Circuit Design ," Jone Willy & sons.
2. M.Samuel,Y.Lieo," Microwave Circuit Analysis and AmpliferDseign ," Prentic Hall .

MICROWAVE AND SATELLITE COMMUNICATIONS

17ECMC1T6D **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**
Semester end examination: 60 marks

Prerequisites: Microwave Engineering, Satellite Communication Systems.

Course Objectives:

- Understand the principles and operation of various subsystems of microwave communication systems
- Will be able to identify earth station configuration and address performance requirements.
- Conceptualize various satellite network architectures that are in use.
- Understand the usage of launch vehicles & their operations.

Course Outcomes:

At the end of the course Student will be able to

- Demonstrate the operation of various subsystems of microwave communication systems
- Configure and manage performance requirements
- Describe the satellite network architectures
- Suggestsuitable launch vehicles depending on the requirements

UNIT-I

Microwave Link Engineering: Propagation on earth satellite link-basic microwave propagation, isotropic radiator, directional properties of antennas, propagation (linear & circular), propagation losses, microwave transmitters, receivers, overall link quality.

UNIT-II

Earth Station and Network Technology: Basic earth station configurations, performance requirements, radio frequency equipment, intermediate frequency and baseband equipment, earth station facility design, major classes of earth stations.

UNIT-III

Satellite Network Architectures: General features of satellite networks, point-to-point networks, VSAT networks, Satellite Operations and Control – satellite control system, intercommunication networks, network operations.

UNIT-IV

Launch Vehicles and Services: Non-Geo missions, geostationary transfer orbit, drift orbit, deployment and in-orbit testing, launch technology and systems, typical launch vehicles, launch interfaces, Risk management in launch & operation.

Learning Resources

Text Books:

1. Bruce R Elbert, "Introduction to Satellite communication" 3rd edition,Artech House, 2008

Reference Books:

1. Gerard_Maral, Michel_Bousquet, Zhili_Sun,"Satellite Communications Systems: Systems, Techniques and Technology", 5th edition, Wiley, 2009.

TELECOM LAB

17ECMC1L1 **Credits: 2**
Lecture: --- **Internal assessment: 25 marks**
Lab: 3 periods/week **Semester end examination: 50 marks**

Course Objectives:

- To Study various pass band modulation and demodulation techniques
- To Understand depth analysis of Spread Spectrum modulation Techniques
- To implement different Source Coding and Channel Coding Techniques.

Learning Outcomes:

At the end of the course Student will be able to

- Design and implement different modulation Techniques
- Design different Source Coding algorithms for data compression
- Analyze and Implement different error control coding techniques.

List of Experiments

1. Phase shift keying modulation & Demodulation using MATLAB./LABVIEW
2. Differential phase shift keying modulation & Demodulation using MATLAB./LABVIEW
3. Frequency shift keying modulation & Demodulation using MATLAB./LABVIEW
4. QAM modulation and demodulation using MATLAB./LABVIEW
5. Direct sequence spread spectrum using MATLAB./LABVIEW
6. Frequency Hopping Spread Spectrum using MATLAB/LABVIEW
7. Implementation of Shannon Fano coding using MATLAB./LABVIEW
8. Implementation of Huffman coding algorithm using MATLAB./LABVIEW
9. Implementation of cyclic code encoder using MATLAB./LABVIEW.
10. Implementation of Syndrome Calculator using MATLAB/LABVIEW
11. Implementation of Convolutional Encoder using MATLAB./LABVIEW
12. Implementation Turbo encoder using MATLAB/LABVIEW

TERM PAPER

17ECMC1L2 **Credits: 2**
Lecture: --- **Internal assessment: 25 marks**
Lab: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- The student is introduced to the concept of validating a simple idea through model
- preparation / Software package or solving a simple Industrial/ Theoretical problem.
- To develop problem solving, analysis, synthesis and evaluation skills.
- To encourage teamwork and improve students presentation and communication skills.

COURSE OUTCOMES:

After completion of the course, student should be able to

- Formulate a real world problem and identify its requirements
- Express technical ideas, strategies and methodologies in oral and document form.
- Self learn new software tools, methodologies and/or experimental techniques that contribute to the solution of the project.

