

DETAILED
SYLLABUS

for

M Tech Degree Course
(Semester System)

TELEMATICS

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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**Academic Regulations for M.Tech(VR10) w.e.f: 2010-2011
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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, PG CET Admissions.

5.2 CATEGORY –B Seats :

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

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	Communication s 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.

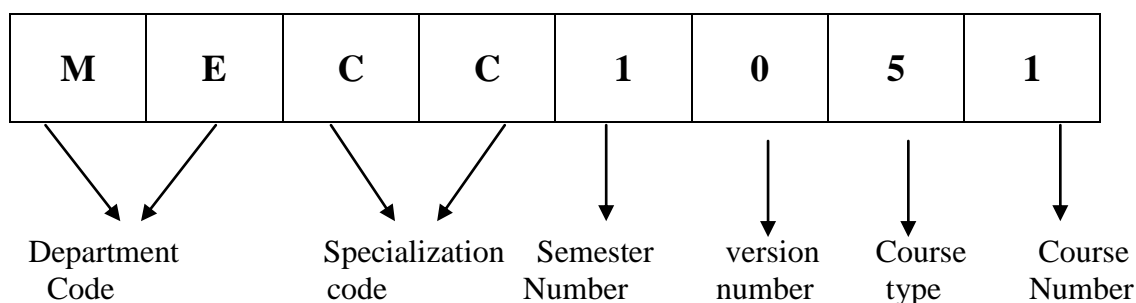


Figure 1: Course Code Description

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 $2/3^{\text{rd}}$ in the examination in which the student scores more marks and $1/3^{\text{rd}}$ 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:

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

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:

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

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 any where 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 a 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.
- Un authorized 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
TELEMATICS

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	ECTM1001	Real Time Embedded Systems	4	0	0	4	40	60	100
2	ECTM1002	Intelligent Transportation Systems	4	0	0	4	40	60	100
3	ECTM1003	Wireless Communications And Networks	4	0	0	4	40	60	100
4	ECTM1004	Ad Hoc Networks	4	0	0	4	40	60	100
5	ECTM1005	Elective –I	4	0	0	4	40	60	100
6	ECTM1006	Elective – II	4	0	0	4	40	60	100
7	ECTM1051	Wireless Communication Lab	0	0	3	2	25	50	75
8	ECTM1052	Seminar	0	0	3	2	25	50	75
Total			24	0	6	28	290	460	750

Elective –I

ECTM1005/1 Location Based Services

ECTM1005/2 Fundamentals of Transportation Telematics

ECTM1005/3 Fleet Telematics

Elective- II

ECTM1006/1 DSP Processors and Architectures

ECTM1006/2 Embedded Communication Software Design

ECTM1006/3 Data Communication and Networks

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	ECTM2001	Embedded Networking	4	0	0	4	40	60	100
2	ECTM2002	Embedded Systems Design using ARM Technology	4	0	0	4	40	60	100
3	ECTM2003	Wireless Sensor Networks	4	0	0	4	40	60	100
4	ECTM2004	Wireless Security	4	0	0	4	40	60	100
5	ECTM2005	Elective –III	4	0	0	4	40	60	100
6	ECTM2006	Elective –IV	4	0	0	4	40	60	100
7	ECTM2051	Ad Hoc Networks and WSN Lab	0	0	3	2	25	50	75
8	ECTM2052	Term Paper	0	0	3	2	25	50	75
Total			24	0	6	28	290	460	750

Elective – III

ECTM2005/1 Data Compression
 ECTM2005/2 Antennas for Wireless Communications
 ECTM2005/3 Artificial Neural Networks

Elective – IV

ECTM2006/1 Electronic Toll Collection-RFID
 ECTM2006/2 Modeling and Simulation of Transportation Telematics
 ECTM2005/3 Teletraffic Theory

