

DETAILED
SYLLABUS

for

M Tech Degree Course
(Semester System)
COMMUNICATIONS & SIGNAL PROCESSING
w.e.f 2010-2011

COURSE STRUCTURE VR10



DEPARTMENT OF
ELECTRONICS & COMMUNICATION
ENGINEERING

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)

(Sponsored by Siddhartha Academy of General & Technical Education)

VIJAYAWADA – 520 007



**VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE**

(Autonomous)

Kanuru, Vijayawada – 520 007

(Approved by AICTE, Accredited by NBA, and ISO 9001: 2008 Certified)

(Affiliated to Jawaharlal Nehru Technological University, Kakinada)

**Academic Regulations for M.Tech(VR10) w.e.f: 2010-2011
(Common to all branches)**

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1. INTRODUCTION

Academic Programmes of the College are governed by rules and regulations as 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 2010-11, for students admitted into two year PG programme offered by the college leading to Master of Technology (M.Tech) in various specializations offered by respective departments as given in Table 1.

2. PROGRAMMES OFFERED

Presently, the college is offering Post Graduate programmes in Engineering with the following specializations:

Table 1: List of Specializations

| S.No | Specialization | Department |
|-------------|--------------------------------------|-----------------------------------------|
| 1 | Structural Engineering | Civil Engineering |
| 2 | Computer Science and Engineering | Computer Science and Engineering |
| 3 | Communications and Signal Processing | Electronics & Communication Engineering |
| 4 | Telematics | |
| 5 | Power Systems | Electrical & Electronics Engineering |
| 6 | CAD/CAM | Mechanical Engineering |
| 7 | Thermal 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 postgraduate programme in a stipulated time frame of 4 years from the date of joining. Otherwise he/she shall forfeit their seat in M.Tech Programme and the admission shall stand cancelled.

4. MINIMUM INSTRUCTION DAYS

Each semester, normally consists of a minimum of 90 instruction days with about 30 to 35 contact periods per week.

5. ELIGIBILITY CRITERIA FOR ADMISSION

The eligibility criteria for admission into M.Tech programme are as per the guidelines of APSICHE .

5.1 CATEGORY –A Seats:

- These seats will be filled by the Convener, PGCET Admissions.

5.2 CATEGORY –B Seats :

- These seats will be filled by the College as per the guidelines of APSICHE

6. PROGRAMME STRUCTURE

Every specialization of the M.Tech programme shall have six theory courses and two practical / mini project / seminar courses in each of first and second semesters. A major project is offered in third and fourth semesters.

6.1 Course Code and Course Numbering Scheme

Course Code consists of eight characters in which the first four are alphabets and rest are numerals. First four characters are described in Table 2 and 3.

Table 2: First and Second Character description

| First Two Characters | Name of the Department |
|----------------------|----------------------------------------------------|
| CE | Civil Engineering Department |
| CS | Computer Science and Engineering Department |
| EC | Electronics & Communication Engineering Department |
| EE | Electrical & Electronics Engineering Department |
| ME | Mechanical Engineering Department |

Third and fourth character represents specialization offering as mentioned in Table No. 3.

Table 3: Third and Fourth Character description

| Next Two Characters | Name of the Specialization |
|---------------------|--------------------------------------|
| SE | Structural Engineering |
| CS | Computer Science and Engineering |
| SP | Communications and Signal Processing |
| TM | Telematics |
| PS | Power Systems Engg |
| CC | CAD/CAM |
| TE | Thermal Engineering |

Fifth and sixth characters represent semester number and syllabus version number of the course offered.

Seventh character represents course type, as per Table No. 4

Table 4: Course type description

| SEVENTH CHARACTER | DESCRIPTION |
|-------------------|---------------|
| 0 | Theory course |
| 5 | Lab course |

Eighth character represents course number as described in Figure 1 below. However, few courses are given distinct codes.

For example, in **MECC 1051** course, the course is offered by Mechanical Engineering Department (**ME**) in CAD/CAM specialization offered in the first semester (**1**), the course syllabus version number (**0**), the course is of lab type (**5**) and the course number is (**1**), as given in figure.2 below.

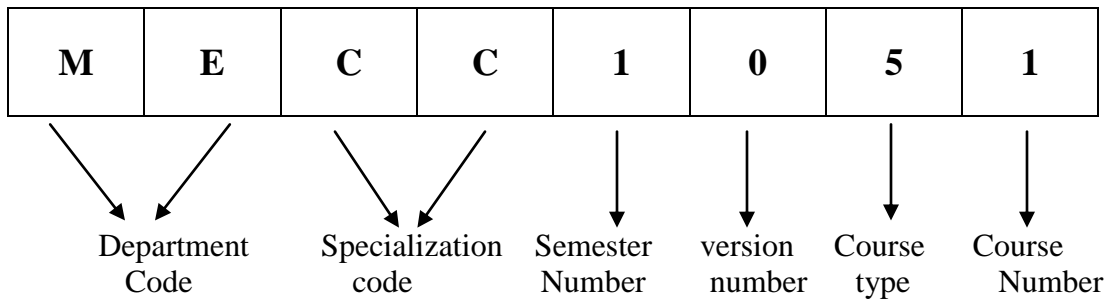


Figure 1: Course Code Description

6.2 Scheme of Instruction for 1st and 2nd Years

- The scheme of instruction and exact syllabi of all postgraduate programmes are given separately.

6.3 Contact Hours and Credits

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

- Lectures – One Lecture period per week is assigned one credit.
- Tutorials - Two tutorial periods per week are assigned one credit.
- Practical – 2 periods per week is assigned one credit
- Seminar/Mini Project shall have 2 credits.
- Major project shall have 24 credits.
- However, some courses are prescribed with fixed number of credits depending on the subject complexity and importance.

6.4 Theory / Tutorial 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. For certain courses, tutorial periods are prescribed, to give exercises to the students and to closely monitor their learning ability.

6.5 Laboratory Courses

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

6.6 Programme Credits

Each specialization of M.Tech programme is designed to have a total of 80 credits, and the student shall have to complete the courses and earn credits as per the requirements for the award of degree.

7. MEDIUM OF INSTRUCTION

The medium of instruction and examination is English.

8. SYLLABUS

As approved by the concerned BOS and the Academic Council.

9. ELIGIBILITY REQUIREMENT FOR APPEARING SEMESTER END EXAMINATION AND CONDONATION

- a) Regular course of study means a minimum average attendance of 75% in all the courses computed by totaling the number of periods of lectures, tutorials, practical courses and project work as the case may be, held in every course as the denominator and the total number of periods attended by the student in all the courses put together as the numerator.
- b) 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 in each subject and provided the Principal is satisfied with the genuineness of the reasons and the conduct of the student.
- c) Students, having shortage of attendance, shall pay Rs.20/-per every period of attendance shortage subject to a minimum of Rs.500/-.
- d) Minimum of 50% aggregate marks must be secured by the candidates in the internal examinations conducted for theory, practice and lab courses, to be

eligible to write semester end examinations. However, if the student is eligible for promotion based on the attendance, in case necessary, a shortage of internal marks up to a maximum of 10% may be condoned by the Principal based on the recommendations of the Heads of the Departments.

- e) Students having shortage of internal marks up to a maximum of 10% shall have to pay Rs.1000/- towards condonation fee for shortage of internal marks.
- f) A student, who does not satisfy the attendance and/or internal marks requirement, shall have to repeat that semester.
- f) Eligible candidates who failed to register for all papers for the semester-end examinations shall not be permitted to continue the subsequent semester and has to repeat the semester for which he/she has not registered for semester end examinations.

