M.D. UNIVERSITY, ROHTAK

Scheme of studies & Examination
B. Tech. (Electronics and Communication Engg.)

SEMESTER VII

F ' Scheme Effective from 2012–2013

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
ECE-405-F	WIRELESS COMMUNICATION	3	1	-	4	50	100	-	150	3
ECE-403-F	SATELITE COMMUNICATION ENGINEERING	3	1	-	4	50	100	-	150	3
ECE-407-F	DATA COMMUNICATION	3	1	-	4	50	100	-	150	3
	*Open Elective	3	1	-	4	50	100	-	150	3
	*Dept Elective-I	3	1	-	4	50	100	-	150	3
ECE-409-F	Digital Signal Processing	3	1	-	4	50	100	-	150	3
ECE-423-F	Wireless & Satellite Communication Lab			3	3	50	-	50	100	3
ECE-429-F	Digital Signal Processing Lab	-	-	2	2	25	-	25	50	3
ECE-427-F	Data Communication Lab	-	-	3	3	50	-	50	100	3
GFEE-401-F	General Fitness For The Profession	-	-	-	-		-	50	50	3
ECE-401-F	Practical Training – II	-	-	-	-	-	-		-	-
	TOTAL	**19**	**5**	**8**	**32**	**425**	**600**	**175**	**1200**	

List of Dept Electives-I

ECE-419-F	Mobile Communication
EE-317-F	Power Electronics
IC-404-F	Fuzzy Logic Control
ECE-461-F	Genetic Algorithms & Applications
ECE-453-F	Radar and Sonar Engg.
EE-405-F	Advance Control System
ECE-411-F	Wireless Sensor Network
ECE-413-F	Image Processing
ECE-415-F	Optical Communication Systems
EEE-413-F	Microcontroller and embedded system

Note:

1. **Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.**
2. ***Student will be permitted to opt for any one elective run by the other departments. However, the departments will offer only those electives for which they have expertise. The choice of the students for any elective shall not be a binding for the department to offer, if the department does not have expertise.**
3. **A team consisting of Principal/Director, HOD of concerned department and external examiner appointed by University shall carry out the evaluation of the student for his/her General Fitness for the Profession.**

4. **Assessment of Practical Training-II, carried out at the end of VI semester, will be based on seminar, viva-voce and project report of the student from the industry. According to performance, letter Grades A, B, C, F are to be awarded. A student who is awarded 'F' grade is required to repeat Practical Training.**

M.D. UNIVERSITY, ROHTAK

Scheme of studies & Examination
B. Tech. (Electronics and Communication Engg.)

SEMESTER VIII

F ' Scheme Effective from 2012–2013

		Subject	Internal Marks	External Marks	Total Marks
1.	**ECE- 402-F**	Industrial Training/Institutional Project Work	150	150	300

Note:

The students are required to undergo Industrial Training or Institutional Project Work of duration not less than 5 months in a reputed organization or concerned institute. The students who wish to undergo industrial training, the industry chosen for undergoing the training should be at least a private limited company. The students shall submit and present the mid-term progress report at the Institute. The presentation will be attended by a committee. Alternately, the teacher may visit the Industry to get the feedback of the students.

The final viva-voce of the Industrial Training or Institutional Project Work will be conducted by an external examiner and one internal examiner appointed by the Institute. External examiner will be from the panel of examiners submitted by the concerned institute approved by the Board of Studies in Engg. & Technology. Assessment of Industrial Training or Institutional Project Work will be based on seminar, viva-voce, report and certificate of Industrial Training or Institutional Project Work obtained by the student from the industry or Institute.

The internal marks distributions for the students who have undergone Industrial Training consist of 50 marks from the industry concern and 100 marks by the committee members consisting of faculty members of concerned department of the parent institute.

The teachers engaged for Institutional Project work shall have a workload of 2 hours per group (at least 4 students) per week.

ECE-405-F **WIRELESS COMMUNICATION**

L T P **Class Work : 50**
3 1 - **Exam : 100**
Total : 150
Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.
MODERN WIRELESS COMMUNICATION SYSTEMS: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Section-B

INTRODUCTION TO CELLULAR MOBILE SYSTEMS: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems.
CELLULAR SYSTEM DESIGN FUNDAMENTALS: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Section-C

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Section-D

WIRELESS NETWORKING: Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signaling, ISDN (Integrated Services digital Networks), advanced intelligent networks.
INTELLIGENT CELL CONCEPT AND APPLICATION: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.