L: Lecture **T:** Tutorial **P:** Practice **C:** Credits

I: Internal Assessment **E:** End Examination **T:** Total Marks

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THIRD AND FOURTH SEMESTERS

SI No	Subject Code	Subject Title	Credits	Evaluation
1.	ECTM 4051	PROJECT	24	50 Marks (Internal)
2.		& VIVA VOICE		& 200 Marks (External)
TOTAL			24	250 Marks

ECTM1001 - REAL TIME EMBEDDED SYSTEMS

UNIT I:

Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits

DEVICES AND BUSES FOR DEVICES NETWORK

I/O Types and Examples – Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-communication Devices - UART and HDLC ,SPI, SCI AND SI- Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - ‘12C’, ‘USB’, ‘CAN’

UNIT II:

DEVICE DRIVERS AND INTERRUPTS SERVICE MECHANISM

PROGRAMMING CONCEPTS AND EMBEDDED PROGRAMMING IN C, C++
Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions -Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic order, Objected Oriented Programming – Embedded Programming in C++, ‘C’ Program compilers – Cross compiler – Optimization of memory codes.

UNIT III: REAL TIME OPERATING SYSTEMS

Definitions of process, tasks and threads – Clear cut distinction between functions – ISRs and tasks by their characteristics, Semaphores, Shared data problem – Use of Semaphore(s), Inter Process Communications using Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Sockets
Operating System Services – Kernel - Process Management – Memory Management – Device Management, File System Organization, Interrupt Routines Handling in RTOS. RTOS Task scheduling models – Co-operative model, Cyclic and Round Robin Scheduling with Time Slicing – Preemptive Scheduling Model – Critical Section Service by a Preemptive Scheduler – Fixed (Static) Real time scheduling of tasks.

UNIT IV: REAL TIME OPERATING SYSTEMS

Study of Micro C/OS-II or Vx Works or Any other popular RTOS – RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions

Case Studies of Programming with RTOS – Understanding Case Definition – Multiple Tasks and their functions – Creating a list of tasks – Functions and IPCs – Exemplary Coding Steps.

TEXTBOOKS:

1. Embedded Systems Architecture, Programming and Design, First reprint Oct. 2003, Rajkamal, TATA McGraw-Hill.(UNITS I, II, III, IV)

REFERENCES :

1. Steve Heath, Embedded Systems Design, Second Edition-2003, Newnes,
2. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.
3. Wayne Wolf, Computers as Components; Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001
4. Frank Vahid and Tony Givargis, Embedded Systems Design – A unified Hardware /Software Introduction, John Wiley, 2002.

ECTM1002- INTELLIGENT TRANSPORTATION SYSTEMS

UNIT I:

The State-of-the-Art in ITS: The Broad Scope of ITS, A Working Definition of ITS, Current Status of ITS, A Critical Review of the State-of-the-Art in ITS

FUNDAMENTAL ISSUES IN TRANSPORTATION SYSTEMS

Principal characteristics of intelligent transportation systems, Scientific validation of ITS designs through modelling and simulation.

DARYN: A DISTRIBUTED DECISION –MAKING ALGORITHMS FOR RAILWAY NETWORKS.

Introduction, The DARYN approach, Implementation of DARYN on ARMSTRONG, Performance of DARYN, limitations of DARYN

UNIT II:

RYNSORD - Novel Decentralised algorithm for railway networks with soft reservation
Introduction, The RYNSORD approach, modelling RYNSORD on an accurate, realistic, parallel processing test bed, implementation issues, simulation data and performance analysis.

DICAF: A Distributed, scalable architecture for IVHS

Introduction, DICAF: A Novel, distributed and scalable approach to IVHS, Modelling DICAF on an accurate, realistic, Parallel processing testbed, implementation and debugging issues, simulation results and performance analysis of DICAF.

UNIT III:

STABILITY OF RYNSORD UNDER PERTURBATIONS

Introduction, formal definition of stability of RYNSORD, modelling RYNSORD for stability analysis, implementation issues, stability analysis of RYNSORD.

MODELLING AND SIMULATION TECHNIQUES FOR ITS DESIGNS

Introduction, virtual and physical process migration strategies for ITS designs, software techniques underlying the process migration strategies, implementation issues, simulation results and performance analysis.