10. EXAMINATIONS AND SCHEME OF EVALUATION

10.1 Internal Examinations:

10.1.1 Theory Courses

Each course is evaluated for **40** marks (a+b)

- a) The internal evaluation shall be made based on the two mid term examinations each for **20** marks will be conducted in every theory course in a semester. The mid term marks shall be awarded giving a weightage of $\frac{2}{3}^{\text{rd}}$ in the examination in which the student scores more marks and $\frac{1}{3}^{\text{rd}}$ for the examination in which the student scores less marks. Each midterm examination shall be conducted for duration of 90 minutes with 3 questions to be answered out of 4 questions.
- b) The remaining 20 marks are awarded through continuous evaluation of assignments / mini project in each subject as notified by the teacher at the beginning of the semester.

Students shall be informed regarding the comprehensive assignment/project during first week of semester and they have to submit completed assignment on or before 12th week of semester.

10.1.2 Laboratory Courses: 25 marks

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

Table 5: Distribution of Marks

| Sl.No. | Criteria | Marks |
|--------|----------------------|-------|
| 1 | Day to Day work | 10 |
| 2 | Record | 05 |
| 3 | Internal Examination | 10 |

10.1.3 Seminar/Mini project: 25 marks

The distribution of internal marks for the seminar/mini project is given below.

Table 6: Distribution of Marks

| Sl.No. | Criteria | Marks |
|--------|---------------------|-------|
| 1 | Report | 15 |
| 2 | Seminar & Viva-viva | 10 |

10.1.4 Major Project: (50 marks each in 3rd & 4th semesters)

The continuous internal evaluation for 50 marks allocated for the project work in each semester of 3rd & 4th shall be on the basis of two seminars by each student on the topic of his/her project evaluated by project review committee & day to day assessment by the supervisor in each semester. The project review committee consists of Head of Department, respective internal guide and three senior faculty members of the department. The distribution of marks is as follows.

Table 7: Continuous internal assessment in each semester

| Sl.No. | Criteria | Marks |
|--------|-----------------------|-------|
| 1 | Two seminars | 15+15 |
| 2 | Day to day assessment | 20 |

10.2 Semester End Examinations

10.2.1 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 :
- There shall be two questions from each unit with internal choice. Each question carries 15 marks. Each course shall consist of four units of syllabus.

10.2.2 Lab Courses: 50 marks

35 marks are allotted for experiments/job works & **10** marks are allotted for viva-voce examination and **5** marks for record.

10.2.3 Seminar/Mini project: 50 marks

There shall be a seminar presentation. For Seminar/Mini Project, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the Department in a report form and shall make an oral presentation before the Departmental Committee. The Departmental Committee consists of Head of the Department, supervisor and two other senior faculty members of the department. For Seminar/Mini Project the evaluation is done for 50 marks internally. A candidate has to secure a minimum of 50% to be declared successful.

10.3 Major Project:

The work on the project shall be initiated in the beginning of the second year and the duration of the project is two semesters. Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the Project Review Committee.

- a) A Project Review Committee (PRC) shall be constituted with Head of the Department as chair person, two senior faculty members of the concerned department.
- b) The candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Project Review Committee for its approval before the second semester end examinations. After obtaining the approval of the Committee the student can initiate the Project work after the second semester end examinations.
- c) If a candidate wishes to change his supervisor or topic of the project he can

do so with approval of the PRC. However, the Project Review Committee (PRC) shall examine whether the change of topic/supervisor leads to a major change of his initial plans of project proposal. If so, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

- d) After approval of the topic in Project Review Committee, the candidate shall be required to submit status report in four stages. The first one in the mid of 3rd semester, second one in the end of 3rd semester, third one in the mid of 4th semester and the final report in the form of draft copy of thesis for the approval of PRC to the Head of the Department and shall make an oral presentation before the PRC.
- e) Due weightage will be given to the papers published from the thesis submitted in the order of International Journal, National Journal, International conference and National conference while evaluating the thesis.
- f) Three copies of the Project Thesis certified by the supervisor shall be submitted to the College.
- g) The thesis shall be adjudicated by one external examiner selected by the Principal. For this, Head of the Department shall submit a panel of five examiners, who are eminent in the field.
- h) The viva-voce examination shall be conducted by a board consisting of the supervisor, Head of the Department and the external examiner. Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination. If any candidate gets less than 50% marks in the viva-voce examination, he/she shall revise and resubmit the project work and reappear for viva-voce examination when next conducted.

In a special case, if any candidate does not submit his/her thesis due to ill health or any other reason permitted by the head of the institution, he/she will be given another chance to attend for the viva-voce examination conducted separately at a later date, if the expenditure for conducting the viva-voce is completely borne by the candidate.

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

11.1 Conditions for Pass and award of Grades & Credits:

- a) A candidate shall be declared to have passed in individual Theory/Drawing course if he/she 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 lab/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) If a candidate secures minimum of 40% marks in Theory Courses in the semester end examination and 40% - 49% of the total marks in the semester end examination and internal evaluation taken together in some theory courses and secures an overall aggregate of 50% in all theory courses of that semester he/she declared to be passed in the theory courses of that semester.
- d) The student has to pass the failed course by appearing the examination when offered next, as per the requirement for award of the degree.
- e) On passing a course of a programme, the student shall earn assigned credits in that Course.

11.2 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 given below.

Table 8: Grading System for individual subjects/labs

| Theory/Drawing | Lab/Project | Grade Points | Letter Grade |
|-----------------------|--------------------|---------------------|---------------------|
| 85-100% | 85-100% | 10 | Ex |
| 75-84% | 75-84% | 9 | A+ |
| 70-74% | 70-74% | 8 | A |
| 65-69% | 65-69% | 7 | B+ |
| 60-64% | 60-64% | 6 | B |
| 50-59% | 55-59% | 5 | C |
| 40-49% | 50-54% | 4 | D |
| < 40% | < 50% | 0 | F (Fail) |

11.3 Calculation of Semester Grade Points Average (SGPA)* and award of division for the program.

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

$$\text{SGPA} = \frac{\Sigma(\text{CR X GP})}{\Sigma\text{CR}} \quad (\text{for all courses passed in semester})$$

Where CR= Credits of a course

GP = Grade points awarded for a course

*SGPA is calculated for the candidates who passed all the courses in that semester.

11.4 Calculation of Cumulative Grade Point Average (CGPA) for Entire Programme.

The CGPA is calculated as below:

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

Where CR= Credits of a course

GP = Grade points awarded for a course

Table 9: Award of Divisions

| CGPA | DIVISION |
|----------------|------------------------------|
| ≥ 8 | First Class with distinction |
| $\geq 6 - < 8$ | First Class |
| $\geq 5 - < 6$ | Second Class |
| < 5 | Fail |

11.5 Transitory Regulations

A candidate, who is detained or discontinued in the semester, on readmission shall be required to pass all the courses in the curriculum prescribed for such batch of students in which the student joins subsequently. However, exemption will be given to those candidates who

have already passed in such courses, in the earlier semester(s) as approved by Board of Studies and ratified by Academic Council.

11.6 Consolidated Grade Card

A consolidated grade card containing credits & grades obtained by the candidates will be issued after completion of the two year M.Tech Programme.

12. REVALUATION

- As per the notification issued by the Chief Controller of Examinations, the students can submit the applications for revaluation, along with the fee receipt for revaluation of his/her answer script(s) of theory course(s), if he/she is not satisfied with marks obtained.
- The Controller of Examinations shall arrange for revaluation of those answer script(s).
- A new external examiner, other than the first examiner, shall reevaluate the answer script(s).
- Better marks of the two will be taken into consideration.

