

BITS-Pilani, Hyderabad Campus: Course Description

M.E. Communication Engineering

Core Courses:

EEE C434 Digital Signal Processing

[3 0 3]

Introduction; design of analog filters; design of digital filters: (IIR and FIR); structures for the realization of digital filters; random signals and random processes; linear estimation and prediction; Wiener filters; DSP processor architecture; DSP algorithms for different applications.

EEE G581 RF & Microwave Engineering

[3 2 5]

Introduction to radio frequency engineering; advantages; various frequency bands; propagation; transmission lines; microwave waveguides and components; their characterizations; s-parameters and their use; microwave transistor; FETs, Gunn diode, IMPATT diodes; microwave tubes; Klystron; two cavity Klystron amplifier analysis; reflex Klystron; TWTs; high power tubes; cross field tubes; microstrip lines; MMICs; microwave measurements; microwave antennas and microwave communication system; microwave applications; ISM applications; introduction to EMI and EMC; microwave hazards.

EEE G612 Coding Theory & Practice

[3 2 5]

Codes for data-compression: instantaneous codes; Kraft inequality; Mcmillan theorem; Huffman codes; codes for error-detection and correction; binary symmetric channel; channel capacity, Shannon's fundamental theorem; linear codes; Macwilliam's identity; Reed-muller codes; cyclic codes; BCH codes; codes for secrecy and security; private-key cryptosystems; affine codes; twisted codes; one-time-pads; public-key cryptosystems based on large primes and discrete logarithms.

EEE G592 Mobile & Personal Communication

[3 2 5]

History of mobile radio; the mobile radio signal environment; review of statistical techniques; path over flat as well as hilly terrain; effects of RF system design on propagation; received signal envelope and phase characteristics; modulation schemes employed; functional design of mobile radio systems, diversity schemes-space; frequency and polarization diversity; mobile radio system functional design; signal error analysis versus performance criteria; multiple access schemes; classification of the concepts of sensitive topics; new concepts data transmission via cellular; spectrum and technology of WLL

EEE G622 Advanced Digital Communication

[3 2 5]

Introduction to Digital communication, review of probability and statistic processes; review of source coding and characterization of signals; optimum receivers for additive white gaussian noise channel; carrier & symbol synchronization; channel capacity & coding; block & convolutional codes; communication through band – limited linear filter channels; adaptive equalization multicarrier systems; digital communication through fading multipath channel; future trends in digital communication

EEE G591 Optical Communication**[3 2 5]**

Optical communication systems and components optical sources and transmitters (basic concept, design and applications); modulators (electrooptic, acousto-optic and laser modulation techniques); beam forming; focussing and coupling schemes to optical repeaters; optical amplifiers; optical field reception; coherent and non-coherent lightwave systems; fibre optic communication system design and performance; multichannel lightwave systems; long haul communications; fibre optic networks.

BITS G540 Research Practice**[4]**

This course is designed to train the students towards acquiring competence in research methodologies. The course will be conducted in terms of actual participation in Research and Development Work. Each student will be assigned to a faculty member to work on specified projects. The student will be required to present a number of seminars in his research area in a structured manner.

Electives:**BITS G553 Real Time Systems****[5]**

Real time software, Real time operating systems scheduling, virtual memory issues and file systems, real time data bases, fault tolerance and exception handling techniques, reliability evaluation, data structures and algorithms for real time/embedded systems, programming languages, compilers and run time environment for real time/embedded systems, real time system design, real time communication and security, real time constraints and multi-processing and distributed systems.

BITS G554 Data Compression**[5]**

Introduction: the need for data compression. Information theory and data compression; Entropy, Relative entropy and mutual information. Fano's inequality. Types of information sources, and source extension. Asymptotic equipartition property and data compression. Entropy rates of stochastic processes. Kraft inequality, Prefix codes, Huffman codes and Arithmetic coding. Quantization and Rate distortion theory. Lossy image compression techniques based on DCT, VQ and Fractals. Introduction to wavelets: continuous and discrete wavelet transforms. Filter banks and wavelets. Frames and tight frames. Wavelet packets. Wavelet based signal processing. Joint source and channel coding.

CS C461 Computer Networks**[3 0 3]**

Evolution of communication and computer networks, protocol layering, network reference models, multiple access protocols, local area networks, packet and circuit switching, switching fabrics, network performance analysis and simulation techniques; addressing, routing, flow and congestion control, IP protocol; Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM) reference models; network interoperability, traffic management and quality of service in integrated network protocol design and implementation strategies

CS G541 Pervasive Computing**[4]**

Select application architectures; hardware aspects; human-machine interfacing; device technology: hardware, operating system issues; software aspects, java; device connectivity issues and protocols; security issues; device management issues and mechanisms; role of web; wap devices and architectures; voice-enabling techniques; PDAs and their operating systems; web application architectures; architectural issues and choices; smart card-based authentication mechanisms; applications; issues and mechanisms in WAP-enabling; access architectures; wearable computing architectures.

