SIR PADAMPAT SINGHANIA UNIVERSITY

Udaipur

SCHOOL OF ENGINEERING

Course Curriculum of Ph.D. Degree Programme in Electronics & Communication Engineering (Batch-2018-19)

Credit Structure

Category	Credits
Departmental Major Subjects	6
Minor Subject	3
Total	9

Note: The student has to select the courses of minimum 6 credits from the department and one minor course of minimum 3 credits from any other department of the SOE/SOM in a semester as per the requirement.

Course Structure: Ph.D. Degree (2018-19)

(Departmental Major Subjects)

S.No.	Course Code	Course Title	L	T	P	Credit(s)
1	EC-601	Hybrid Integrated Circuits	3	0	0	3
2	EC-602	Advance Communication System	3	0	0	3
3	EC-605	WSNs: Protocols, Architecture and Applications	3	0	0	3
4	EC-606	Mobile Computing	3	0	0	3
5	EC-607	Application of Artificial Neural Network Artificial Intelligence in Electronics and Electrical Engineering	3	0	0	3
6	EC-608	Application of Power Systems in Electronics and Electrical Engineering	3	0	0	3
7	EC-609	Analog Implementation of Dynamical Systems	3	0	0	3

Note: The department is offering combination of subjects as EC-601/EC-605 and EC-602/EC-606.

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in
Electronics & Communication Engineering

Semester - I

(Departmental Major Subject)

EC-601	L-T-P-C
Hybrid Integrated Circuits	3-0-0-3

Objective: *The main objective of this course is regarding the fabrication steps of thick film device, thin film and silicon devices as well as basic properties of hybrid substrate materials.*

Course Content

Introduction to hybrid microelectronics, thick film technology, thin film technology, Printed wiring board technology, laser trimming, advantage of hybrid microelectronics, basic properties of hybrid substrate materials.

Thick film materials and processes, Thick film conductors, Thick film dielectrics, Resistor material and processing, Screen printing process, Quality control and manufacturing process.

Classification of IC, electronic grade silicon, crystal growth, Czechoralski and float zone crystal growing methods, silicon shaping, lapping, polishing and wafer preparation, vapor phase epitaxy oxidation thermal dry and wet plasma oxidation.

Thin film deposition techniques, substrate materials, emerging thin film materials, thin film design guidelines, fabrication sequences for thin film resistor-conductor Circuits, Characterization of thin films.

Text/Reference Books

1. Hand Book of Thin Film Technology. Frey H. & Khan H. R. 1st Ed. Springer. 2015.
2. Thin Film Deposition: Principles & Practice. Smith D. L. 1st Ed. McGraw Hill.

1995.
3. VLSI Technology. Sze S. M. 2nd Ed. Tata McGraw Hill. 1988.
4. Nano particles & Nano Structured Films. 1st Ed. Fendler J. H. Wiley-VCH. 1998.

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Semester - I

(Departmental Major Subject)

EC-602 L-T-P-C
Advanced Communication Systems 3-0-0-3

Objective: *This course introduces the concepts of telecommunication along with fundamentals of mobile and satellite communication which is as per present scenario over the globe.*

Course Content

Digital communication system functional architecture, communication channel, coded and un coded digital communication system architecture, ISO- OSI network architecture, telecommunication network and service (DNS, TDRSS, GPS, ISDN) iridium.

Advantage of digital transmission, pulse modulation, PCM, folded binary code, linear vs non-liner PCM codes, companding, delta modulation PCM, differential pulse code modulation, pulse transmission.

Time division multiplexing, t1 digital carrier system, d- type channel banks, super frame format, ccitt tdm carrier system, combo chips, north American digital hierarchy, t carriers, Frequency division multiplexing AT & T's FDM hierarchy, composite base band signal formation of different groups, hybrid data.

Fourier series, exponential form of Fourier series, examples of Fourier series, the sampling function, Fourier transform, correlation between waveform power and cross correlation, auto correlation, Discrete massage, concept of amount of information, average information entropy, information rate, Shannon's theory, channel capacity of a Gaussian channel, bandwidth -s/n trade off.

Entities & terminologies, IP packet delivery, Agent Discovery, Registration, Tunneling & encapsulation, Optimizations, Reverse tunneling, IPv6, IP micro-mobility support, DHCP, Mobile Adhoc networks, Traditional TCP, Classical TCP improvements, TCP over 2.5G/3G wireless networks, performance enhancing proxies, Performance Analysis and Design of Telecommunication Network and Multiple Access Communication Systems, Architectural Issues, Microwave Digital Radio, Link Calculations, Spread Spectrum and Ultra Wide Band Techniques, Bluetooth.