13. READMISSION CRITERIA

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

14. BREAK IN STUDY

Student, who discontinues the studies for what so ever may be the reason, can get readmission into appropriate semester of M.Tech programme after break-in study only with the prior permission of the Principal of the College provided such candidate shall follow the transitory regulations applicable to such batch in which he/she joins. 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/her break in study.

15. ELIGIBILITY FOR AWARD OF M.TECH. DEGREE

The M.Tech., Degree shall be conferred on a candidate who has satisfied the following requirement. A student should register himself for 80 Credits, and should obtain all the 80 credits in order to become eligible for the award of M.Tech Degree.

16. CONDUCT AND DISCIPLINE

- Students shall conduct themselves within and outside the premises of the Institute in a manner befitting the students of our Institution.
- As per the order of Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is banned. Any form of ragging will be severely dealt with.
- The following acts of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.
 - i. Lack of courtesy and decorum; indecent behavior anywhere within or outside the campus.
 - ii. Willful damage or distribution of alcoholic drinks or any kind of narcotics to fellow students
/citizens.
- Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.
- Mutilation or unauthorized possession of library books.
- Noisy and unseemly 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.
- Students are not allowed to use cell phones in the campus.
- Plagiarism of any nature is prohibited.
- Any other act of gross indiscipline as decided by the college 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 college 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 & 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 appeal Committee" (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative /disciplinary matters.
- All the students must abide by the code and conduct rules of the college.

17. MALPRACTICES

- The Principal shall refer the cases of malpractices in internal assessment tests and Semester-End Examinations, to a Malpractice Enquiry Committee, constituted by him/her for the purpose. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action, against the erring students basing on the recommendations of the committee.
- Any action on the part of candidate at an examination trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff, who are in charge of conducting examinations, valuing examination papers and preparing/keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

18. OTHER MATTERS

- 17.1 The physically challenged candidates who have availed additional examination time during their B.Tech/PGCET examinations will be given additional examination time on production of relevant proof/documents.
- 17.2 Students who are suffering from contagious diseases are not allowed to appear either internal or semester end examinations.
- 17.3 The students who 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.
- 17.4 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 Heads of the Departments Meetings, shall be reported to the academic council for ratification.

19. AMENDMENTS TO REGULATIONS

The Academic Council may, from time to time, revise, amend or change the regulations,
schemes of examination and/or syllabi.

ELECTRONICS AND COMMUNICATION ENGINEERING

Curriculum, Scheme of Examination and Syllabi

For M.Tech Degree Program
in

COMMUNICATIONS AND SIGNAL PROCESSING

Being Offered at

Velagapudi Ramakrishna Siddhartha Engineering College

Course Structure – VR10

Wef 2010-2011

FIRST SEMESTER

| S.No | Sub. Code | Subject Title | L | T | P | C | I | E | T |
|--------------|-----------|------------------------------------|-----------|----------|----------|-----------|------------|------------|------------|
| 1 | ECSP1001 | ADVANCED DIGITAL COMMUNICATION | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 2 | ECSP1002 | FIBER OPTICS COMMUNICATION | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 3 | ECSP1003 | TRANSFORMATION TECHNIQUES | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 4 | ECSP1004 | ADVANCED DIGITAL SIGNAL PROCESSING | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 5 | ECSP1005 | ELECTIVE-I | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 6 | ECSP1006 | ELECTIVE-II | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 7 | ECSP1051 | COMMUNICATION LAB | 0 | 0 | 3 | 2 | 25 | 50 | 75 |
| 8 | ECSP1052 | SEMINAR | 0 | 0 | 3 | 2 | 25 | 50 | 75 |
| Total | | | 24 | 0 | 6 | 28 | 290 | 460 | 750 |

ELECTIVE-I

ECSP 1005/1: DIGITAL IMAGE PROCESSING

ECSP 1005/2: DATA COMMUNICATION AND NETWORKS

ECSP 1005/3: DATA COMPRESSION

ELECTIVE-II

ECSP 1006/1: ARTIFICIAL NEURAL NETWORKS

ECSP 1006/2: ADAPTIVE SIGNAL PROCESSING

ECSP 1006/3: MICROWAVE MEASUREMENTS

L: Lecture

T: Tutorial

P: Practice

C: Credits

I: Internal Assessment

E: End Examination

T: Total Marks

ELECTRONICS AND COMMUNICATION ENGINEERING
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SECOND SEMESTER

| S.No | Sub. Code | Subject Title | L | T | P | C | I | E | T |
|--------------|-----------|-----------------------------|-----------|----------|----------|-----------|------------|------------|------------|
| 1 | ECSP2001 | MOBILE COMMUNICATION | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 2 | ECSP2002 | SATELLITE COMMUNICATION | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 3 | ECSP2003 | REAL TIME SIGNAL PROCESSING | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 4 | ECSP2004 | SPEECH PROCESSING | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 5 | ECSP2005 | ELECTIVE-III | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 6 | ECSP2006 | ELECTIVE-IV | 4 | 0 | 0 | 4 | 40 | 60 | 100 |
| 7 | ECSP2051 | DSP LAB | 0 | 0 | 3 | 2 | 25 | 50 | 75 |
| 8 | ECSP2052 | TERM PAPER | 0 | 0 | 3 | 2 | 25 | 50 | 75 |
| Total | | | 24 | 0 | 6 | 28 | 290 | 460 | 750 |

ELECTIVE-III

ECSP 2005/1 : DIGITAL VIDEO PROCESSING

ECSP 2005/2 : DSP PROCESSORS AND ARCHITECTURES

ECSP 2005/3 : RANDOM PROCESSES AND INFORMATION THEORY

ELECTIVE-IV

ECSP 2006/1 : ADHOC NETWORKS

ECSP 2006/2 : ANTENNAS FOR WIRELESS COMMUNICATION

ECSP 2006/3 : VLSI SIGNAL PROCESSING

L: Lecture

T: Tutorial

P: Practice

C: Credits

I: Internal Assessment

E: End Examination

T: Total Marks

ELECTRONICS AND COMMUNICATION ENGINEERING
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Wef 2010-2011
THIRD AND FOURTH SEMESTERS

| S No | Subject Code | Subject Title | Credits | Evaluation |
|-------------|---------------------|----------------------------|----------------|--------------------------------------------------|
| 1. | ECSP 4051 | PROJECT & VIVA VOICE | 24 | 50 Marks (Internal) & 200 Marks (External) |
| TOTAL | | | | 250 Marks |

ECSP 1001 ADVANCED DIGITAL COMMUNICATION

UNIT I

DIGITAL PASSBAND TRANSMISSION

Introduction, Pass band Transmission Model, Gram-Schmidt Orthogonalization Procedure, Geometric Interpretation of Signals, Response of Bank of Correlators to Noisy Input, Coherent Detection of Signals in Noise, Probability of Error, Correlation Receiver, Detection of Signals with unknown Phase, Hierarchy of Digital Modulation Techniques, Coherent Binary PSK, Coherent Binary FSK, Coherent Quadriphase-Shift Keying, Coherent Minimum Shift Keying, Noncoherent Orthogonal Modulation, Noncoherent Binary Frequency-Shift Keying, Differential Phase-Shift Keying, Comparison of Binary and Quaternary Modulation Schemes, M-ary Modulation Techniques, Power Spectra, Band-width Efficiency, Synchronization.

UNIT II

CHANNEL CODING

Introduction, Discrete Memory less Channels, Linear Block Codes, Cyclic Codes, Convolution Codes, Maximum Likelihood Decoding of Convolution codes, Trellis-Coded Modulation, Coding for Compounded-Error Channels.