COMPUTATIONAL ELECTROMAGNETICS

17ECMC2T1 **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Time-Harmonic Electromagnetic Fields

Course Objectives

- To illustrate the concepts electromagnetic and related theorems
- To analyze different problems in electro magnetics
- To illustrate the most common numerical techniques adopted for the electro magnetics modeling of microwave and millimeter-wave circuits and antennas.
- To analyze which method is appropriate for a given problem

Learning Outcomes

At the end of the course Student will be able to

- Understand the concepts of time varying electromagnetic fields
- Understand why numerical methods are needed to solve realistic or practical problems in electromagnetic
- select the most appropriate numerical technique to solve a specific electromagnetic problem
- Apply the efficient numerical method for realistic problems in electromagnetics

UNIT-I

Fundamental concepts: Introduction,Review of Electromagnetic Theory -Electrostatic Fields ,Magnetostatic Fields ,Time-varying Fields,Boundary Conditions,Wave Equations,Time-varying Potentials,Time-harmonic Fields, Classification of EM Problems -Classification of Solution Regions,Classification of Differential Equations, Classification of Boundary Conditions,Some Important Theorems -Superposition Principle,Uniqueness Theorem

UNIT-II

Finite Difference Methods: Introduction, Finite Difference Schemes,Finite Differencing of Parabolic PDEs,Finite Differencing of Hyperbolic PDEs,Finite Differencing of Elliptic PDEs - Band Matrix Method,Iterative Methods,Accuracy and Stability of FD Solutions, Guided Structures -Transmission Lines,Waveguides, Wave Scattering (FDTD) -Yee's Finite Difference Algorithm, Accuracy and Stability,Lattice Truncation Conditions,Initial Fields, Absorbing Boundary Conditions for FDTD,Finite Differencing for Nonrectangular Systems,Cylindrical Coordinates,Spherical Coordinates,Numerical Integration -Euler's Rule,Trapezoidal Rule, Simpson's Rule,Newton-Cotes Rules,Gaussian Rules,Multiple Integration

UNIT-III

Moment Methods: Introduction,Integral Equations - Classification of Integral Equations, Connection Between Differential and Integral Equations, Green's Functions - For Free Space, For Domain with Conducting Boundaries Quasi-Static Problems,Scattering Problems - Scattering by Conducting Cylinder,Scattering by an Arbitrary Array of Parallel Wires, Radiation Problems -Hallen's Integral Equation,Pocklington's Integral Equation,Expansion and Weighting Functions, EM Absorption in the Human Body -Derivation of Integral Equations,Transformation to Matrix Equation (Discretization),Evaluation of Matrix Elements, Solution of the Matrix Equation

UNIT-IV

Finite Element Method: Introduction,Solution of Laplace's Equation -Finite Element Discretization,Element Governing Equations,Assembling of All Elements,Solving the Resulting Equations,Solution of Poisson's Equation-Deriving Element-governing Equations,Solving the Resulting Equations ,Solution of the Wave Equation,Automatic Mesh Generation I — Rectangular Domains ,Automatic Mesh Generation II — Arbitrary Domains -Definition of Blocks,Subdivision of Each Block,Connection of Individual Blocks, Bandwidth Reduction,Higher Order Elements -Pascal Triangle,Local Coordinates,Shape Functions, Fundamental Matrices

Learning Resources

Textbooks:

1. Numerical Techniques in Electromagnetics, 2nd Edition, Matthew Sadiku, CRC Press 2001.
2. Computational Methods for Electromagnetics, By A. F. Peterson, S. L. Ray, and R. Mittra, IEEE Press

Reference Books:

1. Computational Methods for Electromagnetics and Microwaves, By R.C Booton, Jr, , John Wiley &Sons
2. The Finite Element Method in Electromagnetics, By J. M. Jin, John Wiley & Sons
3. The finite difference time domain method for electromagnetis, By K. S. Kunz & R. J. Luebbers, CRC Press
4. Field Computation by Moment Methods, By R. F. Harrington, Macmillan

SIGNAL PROCESSING FOR COMMUNICATIONS

17ECMC2T2 **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Digital Signal Processing, Communications.

Course Objectives:

- To explore the concept of space (Vector and Hilbert) and fourier analysis.
- To design FIR and IIR filters.
- To explore the concepts of Stochastic and Multiratesignal processing.
- To design communication system.

Learning Outcomes:

At the end of the course Student will be able to

- DescribeVector and Hilbertspaces.
- Design various digital filters.
- Discuss about Stochastic and Multirate processing.
- Design communication system.

UNIT-I

Signals and Hilbert Spaces: Euclidean Geometry: a Review, From Vector Spaces to Hilbert Spaces, Subspaces, Bases, Projections, Signal Spaces.

Fourier Analysis: Preliminaries, DFT (Discrete Fourier Transform), DFS (Discrete Fourier Series), DTFT (Discrete-Time Fourier Transform), Relationships between Transforms Fourier Transform Properties, Fourier Analysis in Practice, Time-Frequency Analysis, Digital Frequency vs. Real Frequency

UNIT-II

Discrete-Time Filters: Linear Time-Invariant Systems, Filtering in the Time Domain, Filtering by Example – Time Domain, Filtering in the Frequency Domain, Filtering by Example – Frequency Domain, Ideal Filters.

Filter Design: Design Fundamentals, FIR Filter Design, IIR Filter Design, Filter Structures, Filtering and Signal Classes.

