Scheme of Courses
for
M. Tech.
in
Communication and Information Technology

Recommended
by
The Board of Studies
Meeting
Held on August 10, 2006

Effective from Session: August 2006

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR 190 006
KASHMIR J& K INDIA

National Institute of Technology Srinagar
Electronics & Communication Engineering Department

M. Tech. Communication and Information Technology (CIT)

Course Structure

1. A student has to complete a minimum of 60 credits for the award of M. Tech Degree. The credit structure is as follows:
   - Core : 27 credits
   - Project : 15 credits
   - Electives : 18 credits (minimum)
2. Full time duration : 2 years, Subject to maximum of 2 ½ years
3. Part time duration : 3 years, Subject to maximum of 3 ½ years
4. Full time student has to take 12 to 18 credits in each semester.
3. Part time student has to take 9 to 12 credits in each semester.
4. In addition to above a student can audit a total number of 3 courses during his entire programme of M. Tech, for which he will be awarded a AU grade, subject to following:
   a. In 1st year: 1st semester, full time student is not allowed to audit a course, whereas a part-time student can do so.
   b. A part time or full time student can audit only one course in one semester.

Paper No	Subject	Number of credits
Core Courses:		
Odd Session		
ECEM-101	Digital Communications	3
ECEM-102	Software Engineering	3
ECEM-103	Wireless Communications	3
ECEM-104	Advanced Computer Architecture	3
ECEM-105	Laboratory I (Digital Communication)	1
ECEM-106	Laboratory II (RDBMS)	2
ECEM-107	Advanced Design Techniques (Laboratory Course based on simulation tools)	2
Even Session		
ECEM-108	Computer Networks	3
ECEM-109	Image Processing	3
ECEM-110	Laboratory III (Image Processing)	1
ECEM-111	Laboratory IV (Internet and Web Design)	2
ECEM-112	Communication skills & Research Techniques	Compulsory Audit
Seminar & Project		
ECEM-201	Seminar	1

ECEM-202	Project (Dissertation) – I	3
ECEM-203	Project (Dissertation) – II	12

Elective Courses:

(Minimum of 18 credits to be chosen in)

ECEM-151	Advanced Digital Signal Processing	3
ECEM-152	Multimedia Information System	3
ECEM-153	Advanced microprocessors	3
ECEM-154	Advanced TV Technology and Cable TV	3
ECEM-155	VLSI Design	3
ECEM-156	OOPS with JAVA	3
ECEM-157	System Software	3
ECEM-158	Special Topics in Applied Mathematics	3
ECEM-159	Embedded Systems	3
ECEM-160	Real Time Operating Systems	3
ECEM-161	Optical Communications	3
ECEM-162	Telemedicine	3
ECEM-163	Random Processes and Queuing Theory	3
ECEM-164	VLSI Technology	3
ECEM-165	Management Information System	3
ECEM-166	Special Topics in Communications	3
ECEM-167	Switching and Statistical Multiplexing in Telecommunications networks	3
ECEM-168	Analog & Mixed Signal Design	3
ECEM-169	Computer and Network Security	3
ECEM-170	ESD reliability	3
ECEM-171	RF IC Design	3
ECEM-172	System Design	3
ECEM-173	Special Topics in Information Technology (IT)	3
ECEM-174	Object Oriented Database	3
ECEM-175	Data ware Housing	
ECEM-176	E-commerce	3
ECEM-177	Software Project Management	3
ECEM-178	Computer Vision and Artificial Intelligence	3
ECEM-186	Programming and Programming Methodology	3
ECEM-187	Artificial neural Networks	4
ECEM-188	Pattern Classification	4
ECEM-189	Network Security Laboratory	2
MTHM-103	Function spaces and Wavelet Analysis	3
MTHM-104	Operations Research	3
MTHM-105	Advanced Engineering Mathematics	3

Course: ECEM 101 (Digital Communications)

Characterization of communication signals and systems. Signal space representation, Representation of digitally modulated signals. Optimum receivers for AWGN channels, Correlation demodulator, matched filter demodulator, Optimum detector, and Maximum likelihood sequence detector. Performance of optimum Receivers in terms of probability of error, for memory less modulation, Regenerative repeaters and link budget analysis. Signal design for Band-limited Channels, Optimum pulse shaping, Digital communication through Fading and multipath channels, Inter symbol interference (ISI), Nyquist criteria for zero ISI. Zero forcing, fractionally spaced, linear and adaptive channel equalization. Multi-user communication.

