M.D. UNIVERSITY, ROHTAK

Scheme of studies & Examination
B. Tech. (Electrical Engg.)

SEMESTER VII

F ' Scheme

EFFECTIVE FROM THE SESSION 2012-13

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-403-F	Electric Drives And Control	3	1	-	4	50	100	-	150	3
ECE-409-F	Digital Signal Processing	3	1	-	4	50	100	-	150	3
EE-405-F	Power System Operation And Control	3	1	-	4	50	100	-	150	3
	*Open Elective	3	1	-	4	50	100	-	150	3
	*Dept Elective	3	1	-	4	50	100	-	150	3
EE-409-F	Computer Applications To Power System Analysis	3	1	-	4	50	100	-	150	3
EE-413-F	Electric Drives And Control Lab.			3	3	50	-	50	100	3
ECE-429-F	Digital Signal Processing Lab	-	-	2	2	25	-	25	50	3
EE-419-F	Computer Applications To Power System Analysis Lab.	-	-	3	3	50	-	50	100	3
GFEE-401-F	General Fitness For The Profession	-	-	-	-		-	50	50	3
EE-401-F	Practical Training – II	-	-	-	-	-	-		-	-
	TOTAL	18	6	8	32	425	600	175	1200	

List of Open Electives

1.	HUM-451-F	Language Skills for Engineers
2.	HUM-453-F	Human Resource Management
3.	HUM-459-F	Renewable Energy Resources and Technology
4.	ME-451-F	Mechatronics Systems
5.	IC-455-F	Intelligent Instrumentation for Engineers
6.	OR-401-F	Operations Research

List of Dept Electives

1. EHV AC/DC   (EE-432-F)
2. Fuzzy Logic Control   (IC-404-F)
3. Recent Trends in De-regulated Power Systems (EE-438-F)
4. High Voltage Engineering   (EE-442-F)
5. Electrical Power Quality   (EE-444-F)
6. Power Management   (EE-450-F)

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. (Electrical Engg.)
SEMESTER VIII
F ' Scheme

EFFECTIVE FROM THE SESSION 2012-13

Sr. No	Course No	Subject	Internal Marks	External Marks	Total Marks
1.	EE- 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 4 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.

EE-403-F   **ELECTRIC DRIVES AND CONTROL**

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.

<div align="center">Section -A</div>

ELECTRICAL DRIVES: Introduction, Classification, advantages, Characteristics of Electric Motors, choice of electrical drive machines, status of ac and dc drives.

CONTROL OF ELECTRICAL DRIVES: Modes of operation, closed loop control of drives, sensing of current and speed, Microprocessor based control of electric drives

<div align="center">Section -B</div>

DYNAMICS OF ELECTRICAL DRIVES: Fundamental torque equations, multi-quadrant operation, equivalent values of drive parameters, load torque components, types of loads.

SELECTION OF MOTOR POWER RATING: Heating and cooling, determination of motor rating, continuous, short time and intermittent duty rating, load equalization and determination of moment of inertia of the flywheel.

<div align="center">Section -C</div>

DC MOTOR DRIVES: Starting, Acceleration control, braking, transient analysis, Converter fed dc drive & chopper fed dc drive.

PMBLDC & PMSAC DRIVES: Permanent Magnet Brushless D C drive, Permanent Magnet Sine-fed drives, Switched Reluctance Machine Drives.

<div align="center">Section -D</div>

INDUCTION MOTOR DRIVES: Starting, Acceleration control, braking, transient analysis, Static control techniquesstator frequency control, stator voltage control, rotor resistance control. Static Scherbius system & static Kramer system, vector control.

TEXT BOOKS:
1. Fundamentals of Electrical Drives:- by G.K.Dubey, Narosa Publishing House, New Delhi, 1995
2. Electric drives: Concepts and applications, V.Subrahmaniyam, TMH, New Delhi.

REFERENCE BOOKS:
1. Power Semiconductor controlled drives; by G.K.Dubey, Prentice Hall.
2. Kusko, A., Solid State DC Motor Drives, MIT Press, Cambridge, Mass.USA,1969
3. Pillai S.K., A First course in elecric drives, Wiley Eastern, New Delhi.
4. Chillikan, M., Electric Drives, Mir Publishers, Moscow, 1970.
5. Bose B.K., Power Electronics & AC Drives, Prentice Hall, New Delhi,1991.

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

EE-405-F   **POWER SYSTEM OPERATION AND CONTROL**

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

AUTOMATIC GENERATION CONTROL: Load frequency control (single area case), load frequency control and economic dispatch, optimal load frequency control, Load Management.

Section -B

ECONOMIC LOAD DESPATCH: Introduction, Optimal Operation of Generators of Bus bar, Unit Commitment, Reliability Considerations, Optimal Generation Schedule Hydro thermal optimal scheduling.

