Bachelor of Technology in Electronics and Communication Engineering (ECE)

(2019-20)

Bachelor of Technology in Electronics and Communications Engineering 2019-2020 - Scheme

Semester	Course Code, Course Name (L-T-P)Credits							GP	Contact Hours per Semester	Credits
1	MAL151 Engg Maths-I (3-0-2) 4	CSL106 FOCP-I (2-0-6) 5	CHL150 Engg Chemistry (1-0-3) 2.5	CLL101 Effective Communication- I (2-0-0) 2	MEP110 Engg Graphics & Drg. (3D Printing) (1-0-3) 2.5	CLL120 Human Values and Professional Ethics (1-0-1) 1.5	CSL110 Problem Solving & Design Thinking (0-0-4) 2	GP1 1 Credit	390	**19.5 +1 = 20.5**
2	MAL152 Engg Maths-II (3-0-2) 4	CSL108 FOCP-II (2-0-6) 5	PHY150 Engineering Physics (3-0-2) 4	CLL102 Effective Communication-II (2-0-0) 2	MEL150 Basic of Mechanical Engineering (1-0-3) 2.5	ECL110 Basic of Electrical & Electronics Engineering (2-0-2) 3		GP2 1 Credit	410	**20.5 + 1= 21.5**
	In house Training									**1**
3	CSL215 FOCP-III (2-0-6)5	OE-1 Maths Elective (2-0-2)3	ECL254 Fields, waves and Antennas (2-0-2) 3	ECL203 Analog Electronics and Integrated circuits (2-0-2) 3	ECL255 Digital Electronics and Computer Architecture (2-0-3) 3.5	CLP220 Creative Writing (0-0-2)1	ECP201 Project based learning(0-0-4)2	GP3 1 Credit		**20.5+1= 21.5**
4	ECL201 NT (2-0-2)3	ECL351 Signal processing (2-0-2) 3	ECL253 Analog and Digital communication (2-0-2) 3	ECL363 Embedded System Design (2-0-4) 4	PE-1 (2-0-4)4	ECD201 Creativity and Innovation Outcome Lab 1 Credit	ECV201 Skill Development (0-0-2)1	GP4 1 Credit		**19+1=20**
Summers	Internship									**2**
5	ECL264 RTL Design & Synthesis (2-0-5) 4.5	ECL367 Control Systems (1-0-3) 2.5	ECL302 Data communications and networks (1-0-3) 2.5	PE-2 (2-0-4)4	ECL316 Wireless and Mobile Communication (2-0-1) 2.5	ECC307 Seminar (1-0-0)1	ECD301 Creativity and Innovation Outcome Lab 1 Credit	GP5 1 Credit		**18+1=19**
6	PE-3 (2-0-4)4	PE-4 (2-0-4)4	OE-2 (2-0-2)3	CLP300 Campus to Corporate (1-0-1) 1.5	CHL100 Environmental Studies (2-0-0) 2	Management Course (2-0-0) 2	ECV301 Tech-SD II (0-0-2)1	GP6 1 Credit		**17.5+1= 18.5**
Summers	Internship									**3**
7	PE-5 (2-0-4)4	Foreign Language (2-0-0) 2	SML300 Entrepreneurship (2-0-0) 2	OE-3 Open Elective (MOOC) (2-0-2) 3	ECD401 Project # 1 (0-0-20) 10			GP7 1 Credit		**21+1=22**
8		Self-Study Course GATE Audit	ECL436 Technology and Ethics (Online) (S/NS) Audit		ECD402 Project # 2 / Internship (0-0-36) 18			GP8 1 Credit		**18+1=19**
	Total Credits								**160+8(GP)**	**168**