History, orbital satellite, geostationary satellites, orbital pattern, look angles, classification and frequency allocation, radiation pattern, link models, system parameters, link equations, link budget.

Text/Reference Books

1. Electronics communication system. Tomasi W. 3rd Ed. Pearson Education Asia. 2003.

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Semester - I

(Departmental Major Subject)

EC-605	L-T-P-C
WSNs: Protocols, Architecture and Applications	3-0-0-3

Objective: *This course provides a broad coverage of challenges and latest research results related to the design and management of wireless sensor networks. Covered topics include network architectures, node discovery and localization, deployment strategies, node coverage, routing protocols, and network security.*

Course Content

The vision of ambient intelligence, Application examples, Types of applications, Challenges for WSNs, Mobile ad hoc networks and WSNs, Field buses and WSNs, Enabling technologies for WSNs.

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

Text/Reference Books

1. Protocols and Architectures of Wireless Sensor Networks. 1st Ed. Karl H. & Willig A. John Wiley. 2005.
2. Wireless Sensor Networks – An Information Processing Approach. 1st Ed. Zhoa F. & Guibas L. J. Elsevier. 2007.

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Semester - I

(Departmental Major Subject)

EC-606	L-T-P-C
Mobile Computing	3-0-0-3

Objective: *This course provides a broad coverage of challenges and latest research results related to the mobile computing.*

Course Content

Introduction to Mobile Communications and Computing: Mobile Computing (MC): Introduction to MC, Novel Applications, Limitations and Architecture. GSM: Types of Mobile Services, System architecture, Radio Interface, Network Interface, Operation & Maintenance, Protocols, Localization and Calling, Handover, Security and New Data Services, WLL, XML.

(Wireless) Medium Access Control: Motivation for a Specialized MAC (Hidden and Exposed terminals, Near and Far terminals), SDMA, FDMA, TDMA, CDMA.

Mobile Network Layer: Mobile IPv4 & Mobile IPv6 (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP), DNS & DDNS.

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit / Fast Recovery, Transmission / Time-out Freezing, Selective Retransmission, Transaction Oriented TCP.

Database Issues: Hoarding Techniques, Caching Invalidation Mechanisms, Client Server Computing with Adaptation, Power - aware and Context - aware Computing,

Transactional Models, Query Processing, Recovery, Jitter and Quality of Service Issues.

Data Dissemination: Communications Asymmetry, Classification of New Data Delivery Mechanisms, Push - based Mechanisms, Pull - based Mechanisms, Hybrid Mechanisms, Selective Tuning (Indexing) Techniques.

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, Spectrum of MANET Applications, Routing and Various Routing Algorithms, Security in MANETs.

Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, Protocol Architecture and Treatment of Protocols of all layers), Bluetooth (User Scenarios, Physical Layer, MAC Layer, Networking, Security, Link Management) and J2ME.

Text/Reference Books

1. Mobile Communications. Schiller J. 2nd Ed. Addison –Wesley. 2004.
2. Mobile Computing. Kamal R. 1st Ed. Oxford University Press. 2009.
3. Data Communications and Networking. Forouzan B. A. 3rd Ed. Tata McGraw Hill 2004.
4. Handbook of Wireless Networks and Mobile Computing. Stojmenovic & Cacute. 1st Ed. Wiley. 2002.
5. Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML. Behravanfar R. Cambridge University Press. 2004.
6. Principles of Mobile Computing. Hansmann, Merk, Nicklous & Stober. 2nd Ed. Springer. 2003.
7. Mobile and Wireless Design Essentials. Mallick M. 2nd Ed. Wiley Dream Tech. 2003.

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Semester - I

(Departmental Major Subject)

EC-607 Application of Artificial Neural Network Artificial Intelligence in Electronics and Electrical Engineering	L-T-P-C 3-0-0-3

Objective: *This course provides a broad coverage of challenges and latest research results related to the Artificial Intelligence & Artificial Neural Network. Covered topics include Neural network architectures, ANN paradigm and genetic algorithms, genetic modeling, FUZZY Sets and FUZZY logic and applications of AI techniques.*

Course Content

Introduction to Neural Networks, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Introduction-neural network models-architectures-knowledge representation learning process-learning tasks.

Feed Forward Neural Networks, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the
Perceptron Model, Applications.

ANN paradigm**-**back propagation-RBF algorithms-Hope field networks.