Section -C

POWER SYSTEM STABILITY: Steady state, transient & dynamic stabilities, equal area criteria, effect of fault clearing time on transient stability, dynamics of synchronous machine, factors affecting transient stability.

Section -D

AUTOMATIC VOLTAGE CONTROL & EXCITATION SYSTEMS: AVRs, role of AVR on transient stability of system, type 0 & 1 excitation system, power system stabilizers.

VOLTAGE STABILITY: Basic concept, Voltage collapse, Modelling & prevention.

TEXT BOOKS:
1. Power System Engineering, : I.J. Nagrath & D.P. Kothari :TMH
2. Power System Stability Volume-I : E.W. Kimbark, John Wiley & Sons.
3. Power System Operations and Control : S. Sivanagaraju & G. Sreenivasan; Pearson

REFERENCE BOOKS:
1. Voltage stability by Taylor
2. Power System Control and Stability: P.Kundur : Mc Graw Hill
3. Electric Energy System Theory: O.I.Elgerd : TMH
4. Computer Aided Power System Analysis : S.I. Ahson, D.P.Kothari & A.K. Mahalanabis, TMH.
5. Power System Analysis & Design : B.R.Gupta, Wheelers Publication,
6. EHV-AC/DC Transmission System ; S.Rao : Khanna Pub.
7. PGO & C: Wood & Wallenberg, John Wiley & Sons.

EE-413-F   **ELECTRIC DRIVES AND CONTROL LAB**

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

LIST OF EXPERIMENTS

1. To study Single phase bridge converter drive & study ramp comparator firing circuit for same.

2. To study Single phase Half converter drive & study ramp comparator firing circuit for same.

3. To study Single phase AC motor control drive by anti parallel SCR & DIAC –TRIAC configuration.

4. Speed control of FHP synchronous motor using Three phase Cycloconverter. to observe current and voltage waveform at different frequency.

5. Speed control of FHP synchronous motor using **VSI Inverter** & to observe current and voltage waveform at different frequency.

6. To obtain speed –torque characteristics of 1 H.P DC series motor in Open/close loop using IGBT/MOSFET and to observe current and voltage waveform at different duty factors.

7. To draw speed-torque char. Of Three phase Fully controlled rectifier fed 1 H.P separately excited DC motor at different firing angle and To observe current & voltage waveform at different firing angles.

8. To obtain speed –torque characteristics of 1 H.P DC series motor in open/close loop using single phase converter and to observe current & voltage waveform at different firing angles.

9. Speed torque char. of Three phase VSI inverter fed FHP induction motor drive and to observe current and voltage waveform at different frequency.

10. Speed torque char. of Three phase CSI inverter fed FHP induction motor drive and to observe current and voltage waveform at different frequency.

11. Regenerating and Breaking of DC motor using two Quadrant chopper with active load and to draw negative speed torque curve.

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

L T P   Class Work : 25
- - 2   Exam : 25
                                                         Total : 50
                                                         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.

EE-409-F   **COMPUTER APPLICATION TO POWER SYSTEM ANLYSIS**

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

INTRODUCTION: Introduction to the growth of power systems, Model representation of transmission line introduction, performance of transmission systems, Ferranti effect, security analysis, Contingency analysis.

Section-B

LOAD FLOW STUDIES: Introduction, Bus Admittance Matrix, Formation of Y Bus, Tree graph, Co-tree, Primitive network, Bus Incidence matrix, Formulation of Y Bus using singular transformation, Load flow equations Approximate Load flow study, Gauss-Seidel method for Load flow Study, Algorithm and flow, Chart for Computer application to Load flow studies, using G-I method, Newton-Raphson method for Load flow studies, Algorithm and flow chart for Computer Application to Load flow studies using N.R. Method. Decoupled Load flow Studies, Fast Decoupled Load flow. Comparison between G-S & NR. methods. Load flow Study of Distribution System.

Section-C

SYMMETRICAL AND UNSYMMETRICAL FAULT ANALYSIS: Single line to ground fault, Line to Line fault, Double line to Ground fault and symmetrical fault. Consideration of Pre fault currents. Symmetrical Components.

DIGITAL TECHNIQUES IN FAULT CALCULATIONS: Review of symmetrical components, Sequence networks for synchronous machines, transforms and transmission Lines. Bus Impedance matrix, Algorithm for formulation of Bus. All types of modifications, digital technique in short circuit Studies of: Single line to ground fault, Line to Line fault, Double line to Ground fault and symmetrical fault. Consideration of Pre fault currents.

Section-D

COMPUTER CONTROL & AUTOMATION: Introduction to energy control centres, various states of a power system, SCADA Systems and RTU.   Introduction to the MATLAB Power System block Set. Introduction of the features of EMTP.