Program Electives

Sem IV	Sem V		Semester VI	Semester VII
PE-1	PE-2	PE-3	PE-4	PE-5
ECL308 Semicond. Devices	ECL314 Telecom Switching	**ECL 413 Machine Learning**	ECL411 Optical Comm./	**ECL428 Mobile Computing**
ECL309 Information Theory and Coding	**ECL323 Biomedical Electronics**	ECL403 Microwave and Radar	ECL416 Image Processing	ECL426 Adv. Wireless Comm. Sys
ECP311 Foundn course in Cloud Comp	ECP322 Fndn in Big Data Analytics	**ECL 324 Wireless sensor networks**	ECL352 Design for IoT	ECL401 Satellite & TV
ECL319 Digital Marketing	ECL410 Artificial Neural Networks	ECL420 Fuzzy Sets and Appl.	ECL440 Optimization Techniques	ECL430 Genetic Algorithm
ECL252 Microcontrollers and Sensors	ECL313 Adv. Digital System Design	**ECL315 Analog CMOS Circuit Design**	**ECL366 VLSI CAD & Algorithms**	**ECL417 Verification using system verilog**
Selected Topics in ECE course	Selected Topics in ECE course	Selected Topics in ECE course	Selected Topics in ECE course	Online courses in ECE

Highlights of B.Tech Electronics and Communication Engineering (ECE)

Electronics and Communication Engineering offers the students to delve into a broad range of fields from technology and science. ECE engineers design, analyze, program and supervise in the fields of electronics, communication, robotics, internet of things, embedded systems and VLSI design and many more. It aims to develop the knowledge and skills of the students on the basic concepts and theories that will equip them in their professional work involving analysis, system implementation, operation, production, and maintenance of the various applications in the field of Electronics and Communications Engineering. All of the applications which make our life easier and enjoyable such as Television, Radio, Computers, Mobiles etc. are designed and developed by Electronics and Communication Engineers. ECE engineers design and maintain satellites and also create advanced communication facilities like video conferencing which bring people together from all over the world.

Learning Outcomes of this program are:

- Ability to understand and apply knowledge of basic sciences which is ensured by including right mix of subjects of mathematics, science and basic engineering.
- Skills to identify, formulate, design and develop solutions for complex engineering problems through in-depth knowledge of core Electronics and Communication engineering subjects
- Practical proficiency in almost all the courses offered as part of their Electronics and Communication engineering program with good hands-on experience through practical experiments, projects and exposure through latest simulation tools, software and systems.
- Proficiency in multidisciplinary domains for devising the solution of real time problems, ability to work with national and international organizations and to understand the impact of engineering solutions on the society and environment.
- Realizing personal, social, professional and ethical responsibilities, ability to work as a team and communicate effectively, desire for life-long learning and exhibiting good behavior in all spheres of life

Career Options:

Communication Engineer

Project Design Application engineers

Embedded System Engineer

Automation Engineer

Software Analyst

Technical Director

Field Test Engineer

Senior Sales Manager

Network Planning Engineer

Customer Support Engineer

Electronics and Communications Consultant

Research & Development Software Engineer

Bachelor of Technology (Electronics and Communication Engineering)

(2019-20)

Department of Electrical, Electronics and Communications Engineering

DEPARTMENT CORE SUBJECTS

ECL110 Basics of Electrical and Electronics Engineering

3 credits (2-0-2)

D.C. Circuits, Mesh analysis, Nodal analysis, D.C. Network theorems, star-delta transformation, A.C. Circuits, RMS and average value of voltage and current, form factor, peak factor, series RLC circuit, complex power, transformer, diode, rectifier, clipper, clamper, LED, photodiode, zener diode, BJT, common base, common emitter, common collector configuration. architecture and organization."

ECL201 Network Theory

3 Credits (2-0-2)

Transient Response of RC, RL, RLC Circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using Laplace transform, Types of inputs, transfer function, network functions for one-port and two-port networks, poles and zeros of network functions, time domain behavior from the pole-zero plot, z, y, h, transmission parameters, relationships between parameter sets, inter-connection of two port networks, network topology, filter fundamentals, high-pass, low-pass, band-pass, and band-reject filters, positive real functions, synthesis of one port and two port networks.

ECP201 Project based learning

Credits 1 **(0-0-2)**

Introduction to Engineering Design is a core, offered with an aim to ignite the young minds with concepts in design and innovation. Using the tools and skills learnt in the lab, the students participate in a project challenge to build functional which will provide solutions to real life problems. The labs are structured to provide the building blocks of modern electronic gadgets where students learn and use characteristics of active and passive electronic components, solder, designing and working on PCB, SMD devices, IC 555 timer, DSP Chips to solve real day to day problems while using sense-think-act paradigm to interface and program Arduino microcontroller to a variety of sensors, motors, and learn and experience real time coverage issues and wireless coding techniques.