UNIT III

DESIGN CONSIDERATIONS OF A DIGITAL COMMUNICATION SYSTEM

Intersymbol Interference, Nyquist's Criterion for Distortionless Baseband Binary Transmission, Correlative-Level Coding, Error Probability Plane, Bandwidth Efficiency Plane, Modulation and coding tradeoffs, defining, designing, and evaluating digital communication system, Modulation and coding for band limited channels.

UNIT-IV

SPREAD SPECTRUM TECHNIQUES

Pseudo noise sequences, Direct sequence Spread Spectrum systems, Frequency hopping systems, Synchronization and Jamming Considerations.

TEXT BOOKS:

1. Digital communication, Third Edition, Simon Haykin, John Wiley and Sons. (Units I, III & IV)
2. Digital Communications, Second Edition, B.Sklar, Pearson Education Asia. (Units II & IV)

REFERENCE:

1. J.G. Proakis, Digital Communications, Third Edition, McGraw Hill.

ECSP 1002 FIBER OPTIC COMMUNICATIONS

UNIT – I

OPTICAL FIBER WAVEGUIDES

Ray Theory of Transmission, Electro-magnetic Theory for Optical propagation, Cylindrical Fiber, Single-Mode Fibers,

TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS

Material Absorption Losses in Silica Glass Fiber, Linear Scattering Losses, Non-Linear Scattering Losses, Fiber Bending Loss, Intra modal Dispersion, Inter modal Dispersion, Overall Fiber Dispersion.

UNIT – II

OPTICAL SOURCES

Semiconductor injection Laser, Single Frequency Injection Laser, Non-Semiconductor Lasers, LED Structures, LED Characteristics.

OPTICAL DETECTORS

Semiconductor photo-Diodes without Internal Gain, Semiconductor Photo-Diodes with Internal Gain, Receiver Noise, Receiver Structures, FET Pre-Amplifiers, Semiconductor Laser Amplifiers, Rare earth doped Fiber Amplifiers.

UNIT – III

OPTICAL FIBER SYSTEMS

The Optical Transmitter Circuit, The Optical Receiver Circuit, Digital System Planning Considerations, Analog Systems, Advanced Multiplexing Strategies, Detection Principles, Modulation Formats, Demodulation Schemes, Receiver Sensitivities.

UNIT – IV

ADVANCED OPTICAL SYSTEMS

Fiber Optic LANs, FDDI, SONET, Features Concepts, Protocol Architecture and Functional Working, Soliton Communication System.

TEXT BOOKS

1. Optical Fiber Communications principles and practice, Senior MJ, PHI (UNIT-I to III).
2. Optical fiber communication principles and systems, A selvarajan, subrat kar, T srinivas, TATA McGraw Hill.(UNIT-IV).

REFERENCE BOOKS

1. Keiser G, Optical Fiber Communication McGraw Hill
2. Shimada Setal Coherent Lightwave Communication Technology, Chappman &Hall.
3. Dijafar K.myhbaev & Lowell L.scheiner, fiber optic communication technology. Pearson

ECSP 1003 TRANSFORMATION TECHNIQUES

UNIT – I

Orthogonal Signal Spaces, Approximations of Functions by a Set of Mutually, Orthogonal Functions, Orthogonality in Complex Functions, Trigonometric & Exponential Fourier Series, Concepts of Fourier Transforms, Properties and their Significance, Energy and Power Spectral Density Functions, Problems

UNIT – II

Laplace Transforms, ROC, Properties of L.T., Inverse L.T., Z-transforms, ROC, Properties, Relations between Laplace, Fourier and Z-Transforms, Inverse Z-Transforms

UNIT - III

Short-Time-Fourier Transforms, Properties of STFT, The origin of wavelets, Functions and Function Spaces, Orthogonal basis functions, Continuous Wavelet Transforms (CWT), The Uncertainty Principle and Time frequency Tiling, Properties of wavelets in CWT, Introduction to the Discrete Wavelet Transforms, Continuous versus discrete wavelet Transform, Haar scaling and wavelet Functions and function space, Translation and Scaling, Orthogonality of translates, Function Space, Nested spaces, Scaled Haar wavelet Functions and Orthogonal Wavelets, Support of wavelet System, Daubechies Wavelets.

UNIT – IV

Refinement relation for Orthogonal Wavelet Systems, Restrictions on Filter coefficients, Signal Decomposition and Relationship with Filter Banks, Frequency Response, Signal reconstruction, Perfect matching Filters, Multi-Resolution Analysis (MRA), Two Scale Relations, Orthonormal Wavelets, their Relationship to Filter Banks, PR QMF Filter Banks.

TEXT BOOKS:

1. Signal Processing and Linear Systems, B.P. Lathi, Berkley Cambridge (Unit I & II)
2. “ Insight into Wavelets – from theory to practice”, Second edition, 2008 (Unit III & IV), K.P. Soman and K.I Ramachandran, PHI.

REFERENCES:

1. Alan V. Oppenheim, Alan S. Willsky with S. Hamid Nawab, Signals & Systems, 2nd Edn., Pearson Education, 1997.
2. M.J. Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.
3. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999.
4. Fundamentals of Wavelets - Theory, Algorithms and Applications, Jaideva C. Goswami, Andrew K. Chan, John Wiley & Sons
5. Wavelet Transforms - Introduction to Theory and Applications, Raghuveer M. Rao, Ahit S. Bopardikar, Pearson Education, Asia

ECSP 1004 ADVANCED DIGITAL SIGNAL PROCESSING

UNIT – I

MULTIRATE SIGNAL PROCESSING

Introduction, Decimation by a factor D , Interpolation by a factor I , Sampling rate conversion by a rational factor I/D , Implementation of Sampling rate conversion: Polyphase filter structures, Interchange of filters and down samplers/up samplers, Polyphase structures for decimation and interpolation filters, Direct form and Polyphase FIR structures with Time varying Coefficients.

UNIT – II

MULTIRATE FIR FILTER DESIGN

Multistage Implementation of Sampling Rate Conversion, Design of FIR Filters for Sampling Rate Conversion, Applications Of Multirate signal processing: Design of phase shifters, interfacing of Digital system with different sampling rates, Subband coding of speech signals, Filter bank implementation :Digital Filter banks, Two channel filter banks(QMF), Tree structured Filter banks, Uniform DFT Filter banks, Decimated Filter banks.

UNIT – III

POWER SPECTRUM ESTIMATION

Estimation of Spectra from Finite Duration Observations of a Signals, The Periodogram, Use DFT in power Spectral Estimation, Non Parametric methods for Power spectrum estimation: Bartlett, Welch and Blackman and Tukey Methods, Comparison of performance of Non-Parametric Power Spectrum Estimation Methods.

UNIT – IV

PARAMETRIC METHOD OF POWER SPECTRUM ESTIMATION

Parametric Methods for power spectrum estimation, Relationship between Auto Correlation and Model Parameters, AR(Auto-Regressive) Model parameters: Yule-Walker, Burg and Unconstrained Least Squares Methods, Sequential Estimation, Moving Average (MA) and ARMA Models for power spectrum estimation Minimum Variance Spectral estimates, Pisarenko Harmonic Decomposition Method, MUSIC Algorithm

TEXT BOOKS

1. Digital Signal Processing Principles, Algorithms and Applications, Proakis JG and Manolakis DG, PHI. (Units: I, II, III, IV)

REFERENCES

1. Openheim AV & Schafer RW, Discrete Time Signal Processing PHI.
2. A. Salivahan, A. Vallavaraj, G. Ganapriya, Digital Signal Processing, TMH

ECSP 1005/1 DIGITAL IMAGE PROCESSING

UNIT-I

DIGITAL IMAGE FUNDAMENTALS

Image fundamental steps & components, applications, elements of visual perception, simple image formation model, Image sampling and quantization, basic relationships between pixels, mathematical tools used in DIP.