Course: ECEM 102 (Software Engineering)

Introduction, System analysis, User interface design, Debugging, Profiling and testing methods, Operating system interface, Support tools and scripting language, Project management, User and system documentation.

Course: ECEM 103 (Wireless Communication)

Cellular concepts, frequency reuse, co channel interference, Cell splitting. Radio propagation characteristics; models for path loss, shadowing and multipath fading (delay spread, coherence bandwidth coherence time. Doppler spread). Jakes' channel model. Digital modulation for mobile radio; analysis under fading channels; diversity techniques and Rake demodulator. Introduction to spread spectrum communication. Multiple access techniques used in mobile wireless communications: FDMA/TDMA, CDMA. The cellular concept: Frequency reuse; the basic theory of hexagonal cell layout; spectrum efficiency. FDM/TDM Cellular systems; channel allocation schemes. Handover analysis. Cellular CDMA; soft capacity. Erring capacity comparison of FDM/TDM systems and cellular CDMA. Discussion of GSM standards; signaling and call control; mobility management; location tracing. Wireless data networking; packet error modeling on fading channels, performance analysis of link and transport layer protocols over wireless channels; mobile data networking (mobile IP); wireless data in GSM, IS-95, and GPRS.

Course: ECEM 104 (Advanced Computer Architecture)

High performance processor, Architecture. Motivations for parallel processing. Classification of parallel architectures: SIMD/MIMD, Control data flow, Distributed/ Shared Memory architectures. Mapping algorithms onto regular arrays: Data dependencies, Linear, Rectangular Mesh and Hexagonal Arrays and algorithms for these architectures. SIMD Algorithms: Design considerations, Masking, Vector instruction and data structures. Memory allocation techniques. Interconnection Networks. Sorting and data broadcasting. Massively parallel SIMD computing. MIMD algorithms (shared memory): Synchronization, Mutual exclusion,

Hot Spots. Algorithms for SM/SIMD Machines, Performance issues, MIMD algorithms (Distributed memory): Synchronous and asynchronous operation. Message Routing schemes. Interconnection networks. Packets and Circuits switching. Network architectures. Distributed Algorithms.

Course: ECEM 105 (Digital Communication Lab)

1. Study of Sampling theorem for Band limited signals
2. Study of PCM and ADPCM signal coding techniques
3. Study and generation various digital modulation techniques like FSK, PSK, Differential PSK, Quadrature PSK, QAM
4. Study and generation of different line coding signal formats like NRZ, RZ, Bipolar RZ, AMI, Manchester coding and HDBn etc
5. Study and implementation of error correcting and error detecting techniques am-ming code for error correction, Polynomial code for error detection
6. Study and implementation of FDM, TDM and CDM multiplexing techniques
7. Measurement of Bit error rate of a digital communication channel
8. Study and generation of spread spectrum signals

Course: ECEM 106 (RDBMS Lab)

The student will be exposed to database access techniques using an interactive approach. This approach will use Industry Standard Structured Query Language (SQL) to maintain tables to answer queries and maintain data using single tables and multiple table joins.