ECL 251 Analog Electronics & Integrated circuits

3 Credits (2-0-2)

This course will discuss the basic concepts of Analog Electronics and Integrated Circuits that can help the students to have a clear understanding of the working of analog circuits and integrated system.This course enables students to understand the concepts of BJT, FET, JFET, MOSFET, Biasing of transistors, transistor hybrid model, transistor amplifiers, introduction to differential amplifiers, Operational amplifiers and their characteristics, different feedback topologies, applications of Op-amps.

ECL253 Fields, Waves and Antennas

3 credits L-T-P(2-0-2)

Basic Vector Algebra, Coordinate Systems, Del Operator, Divergence and Curl theorems Electric field, Flux,

Potential, Gauss's law and applications, Bio-Savart's Law, Ampere's law and applications, magnetic flux density, Faraday's law and displacement current, Maxwell's equations in final form, EM waves in different media, EMI, EM hazards and compatibility, Working principle of an antenna, radiation mechanism, antenna parameters,Friis transmission Equation, Analysis of Hertzian dipole,Different types of antennas along with radiation pattern, radiation resistance and gain, Antenna arrays, Microstrip patch antenna, space wave propagation through Troposphere and ionosphere, MIMO systems, Smart antenna.

ECL255 Digital Electronics and Computer Architecture

3.5 Credits (2-0-3)

"This course will discuss the basic concepts of digital circuits and computer architecture and organization that can help the students to have a clear understanding of the working of digital circuits and computer system.This course enables students to design combinational circuits like adders, subtractors, multiplexer, demultiplexer, decoder, encoder and sequential circuits like latches, flipflops, registers and counters.

The course explains the structure and behaviour of the various functional modules of a computer and how they interact to provide the processing needs of a user. It progress to elaborate how the hardware components are connected together to form a computer system. By the end of this course the students will have a comprehensive understanding of the various aspects of computer

ECL254 Analog and Digital Communication

3 Credits (2-0-2)

This course is to study both analog and digital signal processing that forms an integral part of engineering systems in many diverse areas, including communications, speech processing and image processing. It includes cclassification and properties of continuous time and discrete time signals and systems, properties of LTI systems, Fourier transform and its properties, Laplace Transform and its properties, bilateral and unilateral Z-transform and its properties, ROC, solution of difference equation, inverse Z-transform, Analysis of systems in time and frequency domain, convolution Digital filter realizations, canonical forms, Digital Filter Design (IIR Filter and FIR Filter), DFT and FFT computation, circular convolution, Finite register lengths effects.

ECL258 Signal Processing

3 Credits (2-0-2)

This course is to study both analog and digital signal processing that forms an integral part of engineering systems in many diverse areas, including communications, speech processing and image processing. It includes cclassification and properties of continuous time and discrete time signals and systems, properties of LTI systems, Fourier transform and its properties, Laplace Transform and its properties, bilateral and unilateral Z-transform and its properties, ROC, solution of difference equation, inverse Z-transform, Analysis of systems in time and frequency domain, convolution Digital filter realizations, canonical forms, Digital Filter Design (IIR Filter and FIR Filter), DFT and FFT computation, circular convolution, Finite register lengths effects.

ECL302 Data Communication Networks

3 Credits (2-0-2)

Introduction, Network Hardware, Transmission modes, Topologies, Performance Parameters of a network, Topologies, Local area networks (LAN),Metropolitan area Networks (MAN) and Wide area Networks (WAN), Protocols & Reference Models: OSI, TCP/IP, Physical Layer, wired and wireless technologies, Interfaces, Data

Link Layer, Channel access methods, Network Layer, Switching techniques, Routing algorithms, IP addressing, IPv6.

