M.D UNIVERSITY
SCHEME OF STUDIES AND EXAMINATION
BE. II YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)
SEMESTER III
Modified 'E' Scheme effective from 2006-07

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
HUM-201-E	ECONOMICS (COMMON FOR ALL BR.)	3	1	-	4	50	100	-	150	3
MATH-201-E	MATHEMATICS - III (COMMON FOR ALL BR.)	3	2	-	5	50	100	-	150	3
EE-201-E	ELECTRICAL ENGINEERING MATERIALS & SEMI-CONDUCTOR DEVICES (EL,EI, IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-203-E	NETWORK THEORY (EL,EI, IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-205-E	ELECTROMECHANICAL ENERGY CONVERSION (EL,EI, IC, AEI)	3	1	-	4	50	100	-	150	3
CSE-201-E	DATA STRUCTURES & ALGORITHMS (CSE,EL,IT,EI, AEI)	3	1	-	4	50	100	-	150	3
EE-221-E	ELECTRICAL ENGINEERING MATERIALS & SEMI-CONDUCTOR DEVICES LAB (EL,EI, IC, AEI)	-	-	2	2	25	-	25	50	3
EE-223-E	NETWORK THEORY LAB (EL,EI, IC,EE, EEE, AEI)	-	-	2	2	25	-	25	50	3
EE-225-E	ELECTROMECHANICAL ENERGY CONVERSION LAB (EL,EI, IC, AEI)	-	-	3	3	50	-	50	100	3
EE-231-E	ELECTRICAL WORKSHOP (EL,EI, IC,EE,CHE, EEE, AEI)		-	2	2	25	-	25	50	3
	TOTAL	**18**	**7**	**9**	**34**	**425**	**600**	**125**	**1150**	

NOTE:

1. **Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.**

M.D UNIVERSITY
SCHEME OF STUDIES AND EXAMINATION
BE. II YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)
SEMESTER – IV

Modified 'E' Scheme effective from 2006-07

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
HUM-202-E	FUNDAMENTALS OF MANAGEMENT (EE,EL,EI,IC,CHE,ME, EEE, AEI)	3	1	-	4	50	100	-	150	3
MATH-202-E	NUMERICAL METHODS (EE,EL,EI, IC,CHE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-202-E	ANALOG ELECTRONICS (EL,EI, IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-204-E	DIGITAL ELECTRONICS (EL,EI, IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-206-E	COMMUNICATION SYSTEMS (EL,EE, EEE and Common with 6th Sem. – EI, AEI)	3	1	-	4	50	100	-	150	3
EE-208-E	ELECTRO MAGNETIC THEORY (EL,EI, IC, EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-222-E	ANALOG ELECTRONICS LAB (EL,EI, IC,EE, EEE, AEI)	-	-	2	2	25	-	25	50	3
EE-224-E	DIGITAL ELECTRONICS LAB (EL,EI, IC,EE, EEE, AEI)	-	-	2	2	25	-	25	50	3
EE-226-E	COMMUNICATION SYSTEMS LAB (EL,EE, EEE)	-	-	2	2	25	-	25	50	3
MATH-204-E	NUMERICAL METHODS LAB (EE,EL,EI,IC,CHE, EEE, AEI)	-	-	2	2	25	-	25	50	3
GPEE-202-E	GENERAL PROFICIENCY	-	-	-	-	50	-	-	50	3
	TOTAL	**18**	**6**	**8**	**32**	**450**	**600**	**100**	**1150**	

Note:

1. **Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.**
2. **Each student has to undergo practical training of 6 weeks during summer vacation and its evaluation shall be carried out in the V semester.**

M.D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATION
B.E III YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)
SEMESTER – V
Modified 'E' Scheme effective from 2007-08

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-301-E	COMMUNICATION ENGINEERING	3	1	-	4	50	100	-	150	3
EE-303-E	ELECTRONIC MEASUREMENT AND INSTRUMENTATION (EL,EI, IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-305-E	ANALOG ELECTRONIC CIRCUITS (EL,EI, IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-307-E	ANTENNA AND WAVE PROPAGATION	3	1	-	4	50	100	-	150	3
CSE-210-E	COMPUTER ARCHITECTURE AND ORGANISATION (EL, EI, IC, Common with IV sem. CSE, IT)	3	1	-	4	50	100	-	150	3
EE-309-E	MICROPROCESSORS AND INTERFACING (EL,EI, IC,CSE,IT, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-323-E	ELECTRONIC MEASUREMENT AND INSTRUMENTATION LAB (EL,EI, IC,EE)	-	-	2	2	25	-	25	50	3
EE-325-E	ANALOG ELECTRONIC CIRCUITS LAB (EL,EI, IC)	-	-	2	2	25	-	25	50	3
EE-329-E	MICROPROCESSORS AND INTERFACING LAB (EL,EI, IC,CSE,IT, EEE, AEI)	-	-	2	2	25	-	25	50	3
EE-331-E	ELECTRONIC CIRCUIT SIMULATION LAB (COMMON WITH VI SEM. – IC, AEI)	-	-	2	2	25	-	25	50	3
EE-335-E	PRACTICAL TRAINING-I	-	-	2	2		-	-		-
	TOTAL	**18**	**6**	**10**	**34**	**400**	**600**	**100**	**1100**	