TEXT BOOKS:
1. Wireless Communications: Theodore S. Rappaport; Pearsons.
2. Mobile Cellular Telecommunication: W.C.Y.Lee; McGraw Hill
REFERENCE BOOK:
Mobile Communications: Jochen Schiller; Pearson

ECE-403-F SATELLITE COMMUNICATION ENGINEERING

L T P	
3 1 -	Class Work : 50
	Exam : 100
	Total : 150
	Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

PRINCIPLES OF SATELLITE COMMUNICATION: Evolution & growth of communication satellite, Synchronous satellite, Satellite frequency allocation & Band spectrum, Advantages of satellite communication, Active & Passive satellite, Modem & Codec. Applications of satellite communication.

COMMUNICATION SATELLITE LINK DESIGN: Introduction, General link design equations, System noise temperature, C/N & G/T ratio, Atmospheric & Ionospheric effects on link design, Complete link design, Earth station parameters.

Section-B

ANALOG SATELLITE COMMUNICATION : Introduction, Baseband analog(Voice) signal, FDM techniques, S/N & C/N ratio in frequency modulation in satellite link, S/N ratio in FM with multiplexed telephone signal in satellite link, Single channel per carrier(SCPC) systems, Companded single sideband (CSSB) systems, Analog FM/FDM TV satellite link, Intermodulation products & their effects in FM/FDM systems, Energy disposal in FM/FDM systems.

DIGITAL SATELLITE COMMUNICATION : Advantages of digital communication, Elements of digital satellite communication systems, Digital baseband signals, Digital modulation techniques like MSK,GMSK/, QAM ,Satellite digital link design, Time Division Multiplexing.

Section-C

MULTIPLE ACCESS TECHNIQUES: Introduction, TDMA, TDMA-Frame structure, TDMA-Burst structure, TDMA-Frame efficiency, TDMA-superframe, TDMAFrame acquisition & Synchronization, TDMA compared to FDMA, TDMA Burst Time Plan, Multiple Beam (Satellite switched) TDMA satellite system, Beam Hopping(Transponder Hopping) TDMA, CDMA & hybrid access techniques.

SATELLITE ORBITS: Introduction, Synchronous orbit, Orbital parameters, Satellite location with respect to earth, Look angles, Earth coverage & slant range, Eclipse effect, Satellite placement in geostationary orbit, station keeping, Satellite stabilization.

Section-D

]SPECIAL PURPOSE COMMUNICATION SATELLITES : BDS, INMARSAT, INTELSAT,

VSAT(data broadband satellite), MSAT(Mobile Satellite Communication technique), Sarsat (Search & Rescue satellite) & LEOs (Lower earth orbit satellite), Satellite communication with respect to Fiber Optic Communication, LANDSAT, Defense satellite.

LASER SATELLITE COMMUNICATION: Introduction, Link analysis, Optical satellite link transmitter, Optical satellite link receiver, Satellite Beam Acquisition, Tracking & Positioning, Deep Space Optical Communication Link.

TEXT BOOK:

1. Satellite Communication : D.C. Aggarwal ; Khanna.

REFERENCE BOOK :

1. Satellite Communication :Gagliardi ; CBS

ECE-407-F **DATA COMMUNICATION**

L T P	Class Work : 50
3 1 -	Exam : 100
	Total : 150
	Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

DIGITAL COMMUNICATION: Introduction, digital communication, Shannon limit for information capacity,digital radio, digital amplitude modulation, frequency shift keying (FSK), phase shift keying (PSK), quadrature amplitude modulation (QAM), band width efficiency, carrier recovery, differential phase shift keying,(DPSK), clock recovery, probability of error & bit error rate, trellis encoding.

Section-B

DATA COMMUNICATIONS: Introduction, history of data communication, standard organization for data communication, data communication circuits, data communication codes, error control, synchronization, data communications hardware, serial interfaces: RS-232, RS-449 & RS-530, CCITT X.21, parallel interfaces: centronics parallel interfaces. the telephone network: DDD network, private- line service, the telephone circuit, data modems: synchronous modems, asynchronous modems, modem synchronization.