Introduction, Need for image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT-II

IMAGE ENHANCEMENT AND RESTORATION

Spatial domain methods: point processing, intensity transformation functions, histogram processing, Spatial filtering: smoothing filters, sharpening filters. Frequency domain filtering: smoothing filters, sharpening filters, homomorphic filtering.

A Model of the Image Degradation/Restoration Process, Noise models, Restoration filters: spatial & frequency domain filters, Linear Position-Invariant Degradations, Estimating the Degradation function, Inverse filtering, Wiener filter, constrained Least squares restoration .

UNIT-III

IMAGE COMPRESSION AND SEGMENTATION

Fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, image compression models, Elements of information theory, basic compression methods.

Detection of discontinuities - point, line and edge and combined detection ;Edge linking and boundary description, Thresholding, Region oriented segmentation: region growing , region splitting and merging.

UNIT-IV

COLOR IMAGE PROCESSING

Color fundamentals, color models: RGB,CMY,HIS,YIQ, Converting of color models.

TEXTBOOK:

1. "Digital Image Processing", 3RD Ed, R.C.Gonzalez and R.E.Woods, PHI.

REFERENCES:

1. S.Jayaraman, S.Esakkirajan and T.VeeraKumar, "Digital Image processing, Tata Mc Graw Hill publishers, 2009
2. Anil K. Jain "Fundamentals of Digital Image Processing", Pearson Education, 2003.
3. Chanda & Majumdar, "Digital Image Processing and Analysis" , PHI.
4. M.Sonka,V. Hlavac, R. Boyle, "Image Processing, Analysis and Machine Vision.

ECSP 1005/2 DATA COMMUNICATION AND NETWORKS

UNIT I:

INTRODUCTION

Components of network - Topologies - WAN / LAN - OSI - ISO layered Architecture - Modulation and demodulation - Bit error rates - Line coding - Error correcting codes.

DATA LINK LAYER

Design issues - CRC technique and sliding window techniques - Performance analysis of sliding window techniques - Framing formats - Case Study.

UNIT II:

HDLC protocols - Medium access control - CSMA / CD - Token ring and token bus - FDDI - Wireless LAN - Performance analysis of MAC protocols - Bridges.

NETWORK LAYER

Circuit switching - packet switching - Design issues - IP addressing and IP diagram.

UNIT III:

ROUTERS AND GATEWAYS

Routing - Sub netting - CIDR - ICMP - ARP - RARP - IPv6 - QoS.

TRANSPORT LAYER TCP and UDP

Error handling and flow control - Congestion control - TCP Retransmission - Timeout - Socket Abstraction.

UNIT IV:

APPLICATION SERVICES

Simple Mail Transfer Protocol (SMTP) - File Transfer Protocols (FTP), telnet, the World Wide Web (WWW).

Hypertext Transfer Protocol (HTTP), Domain name service (DNS), Security, Multimedia applications.

TEXT BOOKS:

1. "Data and Computer Communications", Seventh Edition, William Stallings, Prentice Hall, 2003.
2. "Computer Networks: A Systems Approach", 2nd Edition, 1999, Larry Peterson, Bruce S Davie, Morgan Kaufmann Publishers.
3. "Computer Networking: A Top - Down Approach Featuring the Internet", 2nd Edition 2002, James F Kurose, Addison Wesley.
4. "TCP / IP Illustrated", W.Richard Stevens and Gary R Wright, Addison Wesley, Volume 1 & 2, 2001.

ECSP 1005/3 DATA COMPRESSION

UNIT – I

Compression - Definition – lossless compression - lossy compression - modeling and coding. compression measure - Shannon's source coding and channel coding theorems – Types of redundancy - transform coding – predictive coding – simple applications.

UNIT – II

Text Compression - Information theory concepts – entropy - Shannon-Fano coding – Huffman coding – arithmetic coding – dictionary-based coding – LZ77 – LZ78 – LZW – BWT – context based coding.

UNIT – III

Audio Compression - Basics of digital audio – audio file formats (WAV, MIDI) - ADPCM in speech coding – vocoders – LPC – CELP – MELP – scalar quantization – vector quantization
Linde-Buzo-Gray algorithm - DPCM – MPEG audio compression.

Video Compression - Basics of digital video – video file formats (AVI, YUV) – color models in video – motion estimation and compensation - Video compression standards: MPEG-1, MPEG- 2, MPEG-4, H.261, H.263 and H.264/AVC.

UNIT – IV

Image Compression - Basics of digital image – image file formats (BMP, GIF, TIFF) – Color models in images - Discrete Fourier Transform – Discrete Cosine Transform – Discrete Wavelet Transform – Sub band coding - EZW – SPIHT – EBCOT - Image compression standards: JBIG, JPEG and JPEG 2000.

TEXT BOOKS:

1. “Data Compression: The Complete Reference”, 3rd Edition New Delhi, 2005, David Salomon, Springer International Edition.
2. “Introduction to Data Compression”, 2nd edition New Delhi, 2000, . Khalid Sayood, Harcourt India Private Ltd.,
3. “Fundamentals of Multimedia”, Ze-Nian Li and Mark S. Drew, Pearson Education, New Delhi, 2004.
4. “The Data Compression Book”, 2nd Edition, Mark Nelson and Jean-Loup Gailly, M&T Books, New York, 1996.
5. “Techniques and standards for image, video and audio coding”, K. R. Rao and J. J. Hwang, Prentice Hall Inc., New Jersey, 1996.

ECSP 1006/1 ARITIFICAL NEURAL NETWORKS

UNIT I

Introduction: History of Neural Networks, Structure and Function of a Single Neuron, Neural Net Architectures, Neural Learning, Application of Neural Networks, Evaluation of Networks, Implementation.

Supervised Learning – Single Layer Networks: Perceptrons, Linear Separability, Perceptron Training Algorithm, Guarantee of Success, Modifications

UNIT II

Supervised Learning – Multilayer Networks I : Multi-level Discrimination, Preliminaries, Back propagation Algorithm, Classification using Back propagation, Setting the Parameter Values, Applications.

Supervised Learning – Multilayer Networks II: Adaptive Multilayer Networks, Boosting, Prediction Networks, Radial Basis Functions, Polynomial Networks.

UNIT III

Unsupervised Learning: Winner-Take-All Networks, Learning Vector Quantizers, Counter propagation Networks, Adaptive Resonance Theory, Topologically Organized Networks

UNIT IV

Associative Learning: Non-iterative Procedures for Association, Hopfield Networks, Optimization Using Hopfield Networks, Brain-State-in-a-Box Network, Boltzmann Machines.

TEXT BOOK:

Elements of Artificial Neural Networks – Second Edition, Kishan Mehrotra, Chilukuri K. Mohan, Sanjay Ranka, Penram International Publishing (India) Pvt. Ltd., (UNITS: I, II, III, IV)

REFERENCE BOOKS:

- 1.. J.M. Zurada Introduction to Artificial Neural Systems, Jaico Publications
2. B. Yegnanarayana, Artificial Neural Networks, PHI, New Delhi

ECSP 1006/2 ADAPTIVE SIGNAL PROCESSING

UNIT – I

Adaptive Systems :Definitions,Characteristics, Applications, Example of an Adaptive System.

The Adaptive Linear Combiner: Description, Weight Vectors, Desired Responses, Performance Function, Gradient and Mean-Square Error.