Note:

1) **Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.**
2) **Assessment of Practical Training-I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by 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.E III YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)
SEMESTER – VI
Modified 'E' Scheme effective from 2007-08

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-302-E	MICROWAVE AND RADAR ENGINEERING	3	1	-	4	50	100	-	150	3
EE-304-E	CONTROL SYTEMS ENGG. (EL,EE, EEE)	3	1	-	4	50	100	-	150	3
EE-306-E	MOS IC'S AND TECHNOLOGY (Common with 7th Sem.- EI)	3	1	-	4	50	100	-	150	3
IT-305-E	COMPUTER NETWORKS (EL,CSE, COMMON WITH V-SEM. – IT, AEI)	3	1	-	4	50	100	-	150	3
EE-308-E	TV ENGINEERING	3	1	-	4	50	100	-	150	3
EE-310-E	DIGITAL SYSTEM DESIGN (EL,EI, IC,EE,CSE, AEI)	3	1	-	4	50	100	-	150	3
EE-324-E	CONTROL SYSTEMS ENGG. LAB (EL,EE, EEE, AEI)	-	-	2	2	25	-	25	50	3
IT-304-E	NETWORK PROGRAMMING LAB (EL, IT, AEI)	-	-	2	2	25	-	25	50	3
EE-330-E	DIGITAL SYSTEM DESIGN LAB (EL,EI, IC,CSE, AEI)	-	-	3	3	25	-	25	50	3
EE-322-E	MICROWAVE LAB	-	-	2	2	25	-	25	50	3
GPEE-302-E	GENERAL PROFICIENCY	-	-	-	-	50	-	-	50	3
	TOTAL	18	6	9	33	450	600	100	1150	

Note:

1. **Each student has to undergo practical training of 6 weeks during summer vacation and its evaluation shall be carried out in the VII semester.**
2. **Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.**

M.D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATION
B.E IV YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)
SEMESTER – VII
Modified 'E' Scheme effective from 2006-07

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-401-E	DATA COMMUNICATION (EL, EE)	3	1	-	4	50	100	-	150	3
IC-403 E	EMBEDDED SYSTEMS DESIGN (EI, IC, EL)	3	1	-	4	50	100	-	150	3
EE-405-E	OPTICAL COMMUNICATION SYSTEMS	3	1	-	4	50	100	-	150	3
EE-407-E	DIGITAL SIGNAL PROCESSING (EL, EI, IC, EE)	3	1	-	4	50	100	-	150	3
	*OPEN ELECTIVE	4	-	-	4	50	100	-	150	3
EE-421-E	DATA COMMUNICATION LAB (EL, EE)	-	-	2	2	25	-	25	50	3
IC-417-E	EMBEDDED SYSTEMS DESIGN LAB. (EI, IC, EL)	-	-	2	2	25	-	25	50	3
EE-427-E	DIGITAL SIGNAL PROCESSING LAB (EL, EI, IC, EE)	-	-	2	2	25	-	25	50	3
EE-431-E	PROJECT	-	-	4	4	50	-	-	50	3
EE-435-E	PRACTICAL TRAINING – II	-	-	2	2	-	-	-		-
	TOTAL	**16**	**4**	**12**	**32**	**375**	**500**	**75**	**950**	

List of Open Electives

1	HUM-451-E	Language Skills for Engineers	8	CSE-451-E	Artificial Intelligence & Expert Systems
2	HUM-453-E	Human Resource Management	9	CSE-303-E	Computer Graphics
3	HUM-457-E	Business Communication	10	IC-455-E	Intelligent Instrumentation for Engineers
4	HUM-455-E	Entrepreneurship	11	IC-403-E	Embedded Systems
5	PHY-451-E	Nano technology	12	CH-453-E	Pollution & Control
6	PHY-453-E	Laser Technology	13	IT-471-E	Management Information System
7	ME-451-E	Mechatronics Systems	14	IT-204-E	Multimedia Technologies