UNIT-III

Stochastic Signal Processing: Random Variables, Random Vectors, Random Processes, Spectral Representation of Stationary Random Processes, Stochastic Signal Processing.

Multirate Signal Processing: Downsampling, Upsampling, Rational Sampling Rate Changes, Oversampling.

UNIT-IV

Design of a Digital Communication System: Communication Channel, Modem Design: Transmitter, Modem Design: Receiver, Adaptive Synchronization.

Learning Resources

Textbooks:

1. Signal Processing For Communications: Pzdesign communication system. Paolo Prandoni and Martin Vetterli, EPFL Press.

MICROWAVE NETWORKS

17ECMC2T3 **Credits: 4**
Lecture: 4 periods/week **Internal assessment:40 marks**
Semester end examination: 60 marks

-------**Prerequisites**:Transmission lines &Wave guides, Microwave Engineering

Course Objectives:

- Understand the concepts of microwave networks.
- Design various impedance matching networks.
- Analyze Excitation techniques of waveguides, and cavities.
- Design of various Microwave filters.

Course Outcomes:

At the end of the course Student will be able to

- Apply different two port network parameters to microwave networks
- Analyzeimpedance matching networks using S matrix
- Apply various Excitation techniques to waveguides, and cavities.
- Design various microwave filters

UNIT I

Introduction to Circuit Concepts: The Network concept, One-port network, Two-port network, Impedance and Equivalent voltagesand currents, Impedance and Admittance Matrices, The Transmission (ABCD) Matrix-relation toImpedance Matrix, Equivalent circuits for two port networks, Parameter conversion,Signal flow graphs.

UNIT II

Scattering Matrix and Matching Networks: Formulation for N-port network, S-Matrix for Reciprocal and Lossless junctions, shift inReference plane, Generalized S-Matrix, conversion of S-parameters to other network parameters,S-Matrix for common systems-Transmission Line, Transition between a co-axial line andWaveguide.Matching Networks:Matching with Lumped elements (L Networks), The Quarter waveTransformer, Single-stub tuning, Double-stub tuning.

UNIT III

Excitation of Waveguides &Cavities: Waveguide Feeds,Excitation of waveguides-Electric and Magnetic current, Aperture coupling. Basics of Rectangular and Cylindrical cavities. Equivalent circuits for cavities-Aperture coupled cavity,Loop coupled cavity. Field expansion in a general cavity, Excitation of cavities.

UNIT IV

Filters: Introduction, Filter Design- Image parameter and Insertion Loss methods. Filter Transformations, Filter Implementation (Richard's Transformation and Kuroda's Identities), Stepped-Impedance Low pass filters and Coupled line Filters.

Learning Resources

Text Books

1. "Foundations for Microwave Engineering", 2nd Edition, Robert E. Collin, Tata McGraw Hill.
2. "Microwave Engineering", 2nd Edition, David M. Pozar, Wiley student Edition.

References

1. "Microwave Circuits", Jerome L. Altman, The Von Nostrad Series.

Student will be able to

OPTICAL NETWORKS

17ECMC2T4 **Credits:4**
Lecture:3 Periods/week **Internal assessment: 40marks**
Semester end examination: 60marks

Prerequisites: Optical communications,computer networks.

Course Objectives:

- To Analyse layers of different optical networks
- To understand the design and construct WDM network elements
- To study the controls and management functions of networks
- To Understand the survivability of Optical Networks

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

- Understand layers of optical networks.
- Design and construct WDM network elements.
- Access and manage optical networks.
- To analyse the protection schemes of optical networks.

UNIT I
Client Layers of Optical Networks: SONET / SDH – Multiplexing, Frame Structure, Physical Layer, Infrastructure, ATM – Functions, Adaptation layers, QoS, Flow Control Signalling and Routing, IP –Routing, QoS, MPLS, Storage Area Networks – ESCON, Fiber Channel, HIPPI, Gigabit Ethernet.

UNIT II
WDM network Elements and Design: Optical Line Terminals and Amplifiers, Add/Drop Multiplexers, Optical Cross Connects, Cost trade-offs in Network Design, LTD and RWA Problems, Dimensioning – Wavelength Routing Networks.

UNIT III
Network Control and Management: Network Management Functions, Optical Layer Services andInterfacing, Layers within Optical Layer, Multivendor Interoperability, Performance and FaultManagement, Configuration Management, Optical Safety.

UNIT IV
Network Survivability: Basic Concepts of Survivability, Protection in SONET/SDH Links and Rings,Protection in IP Networks, Optical Layer Protection – Service Classes, Protection Schemes,Interworking between Layers. Network Architecture, Enhanced HFC, FTTC.