UNIT – II

Approaches to the Development of Adaptive Filter Theory: Introduction to Filtering Smoothing and Prediction-Linear Optimum Filtering ,Problem Statement . Principle of Orthogonality , Minimum – Mean- Squared Error, Winer –Hopf Equations, Error Performance , Normal Equation .

UNIT – III

Searching the Performance Surface – Methods and Ideas of Gradient Search Methods, Gradient Searching Algorithm and its Solution, Stability and Rate of Convergence, Learning Curves, Gradient Search by Newton’s Method, Method of Steepest Descent, Comparison of Learning Curves

LMS Algorithms – Overview, LMS Adaptation Algorithms, Stability and Performance Analysis of LMS Algorithms, LMS Gradient and Stochastic Algorithms, Convergence of LMS Algorithms

UNIT – IV

Applications – Noise Cancelling, Cancelling Echoes in Long Distance Telephone Circuits, Adaptive Beam Forming

Kalman Filtering Theory – Introduction, Recursive Mean Square Estimation for Scalar Random Variables, Statement of Kalman Filtering Problem, Innovation Process. Estimation of State using the Innovation Process, Filtering, Initial Conditions, Summary of Kalman Filters, Variants of the Kalman Filtering the Extend Kalman Filtering, Identification as a Kalman Filtering Problem

TEXT BOOKS:

1. Adaptive Signal Processing, Bernard Widrow – PH/Pearson Education, Asia (Unit-I to III)
2. Adaptive filter Theory, Simon Haykins, PHI (Unit- IV)

REFERENCES:

1. Sophocles J. Orfamidis - Optimum Signal Processing – An Introduction, 2nd Edition, McGraw Hill
2. S. Thomas Alexander – Adaptive Signal Processing – Theory and Applications, Springer – Verlag

ECSP 1006/3 MICROWAVE MEASUREMENTS

UNIT – I

Measurement of wavelength and frequency, Equivalent circuit of the cavity wave meters, Typical wavemeters, Resonant cavities

Methods of Frequency Measurements : Direct measurement, Interpolation method, Additive frequency method

UNIT – II

Measurement of Impedance : Constructional details of slotted section and its limitations, standing wave detector, Techniques in standing wave detector measurements, Measurement of low & high VSWR., Location of voltage minima, Use of Smith chart in impedance measurements, Errors in standing wave detector impedance measurements, Electrometers

Measurement of Power : Methods of power measurement, Typical barrette elements, thermistor, bolometer bridge circuits, Extending the range of Bolometer devices, Crystal Detector, Dielectric Measurement for Solids

UNIT – III

Measurements on Microwave circuits and components, T and P network, Measurement of scattering coefficients, Graphical determination of scattering coefficients, Coupling and Directivity of directional coupler

UNIT – IV

Measurement of Attenuation : Insertion of Power ratio method, substitution method, scattering coefficient method, Return Loss

Antenna Measurements : Measurement of radiation patterns, Antenna gain measurements, Antenna impedance Measurements, Polarization Measurements

TEXT BOOKS

1. Basic Microwave Techniques and Laboratory Manual, M.L. Sisodia & G S Raghuvanshi, New Age International Publishers, 2007 (Unit I,II,III &IV)

REFERENCE BOOKS :

1. P. A. Rizzi, Microwave Engineering Passive Circuits, Prentice Hall, 1987
2. D.M. Pozar, Microwave Engineering, John Wiley, 1998
3. Dennis Roddy, Microwave Technology, PHI, 1986
4. Annapurna Das & Sisir K Das, Microwave Engineering, TMH, 2004

ECSP-1051 COMMUNICATION LAB

LIST OF EXPERIMENTS:

1. Time Division Multiplexing of signals & Framing in the TDM
2. Study of Manchester Coder – Decoder
3. Forming a PC to PC Communication Link using Optical Fiber and RS 232 interface
4. Measurement of various losses in an Optical Fiber
5. Comparative study of EMI in copper and Optical media
6. Study of Optical Time Domain Reflecto meter
7. Measure the Scattering parameters of the devices: Circulator & Hybrid TEE
8. Study of Antenna Radiation Patterns of E-Plane and H-plane radiation patterns of a Pyramadal horns
9. Study of spectrum analyzer
10. Measurement of Q-factor of cavity resonator
11. Study of Cellular communication Systems
12. Study of Satellite communication Receiver

ECSP 2001 MOBILE COMMUNICATIONS

UNIT - I

Introduction - Evaluation of Mobile Radio Communication, Mobile Radio Systems around the world, Examples of Wireless Communication Systems: Paging systems, Cordless Telephone Systems, Cellular Telephone Systems

Modern Wireless Communication Systems: Second generation cellular networks, third generation networks, Wireless Local Loop (WLL) LMDS, Wireless Local Area Networks(WLAN), Bluetooth & Personal Area Networks

UNIT - II

The Cellular Concept - System Design Fundamentals : Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems Mobile Radio Propagation: Large-Scale Path Loss: Introduction, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection, Ground Reflection, Diffraction Scattering, Practical Link Budget Design Using Path Loss Models, Outdoor Propagation Models-(Longley Rice Model & Durkin's Model_ A Case Study), Indoor Propagation Model (Partition Losses (Same Model) & Partition Losses between Floors), Signal Penetration into Buildings, Ray Tracing and Site Specific Modeling

UNIT - III

Mobile Radio Propagation: Small-Scale Fading and Multipath : Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small Scale Fading, Rayleigh and Ricean Distributions, Statistical Models for Multipath Fading Channels, Theory of Multipath Shape Factors for Small-Scale Fading Wireless Channels, Examples of Fading Behavior, Second Order Statistics Using Shape Factors, Applying Shape Factors to Wideband Channels, Revisiting Classical Channel Models with Shape Factors

UNIT - IV

Review of the Modulation Techniques for mobile radio, Review of the Multiple Access techniques for Wireless Communication, Wireless data networking, Wireless Data Services, AMPS, Global System for Mobile (GSM)

TEXT BOOKS:

1. Wireless Communications: Principles and Practice, 2nd Edition, T S Rappaport, Pearson Education. .(Unit's I,II,III&IV).

REFERENCES:

1. J G Proakis, Digital Communication, McGraw Hill, 1995.
2. GE Stuber, Principles of Mobile Communications, Kluwer academic 1996.

ECSP 2002 SATELLITE COMMUNICATIONS

UNIT - I

Introduction

Orbital aspects of Satellite Communications - Look Angle and Orbit determinations - Orbital effects in communication system Performance

Space craft subsystems

AOCS, TT& C, Power system, Satellite transponder, spacecraft Antennas Satellite Link Design System Noise temperature and 'G/T ratio - Design of downlink, Uplink - Design of satellite links for specified C/N

UNIT - II

Multiple Accesses

FDMA, TDMA, CDMA, Estimating channel requirements- Practical Demand Access systems, Multiple Access With on board processing

Encoding and forward error correction for Digital Satellite links

Error detection and correction capabilities of Linear Block codes, Binary Cyclic codes, performance of Block error correction Codes, Implementation of error Detection on satellite links.

UNIT - III

Earth Station Technology

Earth Station Design, Design of Large Antennas, Tracking, Small earth station Antennas, Equipment for earth station.

Satellite Packet Communications:

Message transmission by FDMA: The M/G/1 Queue, Message transmission by TDMA - Pure ALOHA: Satellite packet switching - slotted ALOHA -Packet Reservation - Tree algorithm.

UNIT - IV

Very small Aperture Terminal Networks

VSAT Technologies - Network Configurations - Multi access and Networking Network Error Control - Polling VSAT Networks.

Mobile Satellite Networks :Operating Environment - MSAT Network concept - CDMA MSAT Network.