ECL316 Wireless mobile communication

3 credits (2-0-2)

Mobile Radio Systems around the world, examples of Wireless Communication Systems, Co-channel interference Analysis- Hand over Analysis, Call flows, 3G and 4G technologies, WIMAX, LTE, VoLTE, Multiple Access Techniques, Large scale path loss, propagation mechanisms, Small scale fading, parameters of multipath channels, Mobile radio propagation

ECL256 Embedded System Design

(2-0-4) 4

Importance of Embedded Systems, Applications, Indian and Global Market. Microprocessors vs Miicrocontrollers. RISC and CISC Architectures. Low-levl and high level embedded programming concepts. Register and Memory architecture. Addressing Modes, Arithmetic and Logical Operations, Delay Subroutines, Timers, Serial Communications, Interrupt handling, Interfacing with LED, LCD, ADC, DAC, DC and PWM Motor Control, and Sensor. Application Prototyping.

ECL264 RTL Design & Synthesis

(2-0-5) 4.5

ASIC Design Flow, Language Constructs and Conventions in Verilog HDL, Combinational Logic, Design, Sequential Logic Design, Architecture of FPGA, Behavioral Modeling, Modeling Techniques, State Machine, Moore and Mealay State Model, User Defined Primitives, Programming Language Interface, Logic Synthesis, Introduction to FPGA, Current Trends.

ECL267 Control Systems

(1-0-3) 2.5

Types of control systems with appropriate examples, Transfer function concept, reduction techniques: block diagram, signal flow graphs, Mason's gain formula, time response of 1st order and 2nd order systems time domain specifications (general and of an under damped 2nd order system), steady stateerror and error constants, concept of stability, Routh stability criterion, PID controller, Time Domainand Frequency Domain Plots, concept of lag-lead compensation.

ECR107,108,207,208,307,308,407,408 General Proficiency

1 Credit each (0-1-0)

General proficiency evaluation is conducted in the 8th semester where a student will be evaluated for his achievements and participation in extra-curricular activities throughout four years and also for his academic excellence. The evaluation is based on academic performance, co-curricular activities in sports, cultural fest etc., social outreach, general awareness, soft skill development and outstanding achievements.

ECD401 Major Project (A)

10 Credits

Development of a technical project, research and simulation or hardware implementation of new or recent technological trend under the guidance of faculty. Complete literature survey, feasibility testing, circuit design, component arrangement etc

ECD402 Major Project (B)/Internship

18 Credits

Completion of Project with good hardware which has Financial Viability ,Originality-innovativeness, Customer end applicability, Usefulness to society-

addressing a larger section, Sustainability or simulation results with good research paper and report of complete project with appropriate results and conclusions undertaken as ECD405.

A full 14 week internship can be done in lieu of major project part B which has to be approved prior to start and evaluated after completion.

ECC307 Seminar

1 Credit (1-0-0)

Independent study on any latest trend in communication technology or any recent research field. Students are evaluated on individual basis on the parameters like content of the topic, delivery, presentation techniques and viva-voce.

ECT106 In house training for Minor Projects

1 Credit

Aim of practical Training for the B.Tech students of EECE at the end of first year is to have knowledge about the basic electronic components, assembling and testing of small electronic projects before they start their major projects on their own or go for some Practical training. This training will be held after the final examinations of second Semester. Students are expected to do a minor project under the guidance of NCU faculty. They will be using the departmental project lab and other facilities of the NCU University during this training.

ECT208 Industrial Training

2 Credits

Better interaction between Technical institutions and industry is of the essential today. At the end of semester 4, Students are sent to industries of interest areas for 4-6 weeks to have hands on experience and exposure to industrial environment. This is continuously monitored by internal faculty supplemented by a compulsory visit of faculty to company for feedback. At the end of the training the students are evaluated.

ECT308 Industrial Training

3 Credits

Exposure to the industrial atmosphere and subsequent placement of young graduating engineers in industries across the country is of the essential today. At the end of semester 6, students are sent to industries of interest areas for 6-8 weeks to have hands on experience and exposure to industrial environment. The students are exposed to the professional environment and learn the technical and behavioral skills. They are continuously monitored by internal faculty supplemented by a visit to the company by the same faculty during their training. At the end of training they are evaluated.

ECV201 Skill Development Course I

(0-0-2) 1 Credit

Introduction to MATLAB, plotting of functions and data, built-in functions, dealing with matrices and arrays, 2-D and 3-D plotting with graphics, integration and differential equations, basic MAT LAB commands, M-files, introduction to Simulink and building basic models with examples, SimPower System, introduction to Control system toolbox, signal processing toolbox and communication toolbox.