UNIT IV:

FUTURE ISSUES IN INTELLIGENT TRANSPORTATION SYSTEMS: Future issues in intelligent transportation systems

New Meta-Level Principles for an Untapped ITS Technological Mine: Meta-Level Principles, The ITS Mine and New Mining Implements, Examples of Formidable Challenges and Amazing Opportunities

TEXT BOOKS:

1. Sumit Ghosh, Tony S. Lee, “Intelligent Transportation Systems: Smart and Green Infrastructure Design”, Second Edition, CRC Press (UNIT- I, II, III & IV).

ECTM1003 - WIRELESS COMMUNICATIONS AND NETWORKS

UNIT I:

Wireless Communications & System Fundamentals: Introduction to wireless communications systems, examples, comparisons & trends. Cellular concepts- frequency reuse, strategies, interference & system capacity, trucking & grade of service, improving coverage & capacity in cellular systems. **Multiple Access Techniques for Wireless Communication:** FDMA, TDMA, SSMA (FHMA/CDMA/Hybrid techniques), SDMA technique, Packet radio access-protocols, CSMA protocols, reservation protocols, capture effect in packet radio , capacity of cellular systems .

UNIT II:

Wireless Networking: Introduction , differences in wireless & fixed telephone networks, traffic routing in wireless networks –circuit switching, packet switching X.25 protocol. Wireless Data Services - Cellular Digital Packet Data (CDPD), Advanced Radio Data Information Systems, RAM Mobile Data (RMD). Common channel signaling (CCS), ISDN-Broad band ISDN & ATM ,Signaling System No .7 (SS7) - protocols, network services part, user part, signaling traffic, services & performance.

UNIT III:

Wireless Local Loop

Wireless Local Loop, IEEE 802.16 Fixed Broadband Wireless Access Standard

Mobile IP and Wireless Application Protocol:

Mobile IP, Operation of mobile IP, Co-located address, Registration, Tunneling

Wireless Application Protocol- Architectural overview, Wireless Mark Language, WML scripts, Wireless session protocol, wireless transaction protocol, Wireless datagram protocol.

UNIT IV:

Wireless LAN Technology:

Infrared LANs, Spread spectrum LANs, Narrow band microwave LANs, IEEE 802 protocol Architecture, IEEE802 architecture and services, 802.11 medium access control, 802.11 physical layer.

Bluetooth: Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol. Introduction to WLL Technology.

TEXTBOOKS:

1. Wireless Communications, Principles, Practice – Second Edn., 2002, Theodore S. Rappaport, PHI.(Refer to Unit I & II)
2. Wireless Communication and Networking – Education 2002, William Stallings, Pearson. (Refer to Unit III & IV)

REFERENCES:

1. Wireless Digital Communications – Kamilo Feher, PHI, 1999.
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.

ECTM1004 - 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”, 2004, C. Siva Ram Murthy and B. S. Manoj, Pearson. .(Units-I,II,III & IV)
2. “Ad Hoc Mobile Wireless Networks: Protocols and Systems”,2001.C. K. Toh, Prentice Hall. (Unit- I)

ECTM1005/1 - LOCATION BASED SERVICES (Elective-I)

UNIT I: FUNDAMENTALS

Introduction, Application Scenarios, LBS Actors, Standardization, Location Categories, Spatial Location.

SPATIAL DATABASES IN GIS

Spatial databases and GIS, Geographic versus spatial data modules, Representing spatial objects, Features and themes, Algorithms of computational geometry, Geography markup language.

UNIT II: CELLULAR NETWORKS AND LOCATION MANAGEMENT

Overview of cellular systems, principles of cellular networks, mobility management, common concepts of location management, location management in CS networks, location management in PS networks.

UNIT III: FUNDAMENTALS OF POSITIONING

Classification of positioning infrastructures, Basic positioning methods, Range of measurements, Accuracy and precision, Error sources.