The student would have to develop and write SQL queries that will

1. Extract data from a single table
2. Use predicates and operators
3. Use SQL functions
4. Add, change and remove data in a data base
5. Manage database transactions
6. Create and manage tables and other data base objects
7. Control access to data
8. Join together data items from multiple tables
9. Use sub-queries for selection of data
10. Perform summery analysis

Course: ECEM 107 (Advanced Design Lab (Techniques)

1. Introduction to Unix
2. Circuit simulation-using SPICE, application of SPICE for analog design
3. Timing simulation with IRSIM, Design of static and dynamic digital circuits with IRSIM
4. Layout of integrated circuits. Use of the layout tool MAGIC for analog and digital integrated circuits
5. Group projects on design, analysis and layout of integrated circuits

Course: ECEM 108 (Computer Networks)

Review of data communication techniques. Data transmission, line coding, error control coding. Data switching, circuit switching message and packet switching. Network model ISO-OSI model, primitives and services. Local Area Network. LAN topologies and protocols. Elements of queuing. Data link control Simplex, pipelined and sliding window protocols, simplex performance analysis. X.25 data link layer. Random accesses techniques. Pure, slotted and finite population ALOHAs. Stability in ALOHAs. Routing and congestion control Static, adaptive, centralized and distributed routing procedures, congestion control. IEEE 802x protocols, implementation and performance issues. High speed LAN's. Transport layer. Quality of service, transport classes. Design issues, buffer management, synchronization. Session and presentation layer synchronization issues. Formatting data, compression, and data security. Broadband services, Admission and access control in broadband networks, ATM reference model.

Course: ECEM 109 (Image Processing)

Introduction: imaging and imaging devices. Image sampling and quantization, relationship between pixels and imaging geometry. Image enhancement techniques: Frequency domain, spatial domain, and fuzzy logic based. Image Segmentation: using edge detection and edge linking techniques, Image threshold and region oriented segmentations. Image representation schemes: Chain codes, polygonal approximation, and signatures. Shape descriptors: Fourier descriptors. Descriptor using moments. Descriptor using AR and CAR modeling. Texture: Introduction to texture, different techniques of texture analysis and their comparison.

Course: ECEM 110 (Image Processing Lab)

1. Image acquisition, digitization and display
2. Application of edge detection techniques on Images
3. Enhancement of images using histogram equalization, histogram modification, and fuzzy Logic
4. Segmentation of images using thresholding and region growing

Course: ECEM 111 (Internet and Web Design Technologies Lab)

1. Basic tools of Internet access, email, ftp, telnet, news, anarchie, www.
2. Basic INTERNET protocols, TCP/IP, SMTP, ftp, http, routers, algorithms and protocols for routing

3. Internet programming, Unix system calls, socket programming, Languages for the Internet, HTML, XML, Java Script, Perl, Applications
4. Network information discovery and retrieval, web servers, robots and search engines
5. Security, firewalls, encryption and protocols
6. Internet - IP v6

Course: ECEM 112 (Communication skills & Research Techniques)

Basics of communication, communication skills, public speaking, communication methods and media, e-mail & beyond, learning through internet, multimedia presentations, effective meetings, professional care of your voice, group discussions & interviews, literature survey, research techniques, optimizations of research parameters, making video films, basic elements of ETV production, distance education,

Course: ECEM 151 (Digital Signal Processing)

Discrete-time signals and systems, frequency domain representation, z-transform, discrete Fourier transform, discrete convolution and correlation. Fast Fourier transform algorithms, computational considerations. Digital filters representations, forms, realizations, Design of digital filters, specifications and design techniques IIR and FIR digital filter. Decimation in time and decimation in frequency algorithms, Applications of digital signal processing. Finite word length effect in digital signal processing applications. Introduction to Digital signal processors, Fixed and Floating point DSP Processors, Memory architecture of DSP processors .

Course: ECEM 152 (Multimedia Information Systems)

Introduction to Multimedia, Multimedia Objects, Multimedia in business and work. Multimedia hardware, Memory & Storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Multimedia information, Delay-sensitive and time based Media data modeling, Multimedia storage and retrieval techniques, Multimedia communications: Synchronization, delay compensation, QOS negotiation protocols, Architectures and issues for distributed multimedia systems, Prototype multimedia systems: Video-on-Demand, Video conferencing.