TEXT BOOKS:
1. Power Systems Engineering by S. K. Gupta, Umesh publication
2. Power System Analysis & Design with CD by Glover, Cengage Learning
3. Power System Engg., by B.R.Gupta: S. Chand.
4. Power System Analysis: Hadi Saadat, TMH, New Delhi.
5. Computer Techniques in Power System analysis by M. A. Pai

REFERENCE BOOKS

1.   Advance power system analysis and dynamics by L.P. Singh: Wiley Eastern ltd.
2.   Electrical Energy system theory: An introduction by O.I.Elgerd : TMH.
3.   Elements of power system analysis by W. D. Stevenson: M.G.H.
4.   Power System Engineering by I.J.Nagrath & D.P.Kothari: TMH.
5.   Computer methods in power system by G. W. Stagg and A. H. El-Abiad: M.G.H.

EE-419-F   COMPUTER APPLICATIONS TO POWER SYSTEMS ANALYSIS LAB

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

1. Draw the flow chart and develop the computer program for the formation of the Y Bus of a generalized network.
2. Draw the flow chart and develop the computer program for the formation of the Z Bus of a generalized network.
3. To plot the swing curve and observe the stability.
4. To perform load flow study using Gaus Shiedel method.
5. Perform short circuit study for any type of fault.
6. To observe transmission losses and efficiency with variations in power for the given example.
7. Design of distribution system
8. To study the features of EMTP
9. To study the MATLAB Power System block set features.
NOTE:
At least 10 experiments have to be performed with at least 7 from above list, remaining 3 may either be performed from above list or designed & set by concerned institution as per the scope
of syllabus.

EE-432-F   **EXTRA HIGH VOLTAGE AC/ DC**

L T P   Exam : 100
3 1 -   Sessionals : 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

Break Down Mechanism of Gaseous Materials :
Mechanism of Breakdown of gases, Townsend's first Ionization Co-efficient, Townsend's second Ionization Coefficient, Townsend's Breakdown Mechanism, Streamer Theory of Breakdown in gases, Paschen's law.

Breakdown in Liquid and Solid Dielectrics: Suspended Particle Theory, Cavity Breakdown, Electro-convection Breakdown, Breakdown in solid Dielectrics, Intrinsic Breakdown, Electromechanical Breakdown, Breakdown due to Treeing and Tracking, Thermal Breakdown, Electrochemical Breakdown.

Section -B
Generation of High Voltage AC. and D.C : Half wave and Full wave Rectifier, Cockroft Walton Voltage Multiplier Circuit, Ripple in Multiplier Circuit, Electrostatic Vandegraff Generator, Generation of High Alternative Voltage, Cascade Transformer, Resonant Transformer, Generation of High Frequency A.C. High Voltage

Generation of Impulse Voltages and Currents: Standard Impulse Wave Shapes, Impulse Generator Circuit, Multistage Impulse Generator, Marx's Circuit, Generation of Switching Surges, Impulse Current Generation, Tripping and Control of Impulse Generator

Section -C

Measurement of High Voltage and Current: Sphere-Gap, Uniform field Spark gap, Rod Gap, Electrostatic Voltmeter, Generating Voltmeter, Impulse Voltage Measurement using Voltage divider, Measurement of high DC, AC and Impulse Current.

High Voltage Testing of Electrical Equipments : Testing of line Insulator, Testing of Cable, Testing of Bushings, Testing of Power Capacitor, Testing of Power Transformers, Testing of Circuit Breaker.
Section -D

Transients & Insulation Co-ordination in Power System: Over Voltage due to disturbances in D.C & A.C. System, Lightening surges, Switching Surges, Insulation Co-ordination in Power System, Surge Arrestor, Application of surge Arrestor.

TEXT BOOK:
1. High Voltage Engineering By M.S. Naidu & V. Kamaraju - TMH Publication

REFERENCE BOOKS:
1. J. Arrillaga, High Voltage Direct Current Transmission. Pub: Peter Peregrinus Ltd. on behalf of I.E.E Power Engg. Series.
2. Rakos Das Begamudre, Extra EHV A.C Transmission. PHI Publication.
3. C.L Wadhwa , High Voltage Engineering. Pub.: New Age International Ltd.

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.

<center>Section -A</center>

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.

<center>Section -B</center>

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.

<center>Section -C</center>

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.

<center>Section -D</center>

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

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EE-438-F   RECENT TRENDS IN DEREGULATED POWER SYSTEM

L T P   Theory : 100
3 1 -   Sessionals : 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

Deregulation of the Electricity Supply Industry:
Background of deregulation and the current situation, Benefits from a competitive Electricity Market, After effects of Deregulation.

Section -B

Power System Operation in Competitive Environment :
Role of Independent System operator, Operational Planning activities of ISO, operational planning activities of Genco.