Section-C

DATA COMMUNICATIONS PROTOCOLS AND NETWORK CONFIGURATIONS : Introduction, open system interconnection (OSI), data transmission mode,asynchronous protocols, synchronous protocols, public data network, integrated services digital network (ISDN), local area networks, token pass ring, Ethernet. RFID Technology & its applications like Attendance, security ,library management etc.

Section-D

MULTIPLEXING : Introduction, time division multiplexing, T1 digital carrier system, CCITT time division multiplexed carrier systems, CODECS, COMBO chips, line encoding, T-CARRIERS, frame synchronization, bit interleaving VS word interleaving, frequency division multiplexing, AT&T's FDM hierarchy, composite base band signal, formation of a master group.

INTERNET AND TCP/IP: Introduction, history, use of Internet, accessing the Internet, Internet addresses, security on the internet, authentication, firewalls, intranet and extranet, TCP/IP reference model, domain name service, world wide web.

TEXT BOOK:

1. Electronic Communications Systems (4th Ed.) : Wayne Tomasi; Pearson
2. Data Communication and Networking (2nd -edition): Forauzan;

ECE-409-F DIGITAL SIGNAL PROCESSING

L T P	Class Work : 50
3 1 -	Exam : 100
	Total : 150
	Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

DISCRETE-TIME SIGNALS: Signal classifications, frequency domain representation, time domain representation, representation of sequences by Fourier transform, properties of Fourier transform, discrete time random signals, energy and power theorems.

DISCRETE-TIME SYSTEMS : Classification, properties, time invariant system, finite impulse Response (FIR) system, infinite impulse response (IIR) system.

Section-B

SAMPLING OF TIME SIGNALS: Sampling theorem, application, frequency domain representation of sampling, reconstruction of band limited signal from its samples. discrete time processing of continuous time signals, changing the sampling rate using discrete time processing.

Z-TRANSFORM : Introduction, properties of the region of convergence, properties of the Z-transform, inversion of the Z-transform, applications of Z-transform.

Section-C

BASICS OF DIGITAL FILTERS : Fundamentals of digital filtering, various types of digital filters, design techniques of digital filters : window technique for FIR, bi-linear transformation and backward difference methods for IIR filter design, analysis of finite word length effects in DSP, DSP algorithm implementation consideration. Applications of DSP.

Section-D

MULTIRATE DIGITAL SIGNAL PROCESSING: Introduction to multirate digital signal processing, sampling rate conversion, filter structures, multistage decimator and interpolators, digital filter banks.

TEXT BOOKS :

1. Digital Signal Processing : Proakis and Manolakis; Pearson

2. Digital Signal Processing: Salivahanan, Vallavaraj and Gnanapriya;TMH

REFERENCE BOOKS:

1. Digital Signal Processing: Alon V. Oppenhelm;PHI

2. Digital Signal processing(II-Edition): Mitra, TMH

ECE-415-F OPTICAL COMMUNICATION SYSTEMS

L T P **Class Work : 50**

3- 1 -0 **Exam : 100**

Total : 150

Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question. from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

INTRODUCTION TO OPTICAL COMMUNICATION SYSTEMS : Electromagnetic spectrum used for optical communication, block diagram of optical communication system. Basics of transmission of light rays. Advantages of optical fiber communication.

Section-B

OPTICAL FIBERS: Optical fibers structures and their types, fiber characteristics : attenuation, scattering, absorption, fiber bend loss, dispersion; fiber couplers and connectors.

Section-C

LED LIGHT SOURCE : Light emitting diode : recombination processes, the spectrum of recombination radiation, LED characteristics, internal quantum efficiency, external quantum efficiency, LED structure, lens coupling to fiber, behavior at high frequencies.

LASER LIGHT SOURCE : Basic principles of laser action in semi -conductors, optical gain, lasing threshold, laser structures and characteristics, laser to fiber coupling, comparison with LED source.