Learning Resources

Text Books:

1. Optical Networks: A Practical Perspective - Rajiv Rama swami and Kumar N. Sivarajan, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier).
2. WDM Optical Networks: Concepts, Design and Algorithms – C. Siva Rama Murthy and Mohan Guruswamy 2nd Ed., 2003, PEI.

Reference Books:

1. Optical Fiber Communications: Principles and Practice – John.M.Senior, 2nd Ed., 2000, PE.
2. Fiber Optics Communication – Harold Kolimbris, 2nd Ed., 2004, PEI.
3. Optical Fiber Communications – GovindAgarwal, 2nd Ed., 2004, TMH.

4. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.

WIRELESS MIMO COMMUNICATIONS

17ECMC2T5A **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Signals & Systems, Digital Signal Processing**,** Digital Communications

Course Objectives:

- To understandthe basic concept of fading channels, their Probability of Error/Outage Probability and Different Diversity Technique.
- To impart the knowledge about MIMO Channel Modeling, Capacity and Orthogonal Space Time Block Coding.
- To design basic MIMO communication systems, Space-time block codes, Space-time trellis codes, MIMO systems for frequency-selective (FS) fading channels, Turbo codes and iterative decoding for MIMO systems.
- To understand comprehensive coverage of coding techniques for multiple-input, multiple-output (MIMO) communication systems.

Learning Outcomes:

At the end of the course Student will be able to

- Understand the fading channels and calculate Error Probability and Outage Probability.
- Model a MIMO Channel and find its capacity.
- Articulate basic equalization schemes commonly used in wireless system.
- Analyze multiple antenna systems and techniques such as space time codes and singular value decomposition

UNIT I

Fading channels and diversity techniques: Wireless channels – Error/Outage probability over fading channels – Diversity techniques – Channel coding as a means of time diversity – Multiple antennas in wireless communications.

UNIT II

Capacity And Information Rates Of MIMO Channels: Capacity and Information rates of noisy, AWGN and fading channels – Capacity of MIMO channels – Capacity of non-coherent MIMO channels – Constrained signaling for MIMO communications.

UNIT III

Space-Time Block and Trellis Codes: Transmit diversity with two antennas: The Alamouti scheme – Orthogonal and Quasi-orthogonal space-time block codes – Linear dispersion codes – Generic space-time trellis codes – Basic space- time code design principles – Representation

of space-time trellis codes for PSK constellation – Performance analysis for space-time trellis codes – Comparison of space-time block and trellis codes.

UNIT IV

Concatenated Codes, Iterative Decoding: Development of concatenated codes – Concatenated codes for AWGN and MIMO channels – Turbo coded modulation for MIMO channels – Concatenated space-time block coding.

Learning Resources

TextBooks

1.Tolga M. Duman and Ali Ghrayeb, "Coding for MIMO Communication systems", John Wiley & Sons, West Sussex, England, 2007.
2.A.B. Gershman and N.D. Sidiropoulus, "Space-time processing for MIMO communications",Wiley, Hoboken, NJ, USA, 2005.

References

1.E.G. Larsson and P. Stoica, "Space-time block coding for Wireless communications", Cambridge University Press, 2003.
2.M. Janakiraman, "Space-time codes and MIMO systems", Artech House, 2004.
3.H. Jafarkhani, "Space-time coding: Theory & Practice", Cambridge University Press, 2005.

CODING THEORY

17ECMC2T5B **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Digital Communications

Course Objectives

- To Analyse linear block codes and Cyclic codes and investigate the relationship between minimum distance and error correction/detection capabilities
- To Design efficient decoding Algorithms for BCH and Reed-solomon codes
- To Analyse structural properties of Convolutional codes with appropriate graphical representations.
- To study, encoding and decoding concepts of Turbo codes & LDPC codes in noisy channel environment.

Course Outcomes

At the end of the course Student will be able to

- Implement Encoder and Syndrome calculator with appropriate digital logic.
- Design powerful Error correcting Algorithms for correcting more than one error.
- Develop efficient decoding Algorithms with lesser number of computations.
- Explore efficient design methods and the powerful soft iterative decoding techniques for high capacity codes like LDPC codes and Turbo codes.

UNIT-I

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, The Minimum Distance of a Block Code, Error-Detecting and Error-Correcting Capabilities of a Block Code, Standard Array and Syndrome Decoding.

Cyclic Codes: Description of Cyclic Codes, Generator and Parity-Check Matrices of Cyclic Codes, Encoding of Cyclic Codes, Syndrome Computation and Error Detection, Decoding of Cyclic Codes.

UNIT-II

Binary BCH Codes: Binary Primitive BCH Codes, Decoding of BCH Codes, Iterative Algorithm for Finding the Error-Location Polynomial.
Reed-Solomon Codes, Decoding of Non binary BCH and RS Codes. The Berlekamp Algorithm.