Section -C

Transmission open Access and Pricing Issues:
Power Wheeling, Transmission Open Access, Cost component in Transmission, Pricing of Power Transmissions, Security Management in Deregulated environment, Congestion management in Deregulation.

Section -D

Reliability and Deregulation :
Reliability Analysis, Optimal Power Flow as a Basic Tool, Unit Commitment, Formation of Power Pools.

REFERENCES:
1. Lei Lee Lal, Power System Restructuring and Deregulation. UK: John Wiley and Sons, 2001.
2. Kankar Bhattacharya, Math H.J.Bollen and Jaap E. Daalder, Operation of Restructured Power Systems. USA: Kluwer Academic Publishers, 2001.
3. Md Shahidehpour and Muwaffaq Alomoush, Restructured Electrical Power Systems. Marcel Dekker, Inc.
4. S.S. Rao, Switch Gear Protection and Power System Analysis. Khanna Publications

EE- 442-F   **HIGH VOLTAGE ENGINEERING**

L T P   Theory marks : 100
3 1 -   Class Work marks : 50
                                                        Total marks : 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: Recent trends in high voltage transmission.

Conduction and breakdown: Conduction & breakdown in gases, liquids and solid dielectrics, insulator breakdown, insulation characteristics of long air gaps.

Section -B

Voltage gradients on conductors: Electrostatic fields of sphere gaps, fields of line charges and their properties, charge-potential relations for multi-conductor lines, surface voltage gradients on conductors, distribution of voltage gradient on sub conductors of bundle.;

Section -C

Corona: Corona and corona loss, corona loss formula, attenuation of travelling waves due to corona, audible noise generation and characteristics, corona pulses-their generation and properties, properties of pulse, radio interference.

Lightening: Lightening phenomenon, lightning stroke mechanism, principle of lightning protection, tower foot resistance, insulator flash over and withstand voltage, lightning arresters and their characteristics.

Section -D

H.V. testing and Lab equipments : Standard wave-shapes for testing, wave-shaping circuits: principles and theory; impulse generator, generation of ac high voltage for testing, generation of direct voltage, measurement of high voltage, general layout of H.V. Laboratory.

TEXT BOOKS:
1. E.H.V. AC Transmission: R.D. Begamudre, Wiley Eastern Ltd.
2. H.V. Engg.: V. Kamaraju and M.S. Naidu, T.M.H., N.Delhi.

EE-444-F   **ELECTRICAL POWER QUALITY**

L T P   Exam : 100
3 1 -   Sessionals : 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.

<div align="center">Section -A</div>

INTRODUCTION TO ELECTRICAL POWER QUALITY:
Definition of Power Quality, Power Quality Issues, Power Quality v/s Equipment Immunity, Electric Power Quality Standards.

POWER FREQUENCY DISTURBANCES: Common Power Frequency Disturbances, Voltage Sag, Isolation Transformers, Voltage Regulators, Static Uninterruptible Power Source Systems.

<div align="center">Section -B</div>

ELECTRICAL TRANSIENTS: Types and Causes of Transients, Atmospheric Causes, Switching Loads On or Off, Interruption of Fault Circuits, Capacitor Bank Switching, Motor Start Transient, Power Factor Correction, Capacitor Switching Transient.

<div align="center">Section -C</div>

HARMONICS: Definition of Harmonics, Causes of Voltage and Current Harmonics. Individual and Total Harmonic Distortion, Effect of Harmonics on Power System Devices, Guidelines for Harmonic Voltage and Current Limitation, Harmonic Current Mitigation.

<div align="center">Section -D</div>

MEASURING & SOLVING POWER QUALITY PROBLEMS: Power Quality Measurement Devices, Harmonic Analyzers, Transient-Disturbance Analyzers, Oscilloscopes, Data Loggers and Chart Recorders, True RMS Meters, Power Quality Measurements.

REFERENCE BOOKS:
1. G.T. Heydt, Electric Power Quality. 2nd ed. West Lafayette, IN: Stars in a Circle, 1994.
2. A Ghosh, G. Ledwich, Power Quality Enhancement Using Custom Power Devices. Kluwer Academic, 2002
3. R.C. Dugan, M.F. McGranaghan and H.W. Beaty, Electric Power Systems Quality. New York: McGraw-Hill.1996.
4. C. Sankaran, Power Quality. CRC, 2002.
5. J. Arrillaga, D.A Bradely and P.S. Bodger, Power System Harmonics. New York: Wiley, 1985

L T P   Exam : 100
3 1 -   Sessionals : 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: Power Scenario, Power Development, Planning, Power resources, Environment-Power matters Plan, Pre-feasibility and feasibility studies, State relations for
Power etc.

RESOURCES: Resources, Geophysical study, Seismic Considerations, Environmental Restraints, Resettlement and Rehabilitation.
Section -B

PROCUREMENT: Contracting and Procurement, Consulting Services, Types of Contracts, Project Management, Organization and Economy Management, Organizational Planning and Time Scheduling, Project Cost Control.