Section-D

AVALANCHE AND PIN PHOTODETECTORS: Principles of optical detection, quantum efficiency, responsivity, general principles of PIN photodetector, intrinsic absorption, materials and designs for PIN photodiodes, impulse and frequency response of PIN photodiodes, noise in PIN Photodiodes, multiplication process, APD Design, APD bandwidth, APD noise.

TEXT BOOK:

Optical Fiber Communications: John M Senior; Pearson.

REFERENCE BOOKS :

1. Optical Communication Systems : John Gowar; PHI.
2. Optical Fiber Communications : Gerd Keiser; TMH
3. Optical Communication System, (2nd Edition): Satinder Bal Gupta and Ashish Goel; University Science Press
4. Optical fiber Communication : Selvarajan, Kar, Srinivas; TMH.
5. Optical Fiber Communication System by MK Raina, Satya Parkashan, New Delhi.

ECE-423-F WIRELESS & SATELLITE COMMUNICATION LAB

L T P	Class Work : 50
- - 2	Exam : 50
	Total : 100
	Duration of Exam : 3 Hrs.

LIST OF EXPERIMENTS:

1. To set up a satellite communication link & study of change in uplink & downlink frequency.
2. To Study Transmission of Audio & Video Signals & Data communication over satellite link .
3. To Study Transmission of telemetry data like temperature & light intensity over satellite link
4. To measure the propagation delay of signal in a Satellite communication Link.
5. To study different GPS data like longitude, latitude & different types of dilute of precision using GPS receiver..
6. To study selection of various PN codes like Gold, Barker & MLS in CDMA technology .
7. To study generation (spreading) & demodulation (Despreading) of of DSSS modulated signal
8. To study Voice communication over DSSS.
9. To study Minimum shift keying modulation & de modulation .
10. To study radiation pattern & calculate beam width for Yagi uda & Folded dipole antenna.
11. To study radiation pattern & calculate beam width for Circular & Triangular Patch Antenna.
12. to study FHSS Modulation & demodulation & transfer of numeric data.

NOTE:

At least ten experiments are to be performed.

EE-427-E **DATA COMMUNICATION LAB**

L T P **Class Work : 25**
- - 2 **Exam : 25**
Total : 50
Duration of Exam : 3 Hrs.

LIST OF EXPERIMENTS:

1. To study different types of transmission media
2. To study Quadrature Phase Shift Keying Modulation.
3. To study Quadrature Amplitude Modulation.
4. To Study! 6 Quadrature Amplitude Multiplexing.
5. To Study Serial Interface RS-232 and its applications.
6. To study the Parallel Interface Centronics and its applications.
7. To configure the modem of a computer.
8. To make inter-connections in cables for data communication in LAN.
9. To install LAN using Tree topology.
10. To install LAN using STAR topology.
11. To install LAN using Bus topology.
12. To install LAN using Token-Ring topology
13. To install WIN NT
14. To configure a HUB/Switch.

NOTE:

At least ten experiments have to be performed in the semester; At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus .

ECE-429-F **DIGITAL SIGNAL PROCESSING LAB**

L T P	Class Work : 25
- - 2	Exam : 25
	Total : 150
	Duration of Exam : 3 Hrs.

LIST OF EXPERIMENTS:

Perform the experiments using DSP Hardware Processor using Programmes in C Language:

1. To understand sampling theorem & generation of waveforms like sine, square & Triangle.
2. To study Quantization technique .
3. To study PCM encoding & Hamming code generation.
4. To Study Digital modulation techniques ASK/FSK& PSK .
5. To study FIR Filter Implementation.
6. To study Auto correlation & Linear convolution.

Experiments To be performed on MATLAB

1. represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine).
2. To develop program for discrete convolution.
3. To develop program for discrete correlation.
4. To design analog filter(low-pass, high pass, band-pass, band-stop).
5. To design digital IIR filters(low-pass, high pass, band-pass, band-stop).
6. To design FIR filters using windows technique.

NOTE:
At least ten experiments have to be performed in the semester.