Genetic algorithms-introduction-encoding-fitness function-reproduction operators

Genetic modelling**-**genetic operators-cross over and mutation-generational cycle-coveragence of genetic algorithm.

Classical AND Fuzzy Sets, Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Fuzzy Logic System Components: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

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Application of AI Techniques-load forecasting-load flow studies-economic load dispatch -load frequency control-reactive power control-speed control of dc and ac motors.

Text/Reference Books

1. Rajasekharan and Rai, “Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications”, PHI Publication.
2. Jacek M. Zuarda, “Introduction to Artificial Neural Systems”, Jaico Publishing House, 1997.
3. Simon Haykin, “Neural Networks: A Comprehensive Foundation”, Pearson Education, Second Edition, 2001.

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Semester - I

(Departmental Major Subject)

EC-608 Application of Power Systems in Electronics and Electrical Engineering	L-T-P-C 3-0-0-3

Objective: *This course provides a broad coverage of system dynamics, stability, State space representation, digital simulation of transient stability. This course also provides the concept of Multimachine stability, effect of governor action, excitation systems and Rotating Main Exciter.*

Course Content

System Dynamics: Synchronous machine model in state space form, computer representation for excitation and governor systems –modeling of loads and induction machines.

Stability – steady state stability limit – Dynamic Stability limit – Dynamic stability analysis.

State space representation of synchronous machine connected to infinite bus, Time response – Stability by Eigen value approach.

Digital Simulation of Transient Stability: Swing equation, Machine equations.

Concept of Multimachine Stability, Multimachine Transient Stability under Different Faulted Conditions.

Effect of governor action and exciter on power system stability. Effect of saturation, saliency & automatic voltage regulators on stability.

Excitation Systems: Rotating Self-excited Exciter with direct acting Rheostatic type, voltage regulator – Rotating main and Pilot Exciters with Indirect Acting Rheostatic Type Voltage Regulator.

Rotating Main Exciter, Rotating Amplifier and Static Voltage Regulator – Static excitation scheme – Brushless excitation system. Introduction to Neural Networks, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Introduction-neural network models-architectures-knowledge representation learning process-learning tasks.

Text/Reference Books

1. Kimbark, “Power System Stability Vol. I&II, III”, Dover Publication Inc, New York, 1968.
2. Anderson and Fund, Vol – I, P.M.Arolerson & A. A. Fouad, “Power System control and stability”, Galgotia Publications 3B/12, Uttari marg Rajunder Nagar, New Delhi – 110060, 1st Edition, 1981.
3. K. R. Padiyar, “Power System Dynamics Stability and Control”, B. S. Publications, 2nd Edition, 2002.
4. Glenn.W.Stagg &Ahmed. H. El. Abiad, “Computer Applications to Power Systems”.
5. S. S. Vadhera, “Power Systems Analysis & Stability”, Khanna Publishers.
6. Hadi Saadat, “Power System Analysis”, Tata McGraw Hill Publications.
7. John J., Graniger William D, Stevenson. JR., “Power System Analysis”, Tata McGraw Hill Publications.

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Semester - I

(Departmental Major Subject)

EC-609 L-T-P-C
Analog Implementation of Dynamical Systems 3-0-0-3

Objective: *The objective of this course is to introduce various methods for the implementation of electronic circuits to study nonlinear dynamical systems.*

Course Content

Introduction to Linear and Nonlinear Circuits: Circuit elements, linear circuits and nonlinear circuits.

Chaotic Oscillators with Chua's Diode: Chua's diode and its characteristics, simple practical implementation of Chua's diode, autonomous and nonautonomous circuits with Chua's diode, Murali-Lakshmanan-Chua circuit.

Duffing Oscillator: Bifurcation and Chaos: Duffing equation, Single-well Duffing oscillator, Double-Hump potential, analog simulation and experimental verification.

Controlling of Chaos: Various feedback and non-feedback methods for controlling of chaos, Controlling of chaos in various circuits like Chua's circuit, Duffing Oscillator and MLC circuit.

Synchronization of Chaotic Systems and Secure Communication: Drive-response concept, chaos synchronization in Chua's circuit with one way coupling, application of synchronized Chua's circuit in secure communication.

Text/Reference Books

1. Chaos in Nonlinear Oscillators: Controlling and Synchronization. Lakshmanan M & Murali K. World Scientific Publishing Co. Pvt. Ltd.

2. Nonlinear Dynamics: Integrability, chaos and patterns. Lakshmanan M. & Rajasekhar S. Springer Verlag. 2003.