ENGINEERING: Engineering & General Layout of Equipments, Generator, Transformer and Switch Gear and Control Equipment, Construction Methods, Operation and Maintenance Principle, Maintenance organization and planning, Availability, life cycle cost & future development. Visits to sites.
Section -C

POWER SECTOR: Power sector structure in different states, Regulatory Regime in those states, Power utilities in Haryana, Grid management, Power financing, Visit to sites.

POWER STATION: Management of Fuel, water Resource Electricity deviend scenario storage and handling, Pricing, Contract etc., Human resource management. Visit to sites.

Section -D

RISK & HAZARD: Introduction to risk, rules and regulation Aspects of Risk & Hazard Health & risk assessment visit to site.

ELECTRICITY INDUSTRY STRUCTURE & SAFETY REGULATIONS BILL & ETC.: State and Central Power boards / Power corporations.

REFERENCE BOOKS:
1. Electricity Bill, Safety & Conservation Act
2. Arora & Dom Kundwar, A Course in Power Plant Engineering, Pub.: Dhanpat Rai Pub, 2000.
3. Jain & Bala Subranmanyam, "Power Plant Engineering", Dhanpat Rai Pub.,
4. Butter Worth, A.B. Gill, "Power Plant Performance Management", Pub: 1984.
5. P.C. Sharma, "Power Plant Engineering", Dhanpat Rai Pub.,
6. David A. Decenzo, Stephen P. Robbins, Human Resource Management. New Delhi: PHI Pvt. Ltd., 2004.
7. P.K. Nag, Power Plant Engg. N.Delhi: TMH, 2003

HUM-459-F   **RENEWABLE ENERGY RESOURCES & TECHNOLOGY**

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

Introduction: Energy Sources and their availability, renewable energy sources, Prospects of renewable energy sources, application of non conventional and renewal energy sources.

Enviormental Aspects of Electric Energy Geneneration: Introduction Thermal pollution, Atmospheric pollution, Effects of Hydroelectric projects,Nuclear power generation and enviorment, Green House Gas Effects, Global Environmental awareness,Energy options for Indian Economy.

Section -B

Solar Energy : Solar radiation estimation, Basic Principle of Solar Energy physical Principal of the conversion of solar radiation into heat, Collectors, Solar Energy storage system, solar thermal electric conversion, solar electric Power Plant & applications.

Wind Energy: Basic Principle of wind energy conversion, nature & Power of wind, site selection, wind energy conversion SYSTEM. Scheme for Electric Generation, Generator Control load control, Inter connected SYSTEM & applications.

Section -C

Bio Mass Energy: Biomass conversion technologies bio mass generation, classification of Bio Gas Plants material used in Bio Gas Plants., Selection of site & applications.

Geothermal Enrgy: Sources of Geothermal energy Estimation of Geothermal Power, Geothermal Power Plants, Geothermal energy in India and Prospects.

Ocean Energy: Ocean thermal electric conversion, site selection, Power Plant, Prospects of ocean energy in India, tidal Power tidal Power Plant, Prospects in India.

Section -D

MHD & Hydrogen Energy: Basic Principle MHD SYSTEM, advantages, Power OUTPUT of MHD Generation, future Prospects. Principle and classification of fuel cell energy, hydrogen as alternative fuel for Generation of Electrical Energy & applications.

Fuel Cell: Fuel Cell, Management of Fuel, Thermonic power generation, water Resource Electricity deviend scenario storage and handling, Pricing, Contract etc, Introduction to risk, rules and regulation Aspects of Risk & Hazard Health & risk assessment visit to site, Mini hydro generators.

TEXT BOOKS:

1. Renewable Energy Sources and Emerging Technologies : D.P Kothari, K.C.Singla, Rakesh Ranjan- PHI Publications.
2. NON-Conventional energy Sources : G.D. Rai – Khanna Publications.
3. Renewal energy sources and their environmental aspects by Abbari: PHI
4. Electric Power : Dr. S.L. Uppal - Khanna Publications

REFERENCE BOOKS:

1.   Power Plant Engineering : Jain & Bala Subramanyam

IC-455-F   INTELLIGENT INSTRUMENTATION FOR ENGINEERS

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

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:
Definition of an intelligent instrumentation system; feature of intelligent instrumentation ; components of intelligent instrumentation; Block diagram of an intelligent instrumentation.

Section -B

INTERFACING INSTRUMENTS & COMPUTERS:
Basic issue of interfacing; Address decoding; Data transfer control; A/D converter; D/A converter; Other interface consideration.

Section -C

INSTRUMENTATION/ COMPUTER NETWORKS:
Serial & parallel interfaces; Serial communication lines; Parallel data bus; EEE 488bus; Local area networks(LANs) : Star networks, Ring &bus networks, Fiber optic distributed networks, Field bus; Communication Protocols for very large systems: communication network rationalization.