ECV301 Tech- Skill Development Course II

(0-0-2) 1 Credit

This course will make the students proficient in skills required in industry such as programming in software like Android (Mobile Apps) or System Verilog driven verification.

Introduction to Android Environment & it's Setup, Android Architecture, building applications using Android environment, Managing Activity Lifecycle, Development of Multi-device Application

and Dynamic User Interfaces, Saving Data, Interaction with other Apps and Content Sharing.

CLP 300 Campus to Corporate

1 Credit (0-0-2)

Difference between CV/ Resume / Bio data; Importance of a professional resume; Writing objectives; Cover letter; Resume writing layout; Verbal skills; Reasoning; Perceptual speed & accuracy; Handle analytical questions ; Understanding group discussion; Kinds of group discussion; Techniques to handle group discussion; Case study group discussion; Mock Group discussions; Importance of grooming; Powerful dressing for men and women; Body language postures and gestures; Understanding interview process; Types of interview; Handling case study interview; Do's and Don'ts in an interview; Interview cracking techniques; Frequently asked questions in the interview; Myers–Briggs Type Indicator (MBTI); Practice and rehearsals with feedback.

SEG400 GATE

0 Credits –Audit Course

Preparation and test of National GATE examination. The scores of GATE test will be mapped to the marks scheme of NCU and an internal qualifying test will be used for credit calculation.

ECD201 and ECD301 Creativity & innovation outcome **(0-0-2)1**

Students will be free to work on idea-based projects from different areas and come up with a final project with will be evaluated

PROGRAM ELECTIVE COURSES

PROGRAM ELECTIVE - I

ECL308 Semicond. Devices

The physics and properties of semiconductors, energy bands, P-N junction, diffusion, generation-recombination, bipolar transistor, device structure, current-voltage characteristics, metal semiconductor contacts, non-rectifying contacts, metal oxide silicon system, capacitance, oxide and interface charge, MOSFET, device structure, threshold voltage, small geometry effects, velocity saturation

ECL309 Information Theory and Coding

Random variables, various probability density functions, cumulative distribution function, random processes, stationary processes, ergodicity, auto and cross-correlation, power spectral density, center limit theorem, Information, conditional and mutual information, entropy, Shannon-Hartley's Channel Capacity theorem, Noisy Channel, Binary Symmetric channel, Kraft's Inequality, Source coding theorem, Channel Coding, Error correction codes , Convolutional code: Turbo Codes, Basic concepts on cryptography and cryptanalysis, Private key encryption algorithms, stream ciphers, block ciphers, public key encryption algorithms, message authentication digital signatures.

ECL311 Foundn course in Cloud Comp

Cloud Computing session describes the various service delivery models of a cloud computing architecture, and the ways in which clouds can be deployed as public, private, hybrid, and community clouds. Students also learn about the security challenges that cloud deployments experience, and how these are addressed. The course also describes IBM cloud computing architecture and offerings, the IBM WebSphere CloudBurst appliance, and the IBM WebSphere Hypervisor edition software product.

ECL319 Digital Marketing

Digital Marketing Concepts, Web Presence, CMS, Search Engine Optimization, Social Media Setup, Social Media Optimization, Social Media Management, Online Marketing and Advertising, Campaign Creation and Optimization, Analytics, Understanding of web Traffic and common Analytics Terms

ECL252 Microcontrollers and Sensors

This course provides an in-depth and hands-on introduction to interfacing real-world sensors and actuators to embedded computing systems. The course covers basic microcontroller concepts and students learn to program and control the microcontroller systems for real-time operation and user interaction, such as digital input/outputs, interrupt service routines and serial communications. The course will conclude with a student-designed final project demonstration and presentation.

PROGRAM ELECTIVE - II

ECL314 Telecom Switching

Basic Switching System, Dialing types, signaling tones. Introduction to Electromagnetic Exchanges, long-haul communication circuits; principles of traffic switching. Strowger's and crossbar switches; switching system hierarchy, SPC switching, basic call processing, single stage and multi-stage switching network, Space Division Switching , Combination Switching Grade of Service and Blocking Probability - Telephone Networks, Subscriber Loops, Switching Hierarchy and Routing, Signaling Techniques .Transmission media. IP based, multimedia and voice switching.