UNIT-III

Convolutional Codes: Encoding of Convolutional Codes, Structural Properties of Convolutional Codes, Distance Properties of Convolutional Codes, The Viterbi Algorithm, The Soft-Output Viterbi Algorithm (SOVA), The BCJR Algorithm

UNIT-IV:

Turbo Coding: Introduction to Turbo Coding, Distance Properties of Turbo Codes, Performance Analysis of Turbo Codes, Design of Turbo Codes, Iterative Decoding of Turbo Codes.

Low Density Parity Check Codes: Introduction to LDPC Codes, Tanner Graphs for Linear Block Codes, A Geometric Construction of LDPC Codes.

Learning Resources

Text Books:

1. Error Control Coding by Shu Lin, Daniel J.Costello Jr., Second Edition.

DSP PROCESSORS

17ECMC2T5C **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Signals & Systems,Digital Signal Processing

Course Objectives:

- To understand the key principles underpinning DSP through design examples.
- To understand the architecture of a digital signal processor and some programming issues in real-time implementation.
- To analyze various on-chip peripherals of DSP processors.
- To design real-time signal processing algorithms using a DSP processor.

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

- Design DSP filters suitable for real-time applications.
- Understandthe architecture and pipeline operations of DSP Processors
- Illustrate the features of on-chip peripherals and interrupts ofTMS320C54XXDSP Processor.
- Implement various DSP algorithms using DSP processors.

UNIT I

Introduction: 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.

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, Hardware looping, Interrupts, Stacks, Relative Branch Support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT III

Programmable Digital Signal Processors: Commercial Digital Signal Processing Devices, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control,On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT IV

Implementationof Basic DSP Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.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.

Learning Resources

Text Books

1.Digital Signal Processing – Avtar Singh and S.Srinivasan, Thomson Publications, 2004.

References:

1. Digital Signal Processors, Architecture, Programming and Applications - B. VenkataRamani and M. Bhaskar,TMH, 2004.

2. Digital Signal Processing - Jonatham Stein, John Wiley, 2005

3. DSP Processor Fundamentals, Architectures & Features - Lapsley et al. S. Chand & Co, 2000.

ADVANCED COMPUTER NETWORKS

17ECMC2T5D **Credits: 4**
Lecture: 4 periods/week **Internal assessment: 40 marks**
Semester end examination: 60 marks

Prerequisites:Computer Networks.

Course Objectives:

- To study protocols, network standards, networking models, IP addressing, cabling, and networking components.
- To accumulate existing state-of-the-art in network protocols, architectures, Routing techniques and applications.
- To be familiar with contemporary issues in networking technologies
- To provide an awareness of network security issues in data communication.

Course Outcomes:

At the end of the course Student will be able to

- To master the terminology and concepts of the OSI reference model and the TCP-IP reference model.
- To be familiar with Routing techniques and Protocols of Internet.
- Differentiate between TCP and UDP protocol of transport layer
- Acquire knowledge related to applications and their security related aspects in networking.

UNIT-I

Computer Networks and the Internet: History of Computer Networking and the Internet, Networking Devices, Physical media, ISPs and Internet Backbones.
Networking Models: 5-layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing, Equal-Sized Packets Model: ATM.

UNIT-II

Routing and Internetworking: Logical Addressing: IPv4 Addresses, IPv6 Addresses -

Internet Protocol: Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6 –

Routing Techniques: Unicast Routing, Multicast Routing

UNIT-III

Transport and End-to-End Protocols: Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Stream Control Transmission Protocol (SCTP),
Congestion Control and Quality of Service: Data Traffic, Congestion, CongestionControl, Quality of service, Techniques to Improve QoS, QoS in switched networks.

UNIT-IV

Application Layer: The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing

Network Security: Security Services, Digital Signature, Entity Authentication, Key Management.

Learning Resources

Text Book:

1. Data Communications and Networking – Behrouz A. Forouzan.Fourth Edition TMH.

References:

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.

ELECTROMAGNETIC META MATERIALS

17ECMC2T6A **Credits: 4**
Lecture: 4 periods/week **Internal assessment: 40 marks**
Semester end examination: 60 marks

Prerequisites: Electromagnetic field theory, Antenna Theory

Course Objectives:

- To introduce basics of Meta Materials
- To explain fundamentals of Left handed Meta materials
- To explore Transmission line theory of Meta materials
- To explain and explore Two-dimensional Meta materials

Course Outcomes:

At the end of the course Student will be able to

- Express the basic concepts of Meta materials
- Describe the fundamentals of LH Meta materials
- Apply Transmission line theory to Meta materials
- Describe and discuss concept of Two-Dimensional Meta materials