SATTELLITE POSITIONING: Global positioning system

CELLULAR POSITIONING: Positioning in GSM networks, positioning in UMTS networks, Assisted GPS in GSM and UMTS.

UNIT IV: INTERORGANIZATIONAL LBS OPERATION

LBS supply chain, scenarios of the LBS Supply chain, supplier/consumer patterns for location dissemination.

ARCHITECTURES AND PROTOCOLS FOR LOCATION SERVICES

GSM and MTS Location Services, Enhanced Emergency Services, Mobile location protocol.

TEXT BOOKS:

1. Location Based Services: Fundamentals and Operation, **ISBN-10:** 0470092319, **ISBN-13:** 978-0470092316, Axel Kupper, WILEY Publishers. (Unit- I, II, III, IV)

**ECTM1005/2 - FUNDAMENTALS OF TRANSPORTATION TELEMATICS
(Elective I)**

UNIT I:

INTRODUCTION TO TRANSPORT SYSTEMS

Definition and goals of transportation – Six I s in transportation – Three leg stool of transportation system – Challenges and specification of the transportation system.
Role of Telematics in transportation.

TRANSPORTATION SYSTEM COMPONENTS: A Internal Perspective – Physical Components of Transportation Systems, Operators, Operating Plans.

Transportation System Components: A External Perspective – External Components of Transportation Systems.

UNIT II:

MODELS AND FRAMEWORK- Introduction to Modeling and Framework, A structure of Transportation Analysis, Abstraction of Real World in to Models and Frameworks, Models, Modeling Approaches, Framework.

MODELING CONCEPTS – Introduction to Models, Different types of Models, Why we model, Issues in Model Building, New developments in models and framework.

Fundamentals of Traffic Flow and Control-Traffic flow elements, Traffic flow models, Shock wave in traffic streams, Traffic Signalization and Control Principles, Traffic Simulation

UNIT III

PRINCIPLES IN TRAFFIC INFORMATION SENSING

Types and quality definition of data needed in Intelligent Transportation Systems - Traffic data and their quality Traffic Flow characterization

Measures of data uniformity - Classification of traffic sensing approaches.

Key Points of Transportation Systems.

UNIT IV:

TRAFFIC TELEMATICS IN PRACTICE

Transport Telematics in context with transport policy - Section-related (sensors) data collection, Track-related (Floating Car Data) data collection - Traffic data fusion - Online traffic information systems.

TEXT BOOKS:

1. Introduction to Transportation Systems, 2000, Joseph Sussman, Artech House Publishers.
2. Fundamentals of Transportation Engineering: A Multimodal Systems Approach, 2004, Jon D. Fricker, Robert K. Whitford, Prentice Hall.
3. Transportation Engineering: Theory and Methods|| ,1st edition, 2001, Ennio Cascetta, Springer Publishers.
4. Fundamentals of Intelligent Transportation Systems Planning, 2003, Mashrur A. Chowdhury, Adel W. Sadek, Artech Print on Demand.

ECTM1005/3 FLEET TELEMATICS

UNIT I:

Introduction: Enabling technologies, Transport Telematics, Enabling technologies: wireless communication, positioning systems, geographical information systems.
Transport Telematics: traffic & travel information, vehicle related safety, commercial vehicles. Commercial vehicle operations: Development of road freight transport, Fundamentals of road freight transportation, Management levels, Operational and real-time tasks.

UNIT II:

Management information systems: A typical legacy information system, Potentials of Telematics.
The Telematics-enabled information system, Implementation and case study.

Unit III:

Models for routing a fleet of commercial vehicles: The Vehicle Routing Problem, The Pickup and Delivery Problem
The General Vehicle Routing Problem, Drivers' working hours.

UNIT IV:

Dynamic vehicle routing: Dynamic vs. static planning, State of the art, 4 Neighbourhood operators.
Insertion methods, Reduced Variable Neighbourhood Search, Large Neighbourhood Search, Evaluation and Case Study.