Course: ECEM 153 (Advanced Microprocessors)

Pin configuration, Architecture, Memory and I/O space of 8086 microprocessor. Addressing modes and Instruction set. Introduction to assembly language of 8086 microprocessor and example programs. Input/output processor, Interfacing of memories, I/O operations. Programmable interrupt controller,

Programmable communication interface, Programmable Keyboard/Display interface. Floppy disk controller, DMA controller, USART controller, Pointer Controllers, etc. Introduction to 8088 and Pentium series.

Course: ECEM 154 (Advanced TV Technology and Cable TV)

Basic Color TV fundamentals: Optics of the color TV, Luminance and color signal generation, color TV cameras, CCD camera, Color Picture tubes, Chrominance signal generation, complete composite transmitter signal, Different color TV systems-NTSC, SECAM, PAL, Coders and decoders, PAL color TV receiver block diagram. Color TV receivers: Tuner section, IF section, Sound section, Sync section, chroma processing subsystem, EHT generation, SMPOS system, remote control techniques. Alignment and servicing of color TV receiver. Teletext, View data, video games and video recording systems, Advances in video technology and new video TV systems: Projection TV, stereo sound system, 3D Pictures, Digital TV, HDTV, Extended definition TV system, video compression. Direct to home TV broadcasting: Satellite TV system, antenna system, mixers and satellite receivers. Basic community TV system and cable TV system, mixers, modulators, amplifiers, signal splitters, cables for TV distribution.

Course: ECEM 155 (VLSI Design)

Review of MOS transistor models. CMOS logic families including static, dynamic and dual rail logic. Integrated Circuit Layout: Design Rules, Parasitics. Building blocks: ALU's, FIFO's, counters. VLSI system design, data and control path design, floor planning, Design methodology: Introduction to hardware description languages (VHDL), logic, circuit and layout verification. Design examples.

Course: ECEM 156 (OOPS with JAVA)

Introduction, Need of Java, Java as a technology, Objects, Classes, Objects, Classes, Object interaction, Object oriented design and Analysis, Java programming constraints, Inheritance, Abstraction, Polymorphism, Encapsulation, Aggregation, Static binding.

Course: ECEM 157 (System Software)

Functional overview of system software: macro-processors, assemblers, loaders, linkers, compilation and interpretation. Operating systems: introduction concurrency and threads process management, memory management, Disk I/O and File Systems.

Course: ECEM 159 (Embedded Systems)

Embedded system concepts. Hardware organization and architecture, Micro-controllers, Technological aspects of embedded systems, ADC/DAC, Input/ Output devices, Memory devices, Synchronous/ Asynchronous data transfer. Serial/parallel communication ports, programming embedded systems. Embedded

board level design concepts. Introduction to MEMS.

Course: ECEM 160 (Real Time Operating Systems)

Operating system and function, Evolution of operating system, Batch, Interactive, Time Sharing and Real Time System, System protection. Operating Systems types, Process Concept. Concurrency and Synchronization, Mutual Exclusion and Deadlock Problems. Process Management. Process States, Process scheduling Algorithms and Implementation. Storage Management. Concepts and implementation of Real and Virtual Storage. File Management, File Organization, File Systems, Protection and security Performance Evaluation, Case study of the UNIX Operating Systems, Basic issues in Multiprocessor and Distributed Operating Systems.

Course: ECEM 161 (Optical Communication)

Introduction to optical communication, review of optical sources, fibers and detectors, Optical Signaling scheme viz. IM, PL, PCM/PL, digital PPM, PRM, PFM etc., Various receiver configurations – direct detection, homo-dyne and heterodyne, noise sources in optical communication – model noise, speckle noise, shot noise, phase noise, thermal noise etc., integrated and trans-impedance amplifier, optical line coding, performance evaluation of optical receiver for various modulation and demodulation schemes and their comparative study, PINFET receivers, diversity receivers – phase, polarization and combined, introduction to optical space communication, optical fiber link design, fiber optic networks, LIDAR.