TEXT BOOKS

1. Satellite Communications by T. Pratt and C.W. Bostian (1 Ed). (UNIT-I to III)
2. Digital Satellite Communication by Tri T. Ha (2 Ed) (UNIT-III & IV)

REFERENCE:

1. Satellite Communications - by Dr. D.C. Agarwal
2. Electronic Communication Systems -by Tomasi. W

ECSP 2003 REALTIME SIGNAL PROCESSING

UNIT – I

Real time concepts, structural levels of processing, Digital Signal Processing and DSP systems, Comparison between general purpose and DSP processors, Examples of digital signal processors, Motivation of the specialized processors.

UNIT – II

Numeric representation and Arithmetic Fixed point vs floating point, native data word width, Relation between data word size and Instruction word size, Effects of finite word registers.

UNIT – III

Key features of TMS 320C54XX, architecture and addressing modes, Important Instruction set of TMS 320C54XX .

UNIT – IV

Implementation of Digital Filters on DSP Processors – FFT, FIR filters. IIR filters, Adaptive filters and multirate filters.

TEXT BOOKS:

1. Real time Signal Processing, John G. Ackenhusin, Prentice Hall of India, 1999 (Unit I)
2. DSP Processor Fundamentals – Architecturs and Features: Phil Lapsley, Jeff Bier, Amit Sheham, S. Chand & Co., New Delhi (Unit II)
3. Digital Signal Processing, Avtar Singh, S. Srinivasan, IE publications (Unit III&IV)

REFERENCES:

1. B. Venkataramani, M. Bhaskar, Digital signal processors Architecture, programming and applications, TMH publications
2. TMS 320C54XX users guide.

ECSP 2004 SPEECH PROCESSING

UNIT – I

Digital Models for the Speech Signal

Introduction – Digital Speech Processing, Digital Models for the Speech Signal: Introduction, The process of Speech Production, Mechanism of Speech Production, Acoustic Phonetics, Acoustic Theory of Speech Production, Sound Propagation, Example: Uniform Lossless tube, Effect of losses in the vocal track, effect of radiation at the lips, vocal track transfer functions for the vowels, effect of nasal coupling, Excitation of sound in the vocal track, Lossless tube models- Wave propagation in concatenated lossless tubes, Boundary conditions, Transfer function of the lossless tube model.

UNIT – II

Time Domain Models for Speech Processing

Introduction, Time Dependent Processing of Speech, Short time Energy, Average Magnitude, Average Zero Crossing rate, Speech Vs Silence Discrimination Using Energy and Zero Crossings, Pitch Period Estimation using a parallel processing approach, Short time autocorrelation function, Short time average magnitude difference function, pitch period estimation short time auto correlation function , median smoothing and speech processing.

Short Time Fourier Analysis

Basic model short time analysis and synthesis of speech , implementation of filter bank summation methods using FFT, Pitch Detection, Analysis-by-synthesis, Analysis-synthesis systems

UNIT – III

Linear Predictive Coding of Speech.

Principles of linear predictive analysis, solution of LPC Equation, prediction error signal, frequency domain representation of LPC analysis, Relation between the various speech parameter, Synthesis of speech from LP parameters and applications

UNIT – IV

Homomorphic Speech Processing

Complex Cepstrum of Speech Signal, Pitch detection, Formant detection, Homomorphic vocoder. Man-machine communication, Speaker Recognition System , Speech Recognition Systems

TEXT BOOKS

1. L.R Rabiner and S.W.Schafer. Digital Processing of Speech Signals, Pearson Education (UNITS: I, II, III, IV).

REFERENCE BOOKS :

1. Douglas O Shaughnessy, Speech Communications, second Edition, OxfordUniversity Press, 2000
2. Thomas F Quatieri, Discrete-Time Speech Signal Processing: Principles and Practice, Prentice Hall2002

ECSP 2005/1 DIGITAL VIDEO PROCESSING

UNIT – I

Video Formation, Perception, and Representation

Video capture and display, Analog video raster, Analog colour television systems, Digital video

UNIT – II

Video sampling & Video modeling

Basics of Multidimensional Continuous space signals and systems, Discrete space signals and systems, Basics of Lattice theory, Sampling over lattices, sampling of video signals, Filtering operations in cameras and display devices, Conversion of signals sampled on Different lattices, Sampling rate conversion of video signals

Camera Model, Illumination model, Object model, Scene model, Two dimensional motion models

UNIT – III

Two Dimensional motion estimation

Optical flow, General methodologies, Pixel based motion estimation, Block Matching algorithm, Deformable block matching algorithms, Mesh based motion estimation, Global motion estimation, Region Based motion estimation, Application of motion estimation in video coding

UNIT – IV

Foundation of Video coding

Overview of coding systems, Basic notions in probability and information theory, Information theory for source coding, Binary coding, Scalar Quantization, Vector quantization

Block based transform coding and Predictive coding

TEXT BOOKS:

1. “Video processing and Communications” Yao Wang, Jorn Ostermann and Ya Qin Zhang, Prentice Hall Publishers ,2002, ISBN 0-13-017547-1, (UNITS: I, II, III, IV).

REFERENCE BOOKS:

1. R.Gonzalez, R.E.Woods, “Digital Image Processing”, 3rd Edition, Pearson Education, India, 2009.
2. John W.Woods, “Multidimensional Signal, Image and Video Processing and Coding”Elsevier Academic Press Publications2006

ECSP 2005/2 DSP PROCESSORS AND ARCHITECTURES

UNIT I

INTRODUCTION TO DIGITAL SIGNAL PROCESING

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

COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS

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

UNIT II

ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES

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

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

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

UNIT III

IMPLEMENTATIONS OF BASIC DSP ALGORITHMS

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

IMPLEMENTATION OF FFT ALGORITHMS

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

UNIT IV

INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES

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

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004. (UNITS I, II, III & IV)

REFERENCES:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

ECSP 2005/3 RANDOM PROCESSES AND INFORMATION THEORY

UNIT -I

RANDOM VARIABLES

Definition of Random Variable, Probability of Distribution Function, Probability Density Function(PDF), Conditional and Joint Distribution and Densities, Functions of Random Variables, Determining the PDF of $Y = g(X)$, Expected value of a Random Variable, Conditional Expectations, Moments, Joint Moment, Properties of Uncorrelated Random Variables, Jointly Gaussian Random Variables.

UNIT -II

RANDOM PROCESSES

Introduction, Mathematical definition of a Random Process, Stationary Processes, Mean, Correlation, and Covariance Functions, Ergodic Processes, Transmission of a Random Process through a Linear Time-variant Filter, Power Spectral Density, Gaussian Process, Noise, Narrowband Noise, Representation of Narrowband Noise in terms of In-phase and Quadrature Components, Representation of a Narrowband Noise in terms of Envelope and Phase Components, Sine Wave and Narrow Band Noise.

UNIT -III

ADVANCED TOPICS IN RANDOM PROCESSES

Mean square (m.s.) calculus, Stochastic Continuity and Derivatives, Further results on m.s. Convergence, m.s. Stochastic Integrals, m.s. Stochastic Differential Equations, Karhunen-Loeve Expansion, presentation of Band limited and Periodic Processes, Band limited processes, Band pass Random Processes, WSS Periodic processes, Fourier series for WSS processes.

UNIT -IV

INFORMATION THEORY

Uncertainty, Information, Entropy, Source Coding Theorem, Data compaction, Discrete Memory-less channels, Mutual information, Channel capacity, Channel-coding theorem, Differential Entropy and Mutual information for continuous Ensemble, Information capacity theorem, Implications of the information capacity theorem, Information capacity of colored Noise channel, Rate Distortion theory, Data Compression.