TEXT BOOKS:

1. Fleet Telematics: Real-time management and planning of commercial vehicle operations by Asvin Goel, Springer Publications. (Unit- I, II, III, IV)

ECTM1006/1 - DSP PROCESSORS AND ARCHITECTURES (Elective II)

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, 2004, Avtar Singh and S. Srinivasan, Thomson Publications.
(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.

**ECTM1006/2 - EMBEDDED COMMUNICATION SOFTWARE DESIGN
(Elective-II)**

UNIT I:

INTRODUCTION TO COMMUNICATION

OSI Reference Model Communication Devices - Communication Echo System Design Consideration - Host Based Communication - Embedded Communication System - OS Vs RTOS.

SOFTWARE PARTITIONING

Limitation of strict Layering - Tasks & Modules - Modules and Task Decomposition - Layer2 Switch - Layer3 Switch / Routers

UNIT II:

Protocol Implementation - Management Types - Debugging Protocols.

TABLES & OTHER DATA STRUCTURES

Partitioning of Structures and Tables - Implementation - Speeding Up access - Table Resizing - Table access routines.

UNIT III:

Buffer and Timer Management - Third Party Protocol Libraries.

MANAGEMENT SOFTWARE

Device Management - Management Schemes - Router Management - Management of Sub System Architecture - Device to manage configuration - System Start up and configuration.

UNIT IV:

MULTI BOARD COMMUNICATION SOFTWARE DESIGN- Multi Board Architecture - Single control Card and Multiple line Card Architecture - Interface for Multi Board software - Failures and Fault Tolerance in Multi Board Systems.

Program Development Steps -Hardware Independent Development - Using a COTS Board - Development Environment - Test Tools.

TEXT BOOKS

1. "Designing Embedded Communication Software", 2003, Sridhar .T, Elsevier publications. (UNITS I, II, III & IV)

ECTM1006/3 - DATA COMMUNICATION AND NETWORKS (Elective -II)

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, Volume 1 & 2, 2001, . W.Richard Stevens and Gary R Wright, Addison Wesley.

ECTM1051- WIRELESS COMMUNICATION LAB

- [1]. Spectral Characteristic Measurements
- [2]. Signal Modulation Quality Measurements (AM/FM/PM/FSK/PSK/QAM)
- [3]. Amplitude shift keying/Frequency shift keying/Phase shift keying
- [4]. Time Division Multiplexing/Frequency Division Multiplexing
- [5]. Orthogonal Frequency Division Multiplexing
- [6]. Configuring PXIe System for RF/Wireless Communications.
- [7]. FM audio transmitter (PXIe)
- [8]. FM audio receiver (PXIe)
- [9]. AM video transmitter (PXIe)
- [10]. AM video receiver (PXIe)

ECTM2001 - EMBEDDED NETWORKING

UNIT I:

EMBEDDED NETWORK REQUIREMENTS Embedded networking - code requirements - Communication requirements - Introduction to CAN open from Application Level
CAN open standard –Object directory - Electronic Data Sheets & Device - Configuration files - Service Data Objectives - Network management CAN open messages - Device profile encoder.

UNIT II:

CAN CONFIGURATION CAN open configuration - Evaluating system requirements choosing devices and tools - Configuring single devices - Overall network configuration - Network simulation - Network Commissioning - Advanced features and testing.

Underlying Technology CAN-CAN Overview – An Introduction to CAN

UNIT III:

Selecting a CAN Controller - CAN development tools.
MICRO CAN Implementing CAN open- Communication layout and requirements - Comparison of implementation methods-Simple Do It Yourself Implementation – MicoCANopen.

UNIT IV:

CAN open source code - Conformance test – Choosing an Implementation Path- CANopen Example—Example of Entire design life cycle.
IMPLEMENTATION Implementation issues - Physical layer - Data types - Object dictionary - Communication object identifiers - Emerging objects - Node states.