Course: ECEM 162 (Telemedicine)

Introduction, Significance, Infrastructure. Picture archiving and communication systems. Transmission and reception of bio signals. Special Topics in Telemedicine. Minor project

Course: ECEM 163 (Random Processes and Queuing Theory)

Probability, random variables, probability distribution and density functions, joint statistics, conditional static's, independence. Functions of random variables and random vectors. Expectation moments, characteristic functions. Convergence of a sequence of random variables, law of large numbers, central limit theorem. Random Processes, mean and autocorrelation, stationary ergodicity, cyclostationarity, Power spectral density. Response of memoryless and linear systems. Gaussian, Poisson, Markov and Wiener processes. Bi-spectrum, higher order spectra, Kahunen-Loeve expansion.

Detailed study of stochastic processes encountered in queuing theory, namely, point processes – Poisson processes, renewal processes, Markov processes, Markov renewal processes. Study of stationary

behavior (queue lengths, delays blocking) of single station and multi-station queuing systems with various disciplines.

Course: ECEM 164 (VLSI Technology)

Crystal growth, zone refinement, impurities and Defects in Semiconductor crystals. Crystal orientation, wafer preparation, Lapping, etching, polishing, Epitaxial growth of elemental semiconductor materials, Measurement on semiconductor materials. Hall effect measurement, Ohmic contacts, vacuum technology and fabrication of thin film components and devices, ion Implementation, Planner technology, Thick film technology, Fabrication of Photo-conductive and eluminicient devices, Handling and Packaging of microwave integrated circuits.

Course: ECEM 165 (Management of Information Systems)

Introduction to data information system and end users. System and system concept, Physical and computed system, Variables of a system, Data and information processing, Characteristics of data processing (DP), Kinds of DP & steps in DP, Methods of system design: Problem definition, System analysis, System design, Logic for problem solution/problem planning, program preparation. Decicion Support system and overview, Characteristics of DSS, Components and classification of DSS. Debugging & testing, Documentation, Maintenance; Types of information, M.I.S.: Past & present projection, Internal & external information, Planning control & operational functions, Uniform information, Proper time frame, Assistance in decision making. Model based management systems, function time, certainty, uncertainty, risk structures.

Course: ECEM 167 (Switching and Statistical Multiplexing in Telecommunication Networks)

Issues, architectures and performance analysis for statistical bandwidth sharing (multiplexing) and traffic switching in telecommunication networks. Switching: Interconnection networks for circuit and fast packet switching, and their blocking and queuing analysis; call processing architectures; switching system capacity analysis and traffic overload control. Statistical multiplexing; blocking analysis in circuit multiplexed networks, with single rate or multi-rate traffic, call-level multiplexing, burst-level multiplexing. Models for packetised sources, such as voice and video. Models for performance analysis of integrated packet networks; calculation of performance measures; analysis and design of traffic controls. Throughout the course the models will be motivated by problem arising in telephone networks, cellular mobile network and high-speed packet switched networks.

Course: ECEM 168 (Analog and mixed Signal Design)

Introduction to analog VLSI and mixed signal issues in CMOS technologies.

Basic MOS models, SPICE Models and frequency dependent parameters. Basic NMOS/CMOS gain stage, cascade and cascode circuits. Frequency response, stability and noise issues in amplifiers. CMOS analog blocks: Current Sources and Voltage references. Differential amplifier and OPAMP design. Frequency Synthesizers, Voltage Controlled Oscillators and Phased lock-loop. Non-linear analog blocks: Comparators, Charge-pump circuits and Multipliers. Data converters. Analog Interconnects. Analog Testing and Layout issues. Low Voltage and Low Power Circuits. Introduction to RF Electronics. Basic concepts in RF design.