ECE-419-F **MOBILE COMMUNICATION**

L T P	Class Work : 50
3 1 -	Exam : 100
	Total : 150
	Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

MOBILE RADIO SYSTEM: A reference model, Frequencies for radio transnussion, Signals, Antennas, Signal Propagation, Multiplexing, Modulation

CHARACTERISTICS OF RADIO WAVES: Multipath Characteristics of radio waves signal fading, time dispersion, Doppler spread, coherence time, LCR. fading statistics. Diversty techniques

Section-B

MOBILE RADIO PROPAGATION: Mechanism, free space path loss, long distance path loss model, Okumara model, Hata model, PCS model, wideband PCS, Microcell model, Indoor propagation model, Jake's channel model.

Section-C

WIRELESS SYSTEMS: Standards – GSM,signaling & call control, mobility management, location racking wireless data services IS-95, GPRS.

WIRELESS DATA NETWORKING: IEEE Standards, Models Different layers, wireless LAN, Hypes LAN, Bluetooth. Performance analysis of link & transport layer protocols over wireless channels.

Section-D

MOBILE NETWORK LAYER: Mobile IP: Goals, assumptions & requirements, IP packet delivery, Agent discovery, Registration, tunneling and en capsulation, optimization, Reverse tunneling, IP-V6, Mobile ad-hoc networks.

MOBILE TRANSPORT LAYS: Tradition TCP, Classical TCP improvement, TCP over 2.5G/3G wireless networks. Performance enhancing proxies.

TEXT BOOKS:

1. Mobile Communication: II nd edition Jochen Schiller Pearson Education

REFERENCES:

1. Mobile Cellular Telecommunications: 2nd Edition: William, C Y Lee Mc Graw Hill
2. Wireless and Digital Communication: Dr. Kamilo Feher (PHI)
3. T.S. Rappaport, "Wireless Communication, Principles & Practice", Pearson

EE-317-F **POWER ELECTRONICS**

L T P
3 1 -

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

INTRODUCTION : Role of power electronics, review of construction and characteristics of power diode, Shottky diode, power transistor, power MOSFET, SCR, DIAC, Triac, GTO, IGBT & SIT.

SCR: Ratings and protections, series and parallel connections, R, RC and UJT firing circuit and other firing circuits based on ICs and microprocessors; pulse transformer and opto-coupler, commutation techniques.

Section-B

AC REGULATORS: Types of regulator, equation of load current, calculation of extinction angle, output voltage equation, harmonics in load voltage and synchronous tap changer, three phase regulator.

CONVERTERS : One, two, three, six and twelve pulse converters, fully and half controlled converters, load voltage waveforms, output voltage equation, continuous and discontinuous modes of operation, input power factor of converter, reactive power demand, effect of source inductance, introduction to four quadrant / dual converter, power factor improvement techniques,

forced commutated converter, MOSFET and transistor based converters.

Section-C

INVERTERS : Basic circuit, 120 degree mode and 180 degree mode conduction schemes, modified McMurray half bridge and full bridge inverters, McMurray -Bedford half bridge and bridge inverters, brief description of parallel and series inverters, current source inverter (CSI), transistor and MOSFET based inverters.

CHOPPERS : Basic scheme, output voltage control techniques, one, two, and four quadrant choppers, step up chopper, voltage commutated chopper, current commutated chopper, MOSFET and transistor based choppers.

Section-D

CYCLOCONVERTERS : Basic principle of frequency conversion, types of cycloconverter, non-circulating and circulating types of cycloconverters.

DRIVES: Introduction to electric drives: DC drives – converter and chopper fed dc drives, ac drives – stator voltage control, V/f control, rotor resistance control, static Scherbius system and static Kramer systems.

TEXT BOOK:

1. Power Electronics : MH Rashid; Pearson

REFERENCE BOOKS :

1. Power Electronics : PC Sen; TMH

2. Power Electronics : HC Rai; Galgotia

3. Thyristorised Power Controllers : GK Dubey, PHI

4. Power Electronics and Introduction to Drives : A.K.Gupta and L.P.Singh;Dhanpat Rai

5. Power Electronics: P.S Bhimra.

ECE-461-F GENETIC ALGORITHMS & APPLICATIONS

L T P	
3 1 -	Theory : 100
	Class Work : 50
	Total : 150
	Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

INTRODUCTION: Overview, History of evolutionary computation: Search spaces & fitness landscapes, elements of genetic algorithms, comparison of Gas and tradition search methods.