TEXT BOOKS:

1. "Embedded Networking with CAN and CAN open", Glaf P.Feiffer, Andrew Ayre and Christian Keyold, Embedded System Academy 2005. (UNITS I, II, III & IV)

ECTM2002- EMBEDDED SYSTEM DESIGN USING ARM TECHNOLOGY

UNIT-1:

Introduction to Processor Design: Abstraction in Hardware Design, MUO a simple processor, processor design trade off, Design for low power consumption.
ARM Processor as System on-Chip: Acron RISC Machine-Architecture inheritance-Arm Programming model-ARM development tools-3 and 5 stage pipeline ARM organization - ARM Instruction execution and implementation -ARM Co-Processor interface.

UNIT-2:

ARM Assembly Language Programming: ARM instruction types-Data transfer, data processing and control flow instructions -ARM Instruction set-Co-processor instructions.

Architecture support for High Level Language: Data types-abstraction in software design - Expressions-Loops-Functions and procedures -Conditional Statements-Use of Memory.

UNIT-3:

Memory Hierarchy: Memory size and speed-On-Chip memory-Caches-Cache design-an example-memory management.

Architectural Support for System Development: Advanced Microcontroller Bus architecture (AMBA)-ARM memory interface-ARM reference peripheral specification- Hardware system Prototyping Tools- Armulator -Debug architecture.

UNIT-4:

Architectural Support for Operating Systems: An introduction to Operating Systems- ARM system control co processor -CP15 Protection unit registers -ARM Protection unit- CP15 MMU registers-ARM MMU Architecture-Synchronization-Context Switching input and output.

TEXT BOOKS:

1. ARM System on Chip Architecture, 2nd ed., 2000, Steve Furber, Addison Wesley Professional. (UNITS I, II, III & IV)

REFERENCES:

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

ECTM2003- WIRELESS SENSOR NETWORKS

UNIT I:

Advantages of Sensor Networks, Sensor Network Applications, Collaborative Processing, Key Definitions of Sensor Networks.

CANONICAL PROBLEM: LOCALIZATION AND TRACKING

Problem Formulation, Distributed Representation and Inference of States, Tracking Multiple Objects, Sensor Models, Performance Comparison and Metrics.

UNIT II:

NETWORKING SENSORS

Medium Access Control, General Issues, Geographic, Energy-Aware Routing, Attribute-Based Routing.

INFRASTRUCTURE ESTABLISHMENT

Topology Control, Clustering, Time Synchronization, Localization and Localization Services

UNIT III:

SENSOR TASKING AND CONTROL

Task-Driven Sensing, Roles of Sensor Nodes and Utilities, Information-Based Sensor Tasking, Joint Routing and Information Aggregation

SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms, Node-Level Simulators, Programming Beyond Individual Nodes:

UNIT IV:

SENSOR NETWORK DATABASES

Sensor Database Challenges, Querying the Physical Environment, Query Interfaces, Cougar sensor database and abstract data types, Probabilistic queries High-level Database Organization, In-Network Aggregation, and Data-Centric Storage
Data Indices and Range Queries, Distributed Hierarchical Aggregation, Temporal Data.

APPLICATIONS AND FUTURE DIRECTIONS: Emerging Applications, Future Research Directions,

TEXT BOOKS:

1. WIRELESS SENSOR NETWORKS, An Information Processing Approach by Feng Zhao, Microsoft Research, Redmond, WA, Leonidas Guibas, Geometric Computing Group, Stanford University, Stanford, CA. 1st Edition, Morgan Kaufmann Title ISBN: 978-1-55860-914-3 (UNITS I, II, III & IV)

ECTM2004 WIRELESS SECURITY

Unit – I

Introduction, Protecting the means of Communications, protecting privacy, protecting safety, Personal and Public, Shaking up the status quo, Understanding wireless forecasts, reasonable degrees of security, regulatory environments and issues, security related regulations and market factors, guidelines for security measures.