UNIT I

Introduction: Definition of Metamaterials (MTMs) and Left-Handed (LH) MTMs, Theoretical Speculation by Viktor Veselago, Experimental Demonstration of Left-Handedness, Further Numerical and Experimental Confirmations, "Conventional" Backward Waves and Novelty of LH MTMs, Terminology, Transmission Line (TL) Approach, Composite Right/Left-Handed (CRLH) MTMs, MTMs and Photonic Band-Gap (PBG) Structures, Historical "Germs" of MTMs

UNIT II

Fundamentals of LH MTMs: Left-Handedness from Maxwell's Equations, Entropy Conditions in Dispersive Media, Boundary Conditions, Reversal of Doppler Effect, Reversal of Vavilov-Cerenkov Radiation, Reversal of Snell's Law: Negative Refraction, Focusing by a "Flat LH Lens", Fresnel Coefficients, Reversal of Goos-Ḧanchen Effect, Reversal of Convergence and Divergence in Convex and Concave Lenses, Subwavelength Diffraction

UNIT III

TL Theory of MTM: Ideal Homogeneous CRLH TLs, LC Network Implementation, Real Distributed 1D CRLH Structures, Experimental Transmission Characteristics, Conversion from Transmission Line to Constitutive Parameters

UNIT IV

Two-Dimensional MTMs: Eigenvalue Problem, Driven Problem by the Transmission Matrix Method (TMM), Transmission Line Matrix (TLM) Modeling Method, Negative Refractive Index (NRI) Effects, Distributed 2D Structures

Learning Resources

Text Books:

1. Christophe Caloz and Tatsuo Itoh, "Electromagnetic Metamaterials", Wiley –Inter science, 2006

References:

1. Nader Engheta and Richard W. Ziolkowski, Metamaterials: Physics and Engineering Explorations", IEEE Press and Wiley –Interscience, 2006

RF IC DESIGN

17ECMC2T6B **Credits: 4**
Lecture: 4 periods/week **Internal assessment: 40 marks**
Semester end examination: 60 marks

Pre-requisites: Analog Electronic Circuits

Course Objectives

- To impart knowledge on basics of IC design at RF frequencies

Course Outcomes

At the end of the course Student will be able to

- Understanding passive components at RF frequencies and required circuit theory foranalysis
- Studying high frequency amplifier design techniques and low noise amplifier configurations
- distinguish between different types of mixers
- Understanding the design considerations of frequency synthesizers at RF frequencies.

UNIT-I

Characteristics of passive IC components at RF frequencies – interconnects, resistors, capacitors, inductors and transformers – Transmission lines Classical two-port noise theory, noise models for active and passive components, Noise figure, Friis equation, Nonlinearity and cascaded stages, Sensitivity and dynamic range, Passive impedance transformation.

UNIT-II

High frequency amplifier design – zeros as bandwidth enhancers, shunt-series amplifier, fTdoublers, neutralization and unilateralization Low noise amplifier design – LNA topologies, impedance matching, power constrained noise optimization, linearity and large signal performance, noise canceling LNAs, Constant gm biasing, current reusing technique.

UNIT-III

Mixers – multiplier-based mixers, subsampling mixers, diode-ring mixers

UNIT- IV

Oscillators & synthesizers – describing functions, resonators, negative resistance oscillators, synthesis with static moduli, synthesis with dithering moduli, combination synthesizers – phase noise considerations.

Learning Resources

Text Books:

1. Thomas H. Lee, Cambridge, The Design of CMOS Radio-Frequency Integrated Circuits, UK: Cambridge University Press, 2004.

2. BehzadRazavi, RF Microelectronics, Prentice Hall, 1998.

PHASED ARRAYS

17ECMC2T6C **Credits: 4**
Lecture: 4periods/week **Internal assessment: 40 marks**
Semester end examination: 60 marks

Prerequisites: Antennas

Course Objectives:

- To study the different array patterns
- To Analyse the characteristics of various array patterns
- To Synthesize various array patterns
- To study the behaviour of different array feed mechanisms and measure the antenna parameters

Course Outcomes:

At the end of the course Student will be able to

- Design linear arrays with required sidelobes, beamwidht, bandwidth etc., and determine their directivity
- Formulate the array patterns using Taylor narrow Beam design, DOlph-chebyshev array, Taylor one-parameter distribution, Bickmore-Spellmire two parameter distribution.
- Synthesize the circular planar arrays like flat plane slot array, Circular Bayliss difference pattern, Two-Dimensional Optimization, Ring sidelobe synthesis
- Apply different feeding mechanisms for resonant and travelling wave arrays, measure sidelobe patterns

UNIT I

Basic Array Characteristics: Uniformly Excited Linear Arrays: Patterns, Beamwidth, Sidelobes, Grating Lobes, Bandwidth, Planar Arrays: Array Coordinates, Beamwidth, Greating Lobes (Rectangular Lattice, Hexagonal Lattice), Beam Steering and Quantization Lobes: Steering Increment, Steering Bandwidth, Time Delay Deployment, Phaser Quantization Lobes, QL Decollimation: Overlapped Sub-Arrays, Directivity: Linear array directivity, Directivity of Arrays of short Dipoles, Directivity of Arrays of Resonant Elements, Planar array directivity.