CS G553 Reconfigurable Computing**[5]**

Overview of Programmable Logics. FPGA fabric architectures. Logic Elements and Switch Networks. Design and Synthesis of Combinational and Sequential Elements. Placement and Routing. Pipelining and other Design Methodologies. Fine-grained and Coarse-Grained FPGAs. Static and Dynamic Reconfiguration. Partitioning. Hardware/Software Portioning and Partial Evaluation. Systolic Architectures.

EA C415 Introduction to MEMS**[4*]**

Overview, history and industry perspective; working principles; mechanics and dynamics, thermofluid engineering; scaling law; microactuators, microsensors and microelectro mechanical systems; microsystem design, modeling and simulation; materials; packaging; microfabrication: bulk, surface, LIGA etc; micromanufacturing; microfluidics; microrobotics; case studies.

EA C451 Internetworking Technologies**[3 0 3]**

Introduction to internetworking concepts; the internet architecture; goals and key issues related to internetworking technologies; design aspects; HTTP and other relevant protocols; agent technology and tools relevant to the internet; techniques of data compression; voice, video, and interactive video- on-demand over the internet; multimedia operating systems and their impact; multimedia networking; mobile computing; internet security; case studies.

EA C473 Multimedia Computing**[3 0 3]**

Introduction to multimedia; media & data streams; image, video & audio file formats; image & video processing, synthesis of sound signal; image coding & compression, video & audio codecs, low rate video telephony; audio-visual integration, lip reading, face animation; augmented reality; multimedia search services, content based image & video indexing; access to multimedia, humanmachine interfaces, spoken language interface; algorithm vs. architecture based approaches, mul timedia processors, performance quantification; case studies, vision 2010.

EEE C414 Telecommunication Switching Systems and Networks**[3 0 3]**

Intoduction, electromechanical switching, pulse dialing and DTMF dialing, stored program control, space division switching, speech digitization and transmission, time division switching, fundamentals of traffic engineering, telephone networks, signaling, data networks, layered architecture and protocols, LANs, packet switching networks,TCP/IP, ISDN, ATM networks

EEE C472 Satellite Communication**[3 0 3]**

Review of microwave communications and LOS systems; the various satellite orbits like GEO, MEO, LEO; the satellite link analysis and design; the communication transponder system like INSAT, INELSAT etc; the earth segment and earth station engineering; the transmission of analog and digital signals through satellite and various modulation techniques employed; the multiple access techniques like FDMA, TDMA, CDMA, DAMA, etc; the INSAT program; salient features of INSAT – systems and services offered; satellite services offered by INTELSAT, INMARSAT and future satellites like IRIDIUM etc; future trends in satellite communications.

EEE G510 RF Microelectronics**[5]**

Introduction; application of RF electronics in modern systems; basic concepts in RF circuit design, active RF components: various RF diodes and transistors and their circuit models, matching and biasing networks, RF amplifier design: low power, low noise and broadband amplifiers, RF oscillator design; negative resistance oscillator; dielectric resonator oscillators, phase noise. RF Mixers: Balanced mixers; low noise mixers; noise in RF circuits, microwave transmitters and receivers.

EEE G512 Embedded System Design**[3 1 4]**

Introduction to embedded systems; embedded architectures: Architectures and programming of microcontrollers and DSPs. Embedded applications and technologies; power issues in system design; introduction to software and hardware co-design.

EEE G613 Advanced Digital Signal Processing**[5]**

Review of stochastic processes, models and model classification, the identification problem, some field of applications, classical methods of identification of impulse response and transfer function models, model learning techniques, linear least square estimator, minimum variance algorithm, stochastic approximation method and maximum likelihood method, simultaneous state and parameter estimation of extended kalman-filter, non-linear identification, quasi linearization, numerical identification methods.

EEE G626 Hardware Software Co-Design**[4]**

FPGA and ASIC based design, Low-Power Techniques in RT Embedded Systems On-chip networking. Hardware Software partitioning and scheduling, Co-simulation, synthesis and verifications, Architecture mapping, HW-SW Interfaces and Re-configurable computing.

EEE G627 Network Embedded Applications**[4]**

This course deals with the three main application areas of Network Embedded Systems – Wireless Sensor Networks, Automotive Networks, and Industrial Networks– Network Architecture, Deployment Issues, Network Protocol stack: Modular and Cross Layer Design. Network Node: Architectures, operating System and Applications. Middleware Issues and Design. Security and Encryption

IS C462 Network Programming**[3 0 3]**

Overview of computer networks; inter-process communication; network programming; socket interface; client-server computing model: design issues, concurrency in server and clients; external data representation; remote procedure calls; network file systems; distributed systems design

MEL G621 VLSI Design**[3 2 5]**

Introduction to NMOS and CMOS circuits; NMOS and CMOS processing technology; CMOS circuits and logic design; circuit characterization and performance estimation; structured design and testing; symbolic layout systems; CMOS subsystem design; system case studies.