Information Warfare: Functional taxonomy based on information Warfare, Taxonomies of Wireless Communication Networks, taxonomy based on mobility only, Decision Theory, INFOSEC, Vulnerability, Threats, Countermeasures, Impact

Unit II

Cryptographic Security

Concealment, First principles, Lock and key analogy, Transposition ciphers, Substitution Ciphers, Kerchoff's principles, Product ciphers, Classical cryptanalysis, digital cryptography, PRNG, data encryption standard, stream ciphers design considerations, HORNET, Entropy Accumulator Description

Unit III

Speech Cryptology

Phonemes and Phones, Threads, Writing systems, TBS, TDS, Time element scrambling, hopping window, sliding window, Two dimensional scramblers

Unit IV

Bluetooth

Basic specifications, technology, specification development, security architecture, Scatternets, security functions at baseband layer, and link layer, Service discovery protocols, frequency hopping, channel establishment, security manager, authentication, encryption, models, key length negotiation, encryption with the E0 stream., Bluetooth holes, Jamming

Text books:-

Wireless Security: Models, Threats, and Solutions, Edition 2006, Randall K. Nichols, Panos C. Lekkass, Tata McGraw Hill. (UNITS I, II, III & IV)

ECTM2005/1 DATA COMPRESSION (Elective III)

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.

REFERENCES

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

ECTM2005/2 - ANTENNAS FOR WIRELESS COMMUNICATION (Elective III)

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 beamforming, Adaptive antenna, Adaptive array for Wireless Local Loop Wideband smart antenna-spatial diversity-diversity combining-Coherent & noncoherent CDMA spatial processors, Dynamic resectoring using smart antennas, Beamforming for CDMA, Digital Beamforming

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, Omnidirectional 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, Microstrip Patch Antennas

Text Books:

- 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.

ECTM2005/3 ARTIFICIAL NEURAL NETWORKS (Elective III)

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, Support Vector Classification

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, Support Vector Machines, Probabilistic Neural Networks, Polynomial Networks.

UNIT III

Unsupervised Learning: Winner-Take-All Networks, Learning Vector Quantizers, Counter propagation Networks, Adaptive Resonance Theory, Topologically Organized Networks, Distance-based Learning, Principal Component Analysis Networks.

UNIT IV

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

Text Book:

1. 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
3. Wasserman: Neural Computing - Theory and Practice

ECTM2006/1 - ELECTRONIC TOLL COLLECTION-RFID (Elective IV)

UNIT I:

Differential Features Of RFID, Fundamental Differentiation Features, Transponder Construction Formats, Frequency, Range and Coupling, Active and Passive Transponders, Information Processing in the Transponder, Selection Criteria for RFID Systems.

UNIT II:

Fundamental Operating Principles, 1-Bit Transponder, Full and Half-Duplex Procedure, Sequential Procedures, Near-Field Communication(NFC).
Physical Principles of RFID Systems, Magnetic Field, Electromagnetic Waves, Surface Waves, Security of RFID Systems, Attacks of RFID Systems,

UNIT III:

Protection of Cryptographic Measures, Frequency Ranges Used, Data Integrity, Multi access Procedures-Anti Collision.
The Architecture Of Electronic Data Carriers, Transponder with Memory Function, Microprocessors, Memory Technology, Measuring Physical Variables, Data Flow in Applications, RF Interface, Control unit,

UNIT VI:

Integrated RF Interface, Connection of Antennas for Inductive Systems, The Manufacturer of Transponders and Contactless Smart cards, Glass and plastic Transponders, Contactless Smart Cards.
Automatic Number Plate Recognition: Optical character recognition, Vehicle registration plate.

TEXT BOOKS:

1. RFID Handbook: Fundamentals and Applications in Contactless Smart Cards, Radio Frequency Identification and Near-Field Communication, Third Edition [Hardcover]
Dr Klaus Finkenzeller (Author), Dorte Muller (Translator), WILEY Publishers (UNITS I, II, III & IV)

REFERENCES:

1. Guide to Electronic Toll Payments By James Muma Mwape, ISBN 9781615793648, Xulon Press.
2. Automatic Number Plate Recognition [Paperback], Frederic P. Miller (Editor), Agnes F. Vandome (Editor), John McBrewster (Editor), Alphascript Publishers.