UNIT II

Linear Array Pattern Synthesis: Introduction: Pattern Formulations, Physics versus Mathematics, Taylor Narrow Beam Design Principles, Dolph-Chebyshev Arrays: Half wave spacing, Spacing less than half wave, Taylor one parameter Distribution: One-parameter design, Bickmore-Spellmire Two parameter distribution, Taylor N-Bar Aperture distribution, Low-sidelobe distributions: Comparison of distributions, Average sidelobe level, Shaped beam synthesis: Woodward-Lawson synthesis, Elliott Synthesis, Thinned Arrays: Parabolistic Design, Space Tapering, Minimum Redundancy Arrays.

UNIT III

Planar and Circular Array Pattern Synthesis: Circular Planar Arrays: Flat plane slot array, Hansen One-parameter pattern, Taylor circular n pattern, Circular Bayliss Difference pattern, Difference pattern optimization, Noncircular Apertures: Two-Dimensional Optimization, Ring sidelobe synthesis.

UNIT IV

Array feeds and Measurements: Series feeds: Resonant Arrays- Impedance and bandwidth, Resonant slot array design, Travelling Wave Arrays- Frequency Squint and Single Beam condition, Calculation of element conductance, TW slot array design Frequency scanning, Phaser scanning, Shunt feeds: Corporate feeds, distributed feeds, Measurement of Low-sidelobe patterns, Array diagnostics, Wave guide simulators.

Learning Resources

Text books:

1. Phased Array Antennas, R.C.Hansen, Second edition 2009, John Wiley & Sons Publications

Reference Books:

1. Phased Array Antenna Handbook, Second Edition (Artech House Antennas and Propagation Library) 2nd Edition by Robert J. Mailloux.
2. Phased Array Antennas : Floquet Analysis, Synthesis, BFNs and Active Array Systems 1st Edition, Arun K. Bhattacharyya.

RADAR SIGNAL PROCESSING

17ECMC2T6D **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Radar Systems, Digital Signal Processing

Course Objectives

- To illustrate the principles of Radar Systems and Signal Processing techniques.
- To analyze and detect the radar signals in presence of noise.
- To explore about the radar waveforms
- To acquire knowledge about pulse compression Radar.

Course Outcomes

At the end of the course Student will be able to

- Understand the principles of Radar Systems and Signal Processing techniques.
- Detect radar signals in noise using different receivers.
- Analyse the properties of Ambiguity function and waveform design requirements.
- Describe the concepts of pulse compression Radar.

UNIT –I

Introduction: Radar Block Diagram, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance– General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, Bistatic Radar. Matched Filter Receiver – Impulse Response, Frequency Response Characteristic and its Derivation, Matched Filter and Correlation Function, Correlation Detection and Cross-Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter for Non-White Noise.

UNIT –II

Detection of Radar Signals in Noise: Detection Criteria – Neyman-Pearson Observer, Likelihood-Ratio Receiver, Inverse Probability Receiver, Sequential Observer, Detectors – Envelope Detector, Logarithmic Detector, I/Q Detector. Automatic Detection - CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss, CFAR Uses in Radar. Radar Signal Management – Schematics, Component Parts, Resources and Constraints.

UNIT -III

Waveform Selection: Radar Ambiguity Function and Ambiguity Diagram – Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse, Noise Like Waveforms, Waveform Design Requirements, Optimum Waveforms for Detection in Clutter, Family of Radar Waveforms.

UNIT –IV

Pulse Compression in Radar Signals: Introduction, Significance, Types, Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Sidelobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics of Passive System, Digital Compression, SAW Pulse Compression.

Learning Resources

Text Books:

1. Radar Handbook - M.I. Skolnik, 2nd Ed., 1991, McGraw Hill.

2. Radar Design Principles : Signal Processing and The Environment - Fred E. Nathanson, 2nd Ed., 1999, PHI.

Reference Books:

1. Radar Principles - Peyton Z. Peebles, Jr., 2004, John Wiley.

2. Radar Signal Processing and Adaptive Systems - R. Nitzberg, 1999, Artech House.

3. Radar Design Principles - F.E. Nathanson, 1st Ed., 1969, McGraw Hill.

4. Introduction to Radar Systems - M.I. Skolnik, 3rd Ed., 2001, TMH.

MICROWAVE LAB

17ECMC2L1 **Credits: 2**
Lecture : --- **Internal assessment: 25 marks**
Lab : 3 periods/week **Semester end examination: 50 marks**

Prerequisites: Microwave Engineering,Advanced Antenna Theory

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

- Design planar-line sections for RF and Microwave circuits.
- Design Planar-line couplers, and power dividers.
- Analyze RF and microwave networks containing passive distributed components
- Learn the measurement procedures of important parameters in microwave engineering

List of Experiments:
Any 10 experiments from A, B & C (Minimum 2 from each)

A) Measurements on Microstrip components (Passive & Active):

1. Experiment on microstrip power divider.
2. Experiment on Microstrip directional coupler
3. Experiment on Microwave amplifier.
4. Experiment on Microwave Oscillator (VCO).
5. Experiment on Microwave mixer.
6. Experiment on PIN Diode Switch.