ECL323 Biomedical Electronics

Biomedical instrumentation system,cell structure, Bioelectrical signals, Bio-electrodes, Respiration sensors, ECG machine, EEG machine, EMG machine, Heart rate measurement. Pulse rate measurement, Respiration rate measurement, Blood pressure measurement, Cardiac output measurement, phonocardiography, Vector-cardiography. Defibrillators, pacemakers, Computed Tomography, Magnetic Resonance Imaging, Nuclear Medicine, Telemedicine.

ECL322 Fndn in Big Data Analytics

This course, developed specifically for the business analyst will teach how to capture structured, semi-structured and unstructured data from several different data source types using IBM In-foSphere BigInsights and then do manipulations and analysis on the gathered data. This course will focus on using the Graphical User Interface of InfoSphere BigInsights to collect, manipulate, analyze, view and export data

ECL410 Artificial Neural Networks

Artificial Neuron, Characteristics, Architectures, Activation functions, Signal flow graph, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Learning Laws, Feedforward Network, Feedback Networks, Back Propagation Model, Counter Propagation Network, Adaptive Resonance Theory network, CMAC Network, Hopfield, Brain-in-state model, Boltzmann Machine Applications.

ECL313 Adv. Digital System Design

Recap of Mealy and Moore Model, Analysis and design of Clocked Synchronous Sequential Circuits and Asynchronous Sequential Circuits, Hazards-static, dynamic, essential, Mixed Operating Mode Asynchronous Circuits, Fault diagnosis, testing of sequential circuits, Built in Self test, Design using Simple Programmable Logic Devices (PLD)-PLA, PAL, Programmable Logic Memory, Field Programmable Gate Arrays (FPGA)-Xilinx FPGA, Introduction to SystemVerilog- features

PROGRAM ELECTIVE - III

ECL 413 Machine Learning

Artificial Intelligence, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Models, Activation function, Self-organizing Maps, k-means clustering, dimensionality reduction, Statistical Learning, Support Vector Machines, Kernal regression, logistic regression, Decision Trees, Bayesian Learning. Applications.

ECL403 Microwave and Radar

Introduction to transmission Lines, The Smith Chart, Scattering matrix of microwave junction, scattering matrix of tees, Rectangular and circular waveguides, Rectangular cavity resonator, isolators, circulators, phase shifters. Microwave sources :Reflex klystron, Helix Travelling Wave tubes (TWT) , Magnetrons, MASER, Gunn diode and Gunn Effect, Microwave Tunnel diode, IMPATT and TRAPATTS, PIN diode, Radar systems, Frequency bands, Range equations, Pulse Radar.

ECL 324 Wireless sensor networks

WSN architecture and protocol Stack, mote platforms, WSN applications, Factors influencing WSN design, physical and MAC layer technologies, channel effects, challenges for routing and transport protocols, cross layered solutions, time synchronization, Network time protocol, Localization, ranging techniques, wireless sensor and actor networks

ECL420 Fuzzy Sets and Appl.

Overview of Classical Sets, Fuzzy sets, Membership Function, Properties of Fuzzy sets, Operations on fuzzy sets, Arithmetic operations on Fuzzy numbers and Intervals, Classical and fuzzy relations, Operations on fuzzy relations, Fuzzy logic, Quantifiers and Hedges, Architecture of Fuzzy logic Controller, Defuzzification, Applications of fuzzy set theory.

ECL315 Analog CMOS Circuit Design

This course will teach the fundamentals of CMOS and BICMOS analog circuit design techniques used in today's advanced mixed-signal integrated-circuit applications. Topics to be covered include device/process background, IC passives, analog amplifiers, current mirrors, op-amp design, noise fundamentals, RF design basics, switched capacitor circuits, comparators, A/D and D/A converters, and other analog circuitry used in today's mixed-signal ICs. The course will include a laboratory component involving hands-on measurements

PROGRAM ELECTIVE – IV

ECL411 Optical Communication

Introduction to optical communications, ray theory, geometrical optics approach, wave theory approach, types of fiber, modes in step and graded index fiber, losses in fiber-linear and non-linear losses, Solutions, optical sources-and detectors with their working principle and characteristics, various receiver configuration-direct detection, homodyne, hetrodyne receivers, noise sources in optical communication, optical fiber link design, optical components: optical switches, SOA, EDFA, mux/demux, couplers, introduction to optical space communication, fiber in local loop.