TEXT BOOKS:

1. Henry Stark, John W. Woods, Probability and Random Processes with Applications to Signal Processing, 3rd Edition, Prentice Hall, 2002
2. Simon Haykin, Communication Systems, 4th Edition, Wiley & Sons, 2004.

REFERENCES:

1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles , TMH, 4th Edition, 2001
2. Athanasios Papoulis and S.Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes –PHI, 4th Edition, 2002.

ECSP 2006/1 AD HOC NETWORKS

UNIT I

INTRODUCTION TO ADHOC NETWORKS: Origin of Ad hoc Packet Radio Networks – Technical Challenges – Architecture of PRNETs – Components of Packet Radios, Ad hoc Wireless Networks – What is an Ad Hoc Network? Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Ad hoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks – Ad hoc wireless Internet.

UNIT II

MAC PROTOCOLS FOR AD HOC NETWORKS: Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks – Classifications of MAC Protocol . MACAW – FAMA – BTMA – DPRMA – Real-Time MAC protocol – Multichannel protocols – Power aware MAC

ROUTING PROTOCOLS FOR AD HOC NETWORKS

Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols -Table-driven protocols – DSDV – WRP – CGSR – On-Demand protocols – DSR – AODV – TORA – LAR – ABR – Zone Routing Protocol – Power Aware Routing protocols.

UNIT III

MULTICAST ROUTING IN ADHOC NETWORKS

Introduction – Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols.

Classifications of Multicast Routing Protocols -Tree-Based Multicast Routing Protocols- BEMRP, MZRP, MCEDAR- Mesh-Based Multicast Routing Protocols - ODMRP, DCMP, FGMP, NSMP. Energy-Efficient Multicasting

UNIT IV

TRANSPORT LAYER PROTOCOLS

Introduction – Issues in Designing a Transport Layer Protocol for Ad hoc Wireless Networks – Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks –Classification of Transport Layer Solutions – TCP over Ad hoc Wireless Networks – Other Transport Layer Protocols for Ad hoc Wireless Networks

TEXT BOOKS:

1. “Ad Hoc Wireless Networks Architectures and Protocols”, C. Siva Ram Murthy and B. S. Manoj, Pearson, 2004.(Units-I,II,III & IV)
2. “Ad Hoc Mobile Wireless Networks: Protocols and Systems”, C. K. Toh, Prentice Hall, 2001. (Unit- I)

REFERENCES:

1. C. S. Raghavendra, Krishna M. Siva lingam, (2004) “Wireless Sensor Networks”, Springer.

ECSP 2006/2 ANTENNAS FOR WIRELESS COMMUNICATION

UNIT- I:

Essential techniques in Wireless Antenna Design & Systems: Evolution of wireless communication, Technologies in Mobile Communications, Antenna Design- Requirements for Mobile Antennas, Diversity Techniques. Land mobile antenna design- Base Station Antenna Techniques – Types- Recent Base Station Antennas for cellular systems- Antennas for Personal phone

UNIT – II

Smart antennas: Key benefits, Smart antenna technology, Fixed & switched beam forming, Adaptive antenna, Adaptive array for Wireless Local Loop Wideband smart antenna-spatial diversity-diversity combining-Coherent & non coherent CDMA spatial processors, Dynamic rescoring using smart antennas, Beam forming for CDMA, Digital Beam forming

UNIT – III

Antennas for Pagers, Portable Phones, RFID and Personal communication: Pager antenna-practical requirements-Effect of the human body on Antennas, Types and performance, Portable phone antenna-Design Techniques-antenna types, Handsets- design concept-antennas for GSM, PDC and PHS, Diversity Performance in PDC Handsets, RFID antenna

UNIT – IV

Antennas for Cars, Trains, Intelligent Transportation: antennas for broadcast reception in Cars, TV reception in cars, Train radio system, Intelligent Transportation Systems, Vehicle Antennas, Omni directional and directional antennas for Mobile Satellite.

Antennas for Mobile Satellite and Aeronautical mobile system: Antenna Systems for GPS, Array Antenna for GPS Reception, Handset Antennas for Satellite Systems Advanced Circularly Polarized Antennas-Crossed-Dipole Antennas, Crossed-Slot Antennas, Quadrifilar Helical Antennas, Micro strip Patch Antennas

TEXT BOOK:

1. “Smart Antennas for Wireless Communication” Joseph C.Liberti & Theodore S. Rappaport, Prentice Hall Communication Engineering Series.1999
2. “Mobile Antenna Systems Handbook”, II Edition, K.Fujimoto, J.R.James, Artech House, 2001.

REFERENCES:

1. BALANIS.A, “Antenna Theory Analysis and Design”, John Wiley and Sons, New York, 2000.
2. KIN-LU WANG, “Planar Antenna for Wireless Communications”, John-Wiley 2002.

ECSP 2006/3 VLSI SIGNAL PROCESSING

UNIT – I

Introduction to DSP systems – Typical DSP Algorithms, DSP Application Demands and Scaled CMOS Technologies, Representation of DSP Algorithms; Iteration Bound – Data Flow Graph Representations, Loop Bound and Iteration Bound, Algorithms for computing Iteration Bound; Pipelined and parallel processing- Pipelining of FIR Digital Filters, Parallel Processing.

UNIT – II

Retiming – Definitions' and Properties, Solving systems of Inequalities, Retiming Techniques; Unfolding – An Algorithm for Unfolding, Properties of Unfolding, Critical Path, Unfolding, and Retiming, Applications of Unfolding; Folding – Folding Transformation, Register Minimization Techniques, Register Minimization in Folded Architectures.

UNIT – III

Systolic architecture design – Systolic Array Design Methodology, FIR Systolic Arrays, Selection of Scheduling Vector, Matrix- matrix Multiplication and 2D Systolic Array Design; Fast convolution – Cook-Toom Algorithm, Winograd Algorithm, Iterated Convolution, Cyclic Convolution, Design of Fast Convolution Algorithm by Inspection; Algorithmic strength reduction in filters and transforms – Parallel FIR Filters, DCT & Inverse DCT.

UNIT – IV

Pipelined and parallel recursive and adaptive filters – Pipeline Interleaving in Digital Filters, Pipelining in 1st-Order IIR Digital Filters, Pipelining in Higher-Order IIR Digital Filters, Parallel processing for IIR Filters, Combined Pipelining and Parallel Processing for IIR Filters.

TEXT BOOKS

1. " VLSI Digital Signal Processing systems, Design and implementation", Keshab K.Parthi, Wiley, Inter Science, 1999.

REFERENCE BOOKS :

- 1.Mohammed Isamail and Terri Fiez, " Analog VLSI Signal and Information Processing ", Mc Graw-Hill,1994.
- 2.S.Y. Kung, H.J. White House, T. Kailath, " VLSI and Modern Signal Processing ", Prentice Hall,1985.
- 3.Jose E. France, Yannis Tsividis, " Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing ", Prentice Hall, 1994.

ECSP 2051 DSP LAB

Matlab Programs

1. Implementation of DIT-FFT
2. Implementation of DIF-FFT
3. Design and implementation of IIR filters
4. Implementation of Edge detection using various operators
5. Implementation of Line detection, Point detection & Global thresholding.
6. Implementation JPEG algorithm for image compression.
7. Implementation of convolution encoder & convolution veterbi decoder.
8. Implementation of Adaptive filters.

Digital Signal Processors

9. Program to perform Linear convolution using CC Studio
10. Program to perform Circular convolution using CC Studio
11. Program to perform FFT operation using CC Studio .
12. Program to perform Correlation using CC Studio
13. Implementation of FIR filters using Window Techniques