Section-B

FUNDAMENTAL CONCEPTS OF GAS: Typical examples to illustrate how Gas work. Simple computer exercises.

Section-C

PROBLEM SOLVING USING GAS: Evolving computer programs, data analysis & prediction, evolving neural networks, simple computer exercises.

Section-D

IMPLEMENTATION OF GAS: Suitability of GA for typical problems, encoding a problem for a GA, adapting the encoding, selection methods, Genetic operators, Parameters for Gas.

TEXT BOOKS:

1. Davis L,"Handbook of Genetic Algorithms

2. Goldberg D.E.,"Genetic Algorithms in Search optimization & Machine Learning.": Pearson

3. Michalewiez, Z.,"Genetic Algorithms & Data Structures = Evolution Programs

ECE-453-F **RADAR AND SONAR ENGINEERING**

L T P
3 1 -

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

INTRODUCTION TO RADAR: Radar Block Diagram & operation, Radar Frequencies, Radar development, Application of Radar.

Section-B

RADAR EQUATION: Simple form of Radar Equation, Prediction of Range performance, Minimum detectable signal, Receiver noise, Signal to Noise ratio, Transmitter Power, Pulse repetition frequency & range ambiguities, System losses, Propagation effects.

CW & FREQUENCY MODULATED RADAR: The Doppler effect, CW Radar, Frequency-modulated CW Radar, Multiple Frequency CW Radar.

Section-C

MTI & PULSE DOPPLER RADAR: Introduction, Delay Line Cancellors, Multiple or staggered, Pulse repetition frequencies, range-Gated Doppler Filters, Digital Signal Processing, Other MTI delay line, Limitation of MTI performance, Noncoherent MTI, Pulse Doppler Radar,

MTI from a moving platform.

TRACKING RADAR: Tracking with Radar, Sequential Lobbing, Conical Scan, Monopulse Tracking Radar, Tracking in range, Acquisition.

Section-D

RECEIVERS, DISPLAYS & DUPLEXERS : Radar Receivers, Noise Figure, Mixer, Low-noise Front ends, Displays, Duplexer, Receiver protectors.

INTRODUCTION TO SONAR

TEXT BOOK:

1. Introduction to Radar Systems: Merrill I. Skolnik, ; MGH

REFERENCE BOOK:

1. Electronic Communication Systems : Kennedy; TMH

EE-405-F **ADVANCED CONTROL SYSTEMS**

L T P	Theory : 100
3 1 -	Class Work : 50
	Total : 150
	Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

STATE VARIABLE TECHNIQUES: State variable representation of systems by various methods. Solution of state equations-state transition matrix. Transfer function from state variable model. Controllability & observability of state variable model.

Section-B

SECOND ORDER SYSTEMS & STATE PLANE: Phase portrait of linear second systems. Method of isoclines, phase portrait of second order system with non-linearities, limit cycle, singular points.

Section-C

DESCRIBING FUNCTION ANALYSIS: Definition, limitations, use of describing function for stability analysis , describing function of ideal relay, relay with hysteresis & dead zone, saturation/coulomb friction & backlash,

LINEAR APPROXIMATION OF NONLINEAR SYSTEMS: Taylor series, Liapunov's 2nd method.

Section-D

SAMPLED DATA SYSTEMS: Sampling process, impulse modulation, mathematical analysis of sampling process, application of Laplace transform, Shannon's theorem, reconstruction of sampled signal zero order & first order hold, Z-transform, definition, evaluation of Z-transform, Inverse Z-transform, pulse transfer function, limitations of Z-transform, state variable formulation of discrete time systems. Solution of discrete time state equations, stability, definition, the Schur-Cohn stability criterion, Jury's test of stability of extension of Routh-Hurwitz criterion to discrete time systems.

TEXT BOOKS:

1. Digital Control & State Variable Methods : M.Gopal ; TMH.

2. Modern Control Systems, 11/e: Richard C. Dorf; Pearson

REFERENCE BOOKS :

1. Modern Control Theory : M.Gopal ; Wiley International.

2. Discrete Slotine & W.P.Li; Prentice Hall, USA,

3. Digital Control Systems : B.C.Kuo

4. Applied non-linear control : J.E.

5. Nonlinear Control Systems: Isidari ; Springer-Verlag.

ECE-411-F **WIRELESS SENSOR NETWORKS**

L T P	Class Work : 50
3 1 -	Exam : 100
	Total : 150
	Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sectionswhich will be compulsory and of short answer type. Two questions will be set from each of the foursections. The students have to attempt first common question, which is compulsory, and one questionfrom each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

OVERVIEW OF WIRELESS SENSOR NETWORKS :

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

Section-B

ARCHITECTURES:

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.