ECL416 Image Processing

Introduction to Electronic Image Processing, Transforms used in electronic Image Processing,Image Enhancement in spatial domain and frequency domain, study of various transforms, Spatial Filtering & Fourier Frequency Method, Image restoration, Image segmentation and Representation, Image Compression techniques, Current applications of image processing Simulation Software.

ECL352 Design for IoT

Through this course, a high level view of IOTs, design of smart objects that provide collaboration and ubiquitous services will be explored. Design for longevity/energy efficiency will be highlighted. Step by step system design will be introduced. Small video chips that will allow students to prototype will be displayed. At the end of the course, the student is expected to make the right choice of hardware, software and protocols for the proposed application

ECL440 Optimization Techniques

Review of Historical development of engineering application of optimization, single-variable optimization and multivariable optimization, optimality criteria, various methods of constrained optimization, Kuhn Tucker condition, transformation methods, penalty function, application of linear programming, simplex method, revised simplex method, duality in linear programming, applications of optimization techniques and Software computation of various optimization problems through Mat lab.

ECL366 VLSI CAD & Algorithms

Partitioning, problem formulation, classification of partitioning algorithms, group migration algorithms, simulated annealing and evolution, performance driven partitioning, floor planning and pin assignment, problem formulation, classification of floor planning algorithms, classification of pin assignment algorithms, placement, problem formulation, classification of placement algorithms, simulation based placement, partitioning based placement, performance driven placement, routing, global routing, problem formulation, classification of global routing algorithms, detailed routing, problem formulation, classification of detailed routing algorithms.

PROGRAM ELECTIVE - V

ECL428 Mobile Computing

Introduction to mobile computing, Disconnected operation, handling handoffs, Mobile networks, WLAN, Bluetooth, Zigbee, Wireless networking protocols: mobile IP, Mobile TCP and other OSI layer Ad-hoc networks, Manets, routing, routing algorithms and Protocols, mobile data management, location awareness, adaptations, user interfacing issues, security issues, Technology surveys and case studies

ECL426 Adv. Wireless Comm. Sys

Review of wireless propagation models, statistical characterization of MIMO channels, Single-Carrier vs. Multi-Carrier Transmission OFDM systems, OFDMA, Synchronization in OFDM, OFDM Modulation and Demodulation, OFDM Guard Interval, OFDM Guard Band, OFDMA: Multiple Access Extensions of OFDM, Cooperative Communication, Brief Introduction of Massive MIMO.

ECL401Satellite & TV

Elements of satellite communication systems, classification of satellites, frequency bands, earth coverage, earth stations and its parameters, launching of satellites, satellite orbits (LEO, MEO, ICO, GEO), orbits,Link analysis, Satellite transponders, Laser-link based inter-satellite communication systems. National Satellite Systems, GPS Navigation, Working principle of monochrome and colour camera and picture tubes, Frequency bands, Composite video signals, Picture and sound transmission and reception. Digital TV technology, High Definition TV (HDTV), advanced TV Screens/displays, Applications.

ECL430 Genetic Algorithm

Introduction to Evolutionary Computation, Search Operators, Mutation for real-valued representations,, Selection Schemes, Search Operators and Representations, Evolutionary Combinatorial Optimization, Niching and Speciation, Constraint Handling, Genetic Programming & software simulation, current applications of GA, Case studies and analysis of Real time Situations

ECL417 Verification using system verilog

Verification Guidelines: Verification Methodology, Data Types, Procedural Statements, Task and Functions, Routine Arguments, Local Data Storage, Basic OOP, Static and Global variables, Objects and Classes, Connecting the Testbench and Design, Stimulus Timing, SystemVerilog Assertation, Four-Port ATM Routers, Randomization, Constraints Details, Pre and Post Randomization.

ECLXXX Selected Topics in Electronics &Comm.

Courses on latest topic in Electronics and Communication engineering will be offered to students. The content will be decided by the concerned faculty, having expertise in the selected field of interest.