Course: ECEM 169 (Computer and Network Security)

Introduction to computer networks and network security, Authentication and authorization overview, vulnerabilities, risk assessment, incidents, forensics. UNIX vulnerabilities and safeguards, Hash functions (MD5, SHA, RIPEM),Network security (BSDisms, sniffers, wrappers, vpns, firewalls, intrusion detection). Kerberos, DCE. Cryptography, steganography, number theory, random numbers. Secret key encryption (DES, IDEA, RC5, CAST, AES (Rijndael)).Public key encryption (Diffie-Hellman, RSA, ECC, DSA).key management, PKIs .Crypto API's. Secure applications: PGP, S/MIME, CFS, ssh, Netscape/SSL, IPsec. Issues: legal/political/ethical. Operating system security, Operating system security model, Secure security issues, Firewalls, Java security

Course: ECEM 170 (ESD Reliability)

Basics of ESD. ESD models, Testing, Characterization, and failure mechanisms. ON-Chip ESD protection. Advanced ESD protection Design, ESD protection for embedded and high frequency design.

Course: ECEM 171 (RF IC Design)

Introduction to RF and Wireless Technology: Complexity, design and applications. Choice of Technology. Basic concepts in RF Design: Nonlinearly and Time Variance, intersymbol Interference, random processes and Noise. Definitions of sensitivity and dynamic range, conversion Gains and Distortion. Analog and Digital Modulation for RF circuits: Comparison of various techniques for power efficiency. Coherent and Non coherent defection. Mobile RF Communication systems and basics of Multiple Access techniques. Receiver and Transmitter Architectures and Testing heterodyne, Homodyne, Image-reject, Direct-IF and sub-sampled receivers. Direct Conversion and two steps transmitters. BJT and MOSFET behavior at RF frequencies Modeling of the transistors and SPICE models. Noise performance and limitation of devices. Integrated Parasitic elements at high frequencies and their monolithic implementation. Basic blocks in RF

systems and their VLSI implementation : Low Noise Amplifiers design in various technologies, Design of Mixers at GHz frequency range. Various Mixers, their working and implementations, Oscillators: Basic topologies VCO and definition of phase noise. Noise-Power trade-off. Resonatorless VCO design. Quadrature and single-sideband generators, Radio Frequency Synthesizes: PLLS, Various RF synthesizer architectures and frequency dividers, Power Amplifiers design. Linearisation techniques, Design issues in integrated RF filters.

Course: ECEM 172 (System Design)

Basics of system hardware design. Hierarchical design using top-down and bottom-up methodology. System partitioning techniques, interfacing between system components. Handling multiple clock domains, Synchronous and asynchronous design styles. Interface between synchronous and asynchronous blocks. Meta-stability and techniques for handling it. Interfacing linear and digital systems, data conversion circuits. Design of finite state machines, state assignment strategies. Design and optimization of pipelined stages. Use of data flow graphs, Critical path analysis, retiming and scheduling strategies for performance enhancement. Implementation of DSP algorithms.Signal integrity and high speed behaviour of interconnects: ringing, cross talk and ground bounce. Layout strategies at IC and board level for local and global signals.Power supply decoupling.

Course: ECEM 174 (Object Oriented Database)

Introduction to Object Oriented Database, Refreshing, extension and formalization of basic concepts in object oriented programming and relational databases problems concerning relational databases. Extensions of the relational model especially nested relational systems, theoretical foundations for the nested relational model. Object oriented databases--concepts and problems. Persistent programming ,Object oriented databases--semantic modeling, meta programming, long and short transactions, concurrent problems, version handling, introduction to prototypes and interfaces for object oriented database handling, representation of knowledge in object oriented database systems, modeling methods for object oriented databases, existing commercial and experimental object oriented database handling systems. Distributed object oriented database handling systems. Prototypes and user interfaces. Problems related to temporal and spatial aspects. Existing systems. An overview of commercial as well as academic systems.

Course: ECEM 175 (Dataware Housing)

Introduction to Data Warehousing. Client/Server Computing model & Data Warehousing. Parallel processors & Cluster Systems. Distributed DBMS implementations. Client/Server RDBMS Solutions. Data Warehousing Components. Building a Data Warehouse. Mapping the Data Warehousing to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, cleanup & Transformation Tools.