Section -D

SOFTWARE FILTERS :
Description of Spike Filter, Low pass filter, High pass filter etc.

TEXT BOOK:
1. Principles of measurement & Instrumentation: Alan S. Moris ; PHI

GFEE-402-F   GENERAL FITNESS FOR PROFESSION

L T P   Class Work : 50
- - -   Practical : --- marks
                                                                         Total Marks : 50 marks

At the end of each year students will be evaluated on the basis of their performance in various fields. The evaluation will be made by the panel of experts/examiners/teachers to be appointed by the Principal/Director of the College. A specimen perform indicating the weight age to each component/activity is given below :-

Name : _____

College Roll No. _____

Univ.Roll No. _____

Branch _____

Year of Admission _____

I. Academic Performance (15 Marks) :

(a) Performance in University Examination :-

Sem. Result %age of Number of Attempt Marks in which the Sem. obtained exam. has been cleared

I _____

II _____

III _____

IV _____

V _____

VI _____

VII _____

II. Extra Curricular Activities (10 Marks) : Item Level of Remarks Participation (Position Obtained)

Indoor Games _____

(Specify the _____

Games _____

Outdoor Games _____

(Specify the _____

Games) _____

Essay _____

Competition _____

_____

Scientific _____

Technical _____

Exhibitions _____

Debate _____

_____

_____

Drama _____

_____

_____

Dance _____

_____

_____

Music _____

_____

_____

Fine Arts _____

_____

_____

Painting _____

_____

_____

Hobby Club _____

_____

_____

N.S.S. _____

_____

_____

Hostel Management _____
Activities _____

_____

Any other _____
activity (Please _____
specify) _____

III. Educational tours/visitis/Membership of Professional Societies (5 Marks)
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

IV. Contribution in NSS Social Welfare Floor Relief/ draught relief/Adult Literacy mission/Literacy Mission/ Blood Donation/Any other Social Service (5 Marks)
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

V. Briefly evaluate your academic & other performance & achievements in the Institution (5 Marks)

_____
_____
_____
_____
_____
_____

VI. Performance in Viva voce before the committee (10 Marks)

_____
_____
_____
_____
_____

*Marks obtained :
1.( )+II( )+III( )+IV( )+V( )+VI( )

**Total Marks :
Member Member Member Member Member

HUM-451-F   **LANGUAGE SKILLS FOR ENGINEERS**

L T P   Class Work Marks: 50

3 1 0   Exam Marks: 100

                                                             Total Marks: 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.

The real challenge before the students starts when they cross the threshold of the college after completing their degree. They, all of a sudden, find themselves competing for job/P.G. Degrees, through various entrance tests and interviews. Verbal ability forms a major portion of these tests. Without sound language skills and its semantic-syntactic know-how, the students with engineering background find themselves almost under- prepared for such tests. With this difficulty of students in mind, this course is proposed to make them technically proficient in handling the language skills required in competitive exams. The course would expose students to almost all variety of items, the common run of such tests as CAT, GMAT etc. And in the context of LPG, this cutting edge competence becomes imperative, and no professional education can afford to overlook this aspect.

Section A

Remedial English : Parts of speech, Gerunds, Participles and infinitives; Clauses; Sentence-constructions (unity; avoidance of choppy and rambling sentences, logic and consistency, conciseness, sequencing of ideas); Sentence errors-agreement between verb and subject, pronoun and antecedents, sequence of tenses, problems involving modifiers (dangling and misplaced modifiers); Shifts in point of view consistency of number and person, tense, mood, voice and subject; Parallelism; Omissions and mixed constructions.

Section B

Vocabulary : Methods of building vocabulary-etmological roots, prefixes and suffixes; Commonly used foreign words and phrases; spelling; words often confused synonyms and homonyms; one word substitutes; verbal idioms.

Section C

Punctuation and Mechanics: End Punctuation; internal Punctuation; Word Punctuation. Comprehension: Abstracting; Summarizing; Observation, Findings and Conclusions; Illustration and Inductive Logic; Deduction and Analogy.

Section D

Presentation: Oral presentation- Extempore, discussion on topics of contemporary relevance, Interviews.

TEXT BOOKS:

1.Working with words by R. Gairns and S. Redman, Cambridge University Press, London.

2. Meanings into Words-Upper Intermediate Students Book, Deff/Jones, Foundation Books (Cambridge University Press), Delhi.