Courses offered to Other Departments

ECL110 Basics of Electrical & Electronics Engineering

Basic electrical quantities, Ohm's Law, Kirchhoff's Laws, D.C. and A.C Circuits, R,L and C components, behaviors of these components in A.C. circuits, Principle, construction & working of transformer, Network Theorems, Introduction to Voltmeter, Ammeter, Watt meter, Energy meter, Oscilloscope, Function Generator, PN Junction diode, Rectifiers and filter circuits, Clippers, Clampers. Zener diodes, Photodiodes, Light emitting diodes (LED's).Construction and characteristics of Bipolar Junction Transistor, MOSFET (both depletion and enhancement type), CMOSFET's.

ECL200 Digital Electronics

Digital signal, Logic gates, Number system, Error detection and correction codes, Boolean Algebra and Switching functions, Minimization Techniques, Combinational circuits, Logic Modules and their functions, Sequential circuits and their applications, Digital Logic families, A/D and D/A converters, Advances in Technology, Current applications of digital electronics, Simulation Softwares (ORCAD, Labview), Case studies and analysis of Real time Situations

ECL310 Microprocessor and Microcontroller

Basic elements and functions of contemporary Microprocessors: Memory, CPU, Address Data Bus, And Control signals .Pipelining. Architecture and operations of microprocessors and microcontroller (8051)Instructionsets of 8051Timers, interrupts,Serial communication. Timing sequence of different instruction. Interfacing of sensors and transducers with 8051.Hardware/software tradeoffs involved in the design of microprocessor and microcontrollers based systems.

ECL430 Genetic Algorithm

Introduction to Evolutionary Computation, Search Operators, Mutation for real-valued representations,, Selection Schemes, Search Operators and Representations, Evolutionary Combinatorial Optimization, Niching and Speciation, Constraint Handling, Genetic Programming & software simulation, current applications of GA, Case studies and analysis of Real time Situations

ECL 440: Optimization Techniques

Review of Historical development of engineering application of optimization, single-variable optimization and multivariable optimization, optimality criteria, various methods of constrained optimization, Kuhn Tucker condition, transformation methods, penalty function, application of linear programming, simplex method, revised simplex method, duality in linear programming, applications of optimization techniques and Softwarecomputation of various optimization problems through Mat lab.

ECL410 Artificial Neural Networks

Artificial Neuron, Characteristics, Architectures, Activation functions, Signal flow graph, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Learning Laws, Feedforward Network, Feedback Networks, Back Propagation Model, Counter Propagation Network, Adaptive Resonance Theory network, CMAC Network, Hopfield, Brain-in-state model, Boltzmann Machine Applications.

ECL421 IoT Based Application Development

IBM Internet of Things Foundation on Bluemix provides a framework for easily connecting devices to the Bluemix Cloud environment and manages them. These devices will generate large

amounts of data. IBM provides a visual development environment named Node-RED where various devices can be wired together visually, combined with other services on Bluemix, and also with many publicly available APIs to create interesting applications. Internet of Things developers working in the Bluemix environment can leverage a large number of services in areas such as data management and analytics provided by IBM and third parties in their applications. IBM IoT Foundation provides developers a means to rapidly connect their sensors and devices to the cloud, create IoT applications, and deploy.

ECL413 Machine Learning

Artificial Intelligence, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Models, Activation function, Self-organizing Maps, k-means clustering, dimensionality reduction, Statistical Learning, Support Vector Machines, Kernal regression, logistic regression, Decision Trees, Bayesian Learning. Applications.

ECL324: Wireless Sensor Networks

WSN architecture and protocol Stack, mote platforms, WSN applications, Factors influencing WSN design, physical and MAC layer technologies, channel effects, challenges for routing and transport protocols, cross layered solutions, time synchronization, Network time protocol, Localization, ranging techniques, wireless sensor and actor networks.

ECL 323 Biomedical Electronics

Biomedical instrumentation system,cell structure, Bioelectrical signals, Bio-electrodes, Respiration sensors, ECG machine, EEG machine, EMG machine, Heart rate measurement. Pulse rate measurement, Respiration rate measurement, Blood pressure measurement, Cardiac output measurement, phonocardiography, Vector-cardiography. Defibrillators, pacemakers, Computed Tomography, Magnetic Resonance Imaging, Nuclear Medicine, Telemedicine.