Metadata. Reporting & Query Tools & Applications. On line Analytical Processing (OLAP). Patterns & Models. Statistics. Artificial Intelligence.

Introduction to Data Mining. Decision Trees. Neural Networks. Nearest Neighbor & Clustering. Genetic Algorithms. Rule Induction. Selecting & Using the Right Technique.

Data visualization & Overall Perspective. Data Visualization. Putting it All Together.

Course: ECEM 176 (E-Commerce)

Introduction to E-Commerce, Forces behind E-Commerce, E-Commerce Industry Framework, and Brief History of E-Commerce. Inter Organizational E-Commerce, Intra Organizational E-Commerce, and Consumer to Business Electronic Commerce, Architectural framework. Network Infrastructure for E-Commerce, Market forces behind I-way, Component of I Way, Access Equipment, Global Information Distribution Network, Broadband Telecommunication. Introduction to Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology, Mobile Information Devices. Introduction to Web Security, Firewalls & Transaction Security, Client Server Network, Emerging Client Server Security Threats, Firewalls & Network Security.

World Wide Web & Security, Encryption, Transaction security, Secret Key Encryption, Public Key Encryption, Virtual Private Network (VPM), Implementation Management Issues. Overview of Electronics payment, Digital Token based Electronics Payment System, Smart Cards, Credit Card/Debit Card based EPS, Emerging financial Instruments, Home Banking, Online Banking.

EDI, EDI Application in Business, Legal requirement in E-Commerce, Introduction to supply Chain Management, CRM, issues in Customer Relationship Management.

Course: ECEM 177 (Software Project Management)

Rationale for software project management; software architecture; risk management; change control; team dynamics; theories of software development and project management; software maintenance; management-related people skills (listening, negotiation, conducting meetings, writing, leadership); gender-related and ethical issues in software development.

Course: ECEM 178 (Computer Vision and artificial Intelligence)

Introduction Artificial Intelligence: history, applications, current challenges, Basic concepts and definitions, intelligent agents. Solving problems by search Uninformed search, Informed, heuristic search, adversarial search. Knowledge Representation and Inference: Logical agents, First-order logic, inference rules, Non-monotonic reasoning, Knowledge representation: semantics, semantic nets, frames, scripts. Planning: The Inference: Uncertainty, Probabilistic reasoning, decision making, Hidden Markov models, Markov random

fields, Expert system architectures, Bayesian networks. Learning: Observations, Supervised learning: linear predictors, gradient descent, Sequential decision making, reinforcement learning, Artificial Neural Networks Speech Processing, Computer Vision and Perception: Probabilistic language processing, Perception, computer vision and robotics

Robots, External sensing requirements, Compliancy in wrists, Force control loop for assembly programming, High level programming language, Gripper design, Methods of part delivery, Interfacing to industrial equipments, Product design for assembly.

Course: ECEM 186 (Programming and Programming methodology)

Software engineering and the software lifecycle, project planning, software development and maintenance. Models of software engineering. Waterfall, prototyping, exploratory programming, formal transformations, code re-use and assembly. Requirements and specifications, requirements validation and prototyping. Software design, Modularity, decomposition, cohesion and coupling. Software qualities, white & black box testing Using fault models to guide testing, user interface attacks. Design methodologies, Representation and analysis, functional and object-oriented design, design notations. Validation and verification .Code evaluation and examination, metrics, code analysis, errors, defensive design, testing. Programming problems and case studies. Design idioms and patterns, design heuristics, good programming style.

Course: ECEM 202 & 203 (Project : Dissertation)

The project will involve the following activities, review of related work, specification, design and implementation, evaluation and presentation. It will be assessed on the basis of skill demonstrated in the application of design and evaluation techniques, ingenuity, originality and mastery of the chosen field, volume of work achieved, enthusiasm and diligence in its conduct, quality of outcome as shown by effectiveness as system or quality of the experimental results, completeness, coherence, organization, readability, comprehensibility. The students will be encouraged to publish at least one paper in any international journal of repute, besides presenting their work in conferences/workshops.