3. A Practical English Grammar by A.J. Thomson and A.V. Martinet, OUP, Delhi.

4. Examine your English by Margaret M. Maison, Orient Longman, New Delhi.

5. A Practical Guide to Colloquial Idom by W.J. Ball. Longman.

6. A guide to correct English by L.A. ill, Oxford.

7. Structural Essentials of english by H.whitehall, Longman.

8. Advanced English Practice by B.D. Graver, OUP, Delhi

9. Public Speaking, Sudha Publication Pvt. Ltd., New Delhi.

10. Group Discussion, Sudha Publication Pvt. Ltd., New Delhi.

HUM-453-F   **HUMAN RESOURCE MANAGEMENT**

L T P   Class Work Marks: 50

3 1 0   Exam Marks: 100

                                                                   Total Marks: 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

Understanding Organizational Behavior: Definition, Goals of Organizational behavior. Key forces affecting Organizational Behavior. Fundamental Concepts of Organizational Behavior. Motivation : Meaning, Objectives and importance of motivation. Theories of Motivation, Maslow's theory, Mc Greger's Theory Herzberg's theory. Morale : Meaning; Factors affecting morale, types of morale and productivity, Evaluation of morale, improving morale.

Section B

Communication: Definition & importance, Nature of leadership various approaches to leadership styles. Leadership: Definition & importance, Nature of leadership various approaches to leadership styles.

Section C

Importance of human resources in industry, Definition of human resource management, mechanical approach towards personnel, Paternalism, Social system approach. Need for human resource planning, process of human resource planning, Methods of recruitment, Psychological tests and interviewing meaning and importance of placement Meaning and techniques of induction. Training and development : Concepts of training and development, importance of training and development, Management development its nature, purpose and method.

Section D

Significant factors affecting compensation, Methods of wage payment, Wage differentials, Causes of difference in Wages, Types of wage differentials, Wage incentives, Meaning, Objectives, types of incentive plans.

Text Books:

1. Human Resource and Personnel Management-K. Aswathappa-Tata McGraw Hill
Publishing Company Ltd.
2. Personnel Management : C.B. Mamoria, Himalaya Publishing House.
3. Organisational Behavior-Dr. L.M. Prasad (Sultan Chand & Sons).

Reference Books:

1. Personnel Management & Industrial Relations : Dr. T.N.Bhagoliwal Sahitya Bhawan Agra.
2. Personnel Management : V.G. Karnik, Jaico Publishing House.
3. Personnel management & Industrial Relation : Tripathi : Sultan Chand & Sons.
4. Personnel Management-Arun Monappa & Mirza Saiyadain- Tata McGraw Hill Publishing Co. Ltd.
5. Personnel Management and Industrial Relations-D.C. Sharma & R.C. Sharma S.J. Publications.
6. Principles of Personnel Management-Edwin B. Flippo (McGraw Hill).
7. Organizational Behavior-K. Adwathappa.
8. Organizational Behavior-John W. Newsstorn & Keith Davis, Tata McGraw Hill
Publishing Company Limited, New Delhi.

HUM-459-F   **RENEWABLE ENERGY RESOURCES & TECHNOLOGY**

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

Introduction: Energy Sources and their availability, renewable energy sources, Prospects of renewable energy sources, application of non conventional and renewal energy sources.

Environmental Aspects of Electric Energy Generation: Introduction Thermal pollution, Atmospheric pollution, Effects of Hydroelectric projects, Nuclear power generation and environment, Green House Gas Effects, Global Environmental awareness, Energy options for Indian Economy.

Section -B

Solar Energy : Solar radiation estimation, Basic Principle of Solar Energy physical Principal of the conversion of solar radiation into heat, Collectors, Solar Energy storage system, solar thermal electric conversion, solar electric Power Plant & applications.

Wind Energy: Basic Principle of wind energy conversion, nature & Power of wind, site selection, wind energy conversion SYSTEM. Scheme for Electric Generation, Generator Control load control, Inter connected SYSTEM & applications.

Section -C

Bio Mass Energy: Biomass conversion technologies bio mass generation, classification of Bio Gas Plants material used in Bio Gas Plants., Selection of site & applications.

Geothermal Energy: Sources of Geothermal energy Estimation of Geothermal Power, Geothermal Power Plants, Geothermal energy in India and Prospects.

Ocean Energy: Ocean thermal electric conversion, site selection, Power Plant, Prospects of ocean energy in India, tidal Power tidal Power Plant, Prospects in India.

Section -D

MHD & Hydrogen Energy: Basic Principle MHD SYSTEM, advantages, Power OUTPUT of MHD Generation, future Prospects. Principle and classification of fuel cell energy, hydrogen as alternative fuel for Generation of Electrical Energy & applications.

Fuel Cell: Fuel Cell, Management of Fuel, Thermionic power generation, water Resource Electricity deviend scenario storage and handling, Pricing, Contract etc, Introduction to risk, rules and regulation Aspects of Risk & Hazard Health & risk assessment visit to site, Mini hydro generators.