B) Experiments on Microstrip Antennas.

1. Verification of Inverse Square Law using Microstrip patch antenna.
2. Verification of Reciprocity Theorem using Microstrip patch antenna.
3. Experiment on Microstrip patch antenna for their radiation characteristics.
4. Experiment to study polarization characteristics of a patch antenna.

C) Experiments on VHF and UHF antennas.

1. To study the characteristics of Log Periodic Antenna.
2. To study the characteristics of Helical Antenna.
3. To study the characteristics of Discone Antenna.
4. To study the characteristics of Loop Antenna.
5. To study the characteristics of Shielded Loop Antenna.
6. To study the characteristics of Rectangular Slot Antenna.
7. To study the characteristics of Cylindrical Slot Antenna.

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MINI PROJECT

17ECMC2L2 **Credits: 2**
Lecture: --- **Internal assessment: 25 marks**
Lab: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- The student is introduced to the concept of validating a simple idea through model
- preparation / Software package or solving a simple Industrial/ Theoretical problem.
- To develop problem solving, analysis, synthesis and evaluation skills.
- To encourage teamwork and improve students presentation and communication skills.

COURSE OUTCOMES:

After completion of the course, student should be able to

- Formulate a real world problem and identify its requirements
- Express technical ideas, strategies and methodologies in oral and document form.
- Self learn new software tools, methodologies and/or experimental techniques that contribute to the solution of the project.

PEDAGAGOY TRAINING/ INDUSTRIAL TRAINING

17ECMC3TR **Credits: 2**

Interaction Session: 3 Periods/week **Internal assessment: 75 marks**

COURSE OBJECTIVES:

PEDAGOGY

- To developing intercultural communication competence.
- Able to design syllabus and plan lessons that align objectives, methods and assessments

INDUSTRIAL TRAINING

- To expose the students to actual working environment and enhance their Knowledge and skill.
- To install the good qualities of integrity, responsibility and self Confidence.

COURSE OUTCOMES:

After completion of the course, student should be able to

PEDAGOGY

- Prepare lesson plans effectively
- Understand different teaching methods
- Deliver lectures

INDUSTRIAL TRAINING

- Understand the real working environment
- Apply technical knowledge to realistic situations
- Express technical ideas, strategies and methodologies in oral and document form

PEDAGOGY TRAINING

First Week
Preparation of lesson plan
Second Week
Study of different teaching methods
Third Week
Demo Classes to be given for UG students
Fourth Week
Evaluation of teaching performance

INDUSTRIAL TRAINING

First Week
Identification of Industry for training
Second Week
Observation of the working strategies in the industries
Third Week
Identifying and demonstration of the effective methods to the existed methods
Fourth Week
Preparation of documentation

DISSERTATION PART-A

17ECMC3DS-A **Credits: 6**
Lecture : --- **Internal assessment: 50 marks**
Lab : 3 periods/week **Semester end examination: --**

COURSE OBJECTIVES:

- Identification of an industrial / a theoretical problem of smaller scale in his/her field of interest, survey of existing literature and exposure to problem solving methodology.

COURSE OUTCOMES:

After completion of the course, student should be able to

- Exposure to research and development procedures, latest developments in the selected research area.
- Demonstrate technical ideas, strategies and methodologies to peer team

Week 1-10 (II Year- First Semester)

Literature Survey, Defining Problem & Proposed methodology along with Status Report-1

Week 11-20 (II Year- First Semester)

Analysis & Design along with Status Report-2

DISSERTATION PART-B

17ECMC3DS-A **Credits: 10**
Lecture : --- **Internal assessment: 50 marks**
Lab : 3 periods/week **Semester end examination:100 marks**

COURSE OBJECTIVES:

- Development of Prototype or experimental setup or development of Simulation techniques to solve the problem undertaken

COURSE OUTCOMES:

After completion of the project, student should be able to

- Get the solution to industrial / theoretical problems
- Publish research findings in National or International conference/ Journals.
- Express technical ideas, strategies and methodologies in oral and document form

Week 21-30 (II Year-Second Semester)

Development of methodology for considered problem with validation along with Status Report-3

Week 31-40 (II Year-Second Semester)

Testing & Paper Publishing along with Status Report-4