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. **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.**
4. **Project load will be treated as 2 hours per week for Project Coordinator and 1 hour for each participating teacher. Project will commence in VII semester where the students will identify the Project problem, complete the design/procure the material/start the fabrication/complete the survey etc., depending upon the nature of the problem. Project will continue in VIII semester.**

M.D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATION
B.E IV YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)
SEMESTER – VIII
Modified 'E' Scheme effective from 2006-07

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-402-E	WIRELESS COMMUNICATION (COMMON WITH VI SEM – CSE,IT)	3	1	-	4	50	100	-	150	3
EE-404-E	SATELITE COMMUNICATION ENGINEERING	3	1	-	4	50	100	-	150	3
	DEPTT. ELECTIVE – I	4	-	-	4	50	100	-	150	3
	DEPTT. ELECTIVE- II	4	-	-	4	50	100	-	150	3
EE-424-E	SATELITE COMMUNICATION LAB	-	-	2	2	50	-	50	100	3
EE-431-E	PROJECT	-	-	8	8	50	-	100	150	3
EE-422-E	INDEPENDENT STUDY SEMINAR	-	-	4	4	50	-	-	50	
GFEE-402-E	GENERAL FITNESS FOR THE PROFESSION	-	-	-	-	50	-	100	150	3
	TOTAL	14	2	14	30	400	400	250	1050	

DEPT. ELECTIVE-I

EE-432E	Mobile Communication
EE-317E	Power Electronics
IC-404E	Fuzzy Control System (Common with EI, IC main paper in VIIIth sem)

DEPT. ELECTIVE-II

EE-462-E	Genetic Algorithms & Applications
EE-454-E	Radar and Sonar Engg.
EE-406-E	Advance Control System

Note:

1) **Project load will be treated as 2 hrs. per week for the project coordinator and 1 hour for each participating teacher. Project involving design, fabrication, testing, computer simulation, case studies etc., which has been commenced by students in VII semester will be completed in VIII semester.**
2) **For the subject EE-422E (Independent Study Seminar), a student will select a topic from emerging areas of Electronics & Communication Engineering and study it thoroughly and independently. Later he will give a seminar talk on the topic.**
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) **Students will be allowed to use the non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination**

IC –417-E EMBEDED SYSTEM DESIGN LAB

L	T	P
–	–	2

Class Work: 25
Exam: 25
Total: 50
Duration of Exam: 3 Hrs.

8051 Micro Controller

1. Write an Assembly language Programme (ALP) to generate 10kHz square wave.
2. Write an ALP to generate 10 kHz frequency using interrupts.
3. Write an ALP to interface one Microcontroller with other wring serial/parallel communication.
4. Write an ALP for temperature & pressure measurement & to display on intelligent LCD display

PIC Microcontroller

.

5. Write an ALP for PWM based speed control of motor .
6. Write an ALP for PWM based regulator of voltage.
7. Write an ALP to send/receive the data from an computer to MC through serial communication

General

8. Study of Development tools/environment for Microcontroller Programme.
9. Develop an embedded system for traffic light controller using Micro controller
10. Develop an embedded system for the automatic motion of a car (Model of car) & Subsequent display on LCD using Microcontroller..

DEPT. ELECTIVE-I

EE-432E	Mobile Communication
EE-317E	Power Electronics
IC-404E	Fuzzy Control System (Common with EI, IC main paper in VIIIth sem)

DEPT. ELECTIVE-II

EE-462-E	Genetic Algorithms & Applications
EE-454-E	Radar and Sonar Engg.
EE-406-E	Advance Control System

MOBILE COMMUNICATION

EE-432-E

L T P
3 1 0

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

UNIT 1 MOBILE RADIO SYSTEM:
A reference model, Frequencies for radio transnussion, Signals, Antennas, Signal Propagation, Multiplexing. Modulation

UNIT 2 CHARACTERISTICS OF RADIO WAVES:
Multipath Characteristics of radio waves signal fading, time dispersion, Doppler spread, coherence time, LCR. fading statistics. Diversty techniques

UNIT 3 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.

UNIT 4 WIRELESS SYSTEMS:
Standards – GSM, signaling & call control, mobility management, location racking wireless data services IS-95, GPRS.

UNIT 5 WIRELESS DATA NETWORKING:
IEEE Standards, Models Different layers, wireless LAN, Hypes LAN, Blue tooth. Performance analysis of link & transport layer protocols over wireless channels.