Section-C

NETWORKING SENSORS :

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.

Section-D

INFRASTRUCTURE ESTABLISHMENT :

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

TEXT BOOKS:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

REFERENCES:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

ECE-413-F **IMAGE PROCESSING**

L T P	Class Work : 50
3 1 -	Exam : 100
	Total : 150
	Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

Introduction: Fundamental steps in Digital Image Processing, Components of an Image Processing system, Digital Image Fundamentals: Elements of Visual Perception, Light and the electromagnetic spectrum, Image sensing and Acquisition, simple image formation model.

Image sampling and Quantization: concept of sampling & quantization, Representation of digital images, spatial and Graylevel resolution, Relationships between pixels-neighbors of pixel, Adjacency, connectivity, regions, and boundaries, distance measures, Image operations on a pixel basis.

Section-B

Image enhancement in Spatial domain: some basic Gray Level Transformations, Image negatives, log transformations, Power-Law transformations, piecewise –Linear Transformation functions; Histogram Processing, Enhancement using arithmetic/logic operations, Basics of spatial filtering.

Section-C

Image Compression: Fundamentals, Image Compression Models: The source encoder and decoder, the channel encoder and decoder, elements of information theory: Measuring information, The information channel, Fundamental coding theorems; error free compression, lossy compression.

Section-D

Image Segmentation: Detection of Discontinuities: Point detection, Line Detection, Edge detection; Edge Linking and Boundary detection, Thresholding: Role of Illumination, basic global thresholding, basic adaptive thresholding, Regional based segmentation: Basic Formulation, Region growing, region splitting and merging; use of motion in segmentation: Spatial Techniques, Frequency Domain Techniques.

Text Books:

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Pearson
2. Anil K Jain, “Fundamentals of Digital Image Processing”, PHI Edition 1997.

Reference Books:

1. Keenneth R Castleman, " Digital Image Processing”, Pearson
2. Chanda & Majumder, “Digital Image Processing & Analysis”, PHI

IC-404-F **FUZZZY CONTROL SYSTEM**

L T P	Theory/Exam : 100
3 1 -	Class Work : 50
	Total : 150
	Duration of Exam : 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

INTRODUCTION: Fuzzy control from an industrial perspective, knowledge-based controllers, knowledge representation in KBC's.

THE MATHEMATICS OF FUZZY CONTROL:
Vagueness, fuzzy logic versus probability theory, fuzzy sets, their properties & operations on fuzzy sets, fuzzy relations & operations on fuzzy relations, the Extension Principle, Fuzzy propositions, The Compositional Rule of Inference, Different implications, Representing a set of rules.

Section -B

FKBC DESIGN PARAMETERS: The PKBC architecture, choice of variables & content of rules, Derivation of rules, choice of membership functions, choice of scaling factors, choice of fuzzification procedure, choice of defuzzification procedure, comparison and evaluation of defuzzification methods.

Section -C

NONLINEAR FUZZY CONTROL: The Control Problem, The FKBC as a Non-Linear Transfer Element, Types of FKBC such as PID-like FKBC, Sliding Mode FKBC, Sugeno FKBC.
STABILITY OF FUZZY CONTROL SYSTEMS: The State space approach, Stability and robustness indices, input-output stability, circle criterion, the conicity criterion.

Section -D

ADAPTIVE FUZZY CONTROL: Design & Performance Evaluation, Approaches to Design such as membership function tuning using gradient descent, membership function tuning using performance criteria, the self-organizing controller, model based controller.

TEXT BOOK:
An Introduction to Fuzzy Control: D.,Driankov, H.Hellendoorn and M.Reinfrank.; Narosa.

REFERENCE BOOKS:
Fuzzy Control Systems : Abraham Kandel and Gideon Imngholz; Narosa