**ECTM2006/2 - MODELLING AND SIMULATION OF TRANSPORTATION
TELEMATICS (Elective IV)**

UNIT I:

INTRODUCTION TO MODELING

Modeling Aspects – zoning – Graph models - High level modeling – Low level modeling
-Approaches to modeling ,Traffic models – User behavior models – Self localization.

UNIT II:

ELEMENTS OF GRAPH THEORY

Definitions - Modeling approach - Characterization of Graphs - Specifying graphs -
Properties of the Adjacency and Incidence matrix - Shortest Path Algorithms - Spanning
Tree Algorithms.

FLOW THEORY

Introduction - Facts about flows - Augmenting Paths - Important theorems about flows –
Consequences - The Min-Cut-Max-Flow theorem - The Travelling Salesman Problem -
The Transportation Problem

UNIT III:

SELF LOCATION

Estimation philosophies - Least Squares Estimator - Maximum-Likelihood Estimator -
Bayesian Estimator.

The Basic Idea of State Estimation – Kalman Filter – Particle Filter.

UNIT IV

GAME THEORY

Definition – Basic concepts – Game theory example – Equilibria - Mixed Strategies.

SELFISH ROUTING

Path and Flow Costs - Feasible flows - Marginal Cost Functions – Nash flows – Optimal
flows - The Price of Anarchy.

TEXT BOOKS:

1. Transportation Engineering: Theory and Methods, 1st edition, 2001, Ennio Cascetta, Springer Publishers.
2. Kalman Filtering and Neural Networks, Simon Haykin, John Wiley & Sons, New York, USA, 2001.
3. Theoretical improvements in algorithmic efficiency for network flow problems|| , Edmonds, J. and Karp, R. M, Journal of the ACM, 19(2):248–264.

ECTM2006/3 - TELETRAFFIC THEORY (Elective-IV)

UNIT I:

Introduction to Teletraffic Engineering: Modeling of telecommunication systems, ITU recommendations on traffic engineering.

Traffic concepts and grade of service: Concept of Traffic and Traffic unit, Traffic variations and the concept busy hour, The blocking concept, Traffic generation and subscribers reaction, Introduction to Grade-of-Service.

UNIT II:

Time Interval Distributions:

Exponential distribution, Steep distributions, Flat distributions, Cox distributions, Other time distributions, Observations of life-time distribution.

Arrival Processes:

Description of point processes, Characteristics of point process, Little's theorem.

The Poisson process:

Characteristics of the Poisson process, Distributions of the Poisson process, Properties of the Poisson process, Generalisation of the stationary Poisson process

UNIT III:

Multi-Dimensional Loss Systems:

Multi-dimensional Erlang-B formula, Reversible Markov processes, Multi-Dimensional Loss Systems, Convolution Algorithm for loss systems, State space based algorithms.

Dimensioning of telecom networks:

Traffic matrices, Topologies, Routing principles, Approximate end-to-end calculations methods, Exact end-to-end calculation methods, Load control and service protection, Moe's principle.

UNIT IV:

Traffic measurements:

Measuring principles and methods, Theory of sampling, Continuous measurements in an unlimited period, Scanning method in an unlimited time period.

Applied Queueing Theory:

Classification of queueing models, General results in the queueing theory, Pollaczek-Khintchine's formula for $M/G/1$, Priority queueing systems, Queueing systems with constant holding times, Single server queueing system, Round Robin and Processor-Sharing.

TEXT BOOKS:

1. Teletraffic Engineering and Network Planning by Villy B. Iversen, 2006. (UNITS I, II, III & IV)

ECTM2051 - AD HOC NETWORKS AND WSN LAB

Ad Hoc Networks:

SOFTWARE: Network Simulator 2

1. Scene description
2. Scene generation
3. MAC Protocol testing
4. Routing protocol testing
5. Throughput Analysis
6. Grid based routing

Wireless Sensor Networks:

SOFTWARE and HARDWARE: NI LabVIEW and WSN Nodes and Gateways.

7. Topology Control
8. Clustering
9. Timing Synchronization
10. Localization.