UNIT 6 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.

UNIT 7 MOBILE TRANSPORT LAYS:
Tradition TCP, Classical TCP improvement, TCP over 2.5G/3G wireless networks. Performance enhancing proxies.

TEXT BOOKS:
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", PHI 2001.**

Note: Eight questions are to be set – at least one from each unit. Students have to attempt five questions.

EE-317-E POWER ELECTRONICS

L T P	CLASS WORK	:	50
3 1 0	EXAM	: 100	
	TOTAL	:	150
	DURATION OF EXAM	:	3 HRS

UNIT1. 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.

UNIT2. 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.

UNIT3. 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.

UNIT4. 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.

UNIT5. 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.

UNIT6. 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.

UNIT7. CYCLOCONVERTERS :
Basic principle of frequency conversion, types of cycloconverter, non-circulating and circulating types of cycloconverters.

UNIT8. 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; PHI

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.

NOTE : Eight questions are to be set –one from each unit. Students have to attempt any five questions.

IC-404-E FUZZZY CONTROL SYSTEM

L T P			
3 1 0	CLASS WORK	:	50
	EXAM	: 100	
	TOTAL	:	150
	DURATION OF EXAM	:	3 HRS

UNIT 1 INTRODUCTION:
Fuzzy control from an industrial perspective, knowledge-based controllers, knowledge representation in KBC's.

UNIT 2 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.

UNIT 3 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.

UNIT 4 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.

UNIT 5 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.

UNIT 6 STABILITY OF FUZZY CONTROL SYSTEMS:
The State space approach, Stability and robustness indices, input-output stability, circle criterion, the conicity criterion.

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

NOTE : Eight question are to be set at least one from each unit. Students have to attempt five questions in all.

EE– 462-E GENETIC ALGORITHMS & APPLICATIONS

L T P		
4 - -	Theory	: 100
	Class work	: 50
	Total	:150
	Duration of exam.	: 3 hours

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

2. **Fundamental Concepts of Gas:** Typical examples to illustrate how Gas work. Simple computer exercises.

3. **Problem Solving Using Gas:** Evolving computer programs, data analysis & prediction, evolving neural networks, simple computer exercises.

4. **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."
3. Michalewiez, Z.,"Genetic Algorithms & Data Structures = Evolution Programs

Note: 8 questions are to be set –at least one from each unit. Students have to attempt any five questions in all .

EE-454-E RADAR AND SONAR ENGINEERING

L T P			
3 1 0	CLASS WORK	:	50
	EXAM	: 100	
	TOTAL	: 150	
	DURATION OF EXAM	: 3 HRS	

UNIT 1. INTRODUCTION TO RADAR:
Radar Block Diagram & operation, Radar Frequencies, Radar development, Application of Radar.

UNIT 2. 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.

UNIT 3. CW & FREQUENCY MODULATED RADAR:
The Doppler effect, CW Radar, Frequency-modulated CW Radar, Multiple Frequency CW Radar.

UNIT 4. 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.

UNIT 5. TRACKING RADAR:
Tracking with Radar, Sequential Lobbing, Conical Scan, Monopulse Tracking Radar, Tracking in range, Acquisition.

UNIT 6. RECEIVERS, DISPLAYS & DUPLEXERS:
Radar Receivers, Noise Figure, Mixer, Low-noise Front ends, Displays, Duplexer, Receiver protectors.

UNIT 7. INTRODUCTION TO SONAR

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

REFERENCE BOOK:
1. Electronic Communication Systems : Kennedy; TMH

NOTE: 8 questions are to be set –at least one from each unit. Students have to attempt any five Questions.

DEPT. ELECTIVE-I

EE-406-E ADVANCED CONTROL SYSTEMS

L T P		
3 1 -	Theory	: 100 marks
	Class work	: 50 marks
	Total	: 150 marks
	Duration of exam.	: 3 hours

UNIT 1. 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.

UNIT 2. 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.

UNIT 3. 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,

UNIT 4. LINEAR APPROXIMATION OF NONLINEAR SYSTEMS: Taylor series, Liapunov's 2nd method.

UNIT 5. 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.

REFERENCE BOOKS :

1. Modern Control Theory : M.Gopal ; Wiley International.
2. Discrete Slotine & W.P.Li; Prentice Hall, USA,
5. Nonlinear Control Systems: Isidari ; Springer-Verlag.

NOTE : 8 questions are to be set –one from each unit. Students have to attempt five questions.time control system : K.Ogate ; PHI

3. Digital Control Systems : B.C.Kuo
4. Applied non-linear control : J.E.