TEXT BOOKS:

1. Renewable Energy Sources and Emerging Technologies : D.P Kothari, K.C.Singla, Rakesh Ranjan - PHI Publications.
2. NON-Conventional energy Sources : G.D. Rai – Khanna Publications.
3. Renewal energy sources and their environmental aspects by Abbari: PHI
4. Electric Power : Dr. S.L. Uppal - Khanna Publications

REFERENCE BOOKS:

2.   Power Plant Engineering : Jain & Bala Subramanyam

ME-451-F **MECHATRONICS SYSTEMS**

L T P   Theory : 100 Marks

3 1 -   Class work : 50 Marks

                                                                           Total : 150 Marks

                                                                           Duration of Exam : 3 Hours

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 : Definition – Trends - Control Methods: Standalone , PC Based (Real Time Operating Systems, Graphical User Interface , Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

SIGNAL CONDITIONING : Introduction – Hardware - Digital I/O , Analog input – ADC , resolution , sped channels

Filtering Noise using passive components – Resistors, capacitors - Amplifying signals using OP amps – Software - Digital Signal Processing – Low pass , high pass , notch filtering

Section B

PRECISION MECHANICAL SYSTEMS : Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts - Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Harmonic Transmission - Bearings- Motor / Drive Selection.

ELECTRONIC INTERFACE SUBSYSTEMS : TTL, CMOS interfacing - Sensor interfacing - Actuator interfacing – solenoids , motors Isoation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers , over current sensing , resetable fuses , thermal dissipation - Power Supply - Bipolar transistors/ mosfets

Section C

ELECTROMECHANICAL DRIVES : Relays and Solenoids - Stepper Motors - DC brushed motors - DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.

MICROCONTROLLERS OVERVIEW : 8051 Microcontroller , micro processor structure - Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications.

Programming –Assembly , C (LED Blinking , Voltage measurement using ADC).

Section D

PROGRAMMABLE LOGIC CONTROLLERS : Basic Structure - Programming : Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog input / output - PLC Selection - Application.

PROGRAMMABLE MOTION CONTROLLERS : Introduction - System Transfer Function - Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal - S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , Go to Position - Applications : SPM, Robotics.

TEXT BOOKS :

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.

2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

REFERENCES :

1. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.

2. Mechatronics – N. Shanmugam / Anuradha Agencies Publisers.

3. Mechatronics System Design / Devdas shetty/Richard/Thomson.

IC-455-F   INTELLIGENT INSTRUMENTATION FOR ENGINEERS

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

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.

<div align="center">

Section -A

</div>

INTRODUCTION:
Definition of an intelligent instrumentation system; feature of intelligent instrumentation; components of intelligent instrumentation; Block diagram of an intelligent instrumentation.

<div align="center">

Section -B

</div>

INTERFACING INSTRUMENTS & COMPUTERS:
Basic issue of interfacing; Address decoding; Data transfer control; A/D converter; D/A converter; Other interface consideration.

<div align="center">

Section -C

</div>

INSTRUMENTATION/ COMPUTER NETWORKS:
Serial & parallel interfaces; Serial communication lines; Parallel data bus; EEE 488bus; Local area networks(LANs) : Star networks, Ring &bus networks, Fiber optic distributed networks, Field bus; Communication Protocols for very large systems: communication network rationalization.

<div align="center">

Section -D

</div>

SOFTWARE FILTERS :
Description of Spike Filter, Low pass filter, High pass filter etc.

TEXT BOOK:
1. Principles of measurement & Instrumentation: Alan S. Moris; PHI

OR-401-F   **OPERATIONS RESEARCH**

L T P   **Class Work :** 50 Marks
3 1 0   **Exam :** 100 Marks
                                                        Total : 150 Marks
                                                   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

Development – Definition– Characteristics and Phases – Types of models – operation Research models – applications.
ALLOCATION : Linear OPERATIONS-RESEARCH
 Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques -Two–phase method, Big-M method – Duality Principle.

Section – B

TRANSPORTATION PROBLEM – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy. Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem-Traveling Salesman problem.
REPLACEMENT : Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement. staffing problem, equipment renewal problem.

Section – C

System Reliability: Introduction-Definition-Failure Rates-Bath-tub shaped failure rate(Hazard Rate)-Reliability of systems-series arrangement and parallel arrangement-methods of assuring reliability.

Section – D

Information Theory-Introduction, measure of Information, binary unit of information , entropy, properties of average measure of entropy, important relations for various entropies, set of axioms for an entropy function, uniqueness theorem, communication system, noiseless channel, channel capacity, efficiency and redundancy, mutual information, encoding.

TEXT BOOK :
1. OPERATIONS-RESEARCH / S.D.Sharma-Kedarnath
2. Introduction to O.R/ Taha/ Pearsons
REFERENCES: 1)Operation Research/A.P.VERMA/SK KATARIA AND SONS
                     2) Operations Research/P.K.GUPTA & D.S.HIRA