Baba Ghulam Shah Badshah University
Rajouri (J&K)-185131

Syllabus Fifth Semester
B. Tech. Degree Course

Department of Electrical Engineering

College of Engineering and Technology
School of Mathematical Sciences & Engineering
Baba Ghulam Shah Badshah University
Rajouri (J&K)-185131

Curriculum Structure

Semester-V

Theory Courses

Course Code	Title	Scheme of Exam				Hrs./Week		
		Duration (Hrs.)	IA	UE	Total Marks	L	T	P
ERE-521	Power System-II	3	40	60	100	4	0	0
ERE-522	Microprocessor & Interfacing	3	40	60	100	3	1	0
ERE-523	Control System-I	3	40	60	100	3	1	0
ERE-524	Communication Systems	3	40	60	100	3	1	0
ERE-525	Power Engineering	3	40	60	100	3	1	0
ERE-526	Design of Power Apparatus	3	40	60	100	3	1	0
Total			**240**	**360**	**600**			

Laboratory Courses

ERE-531	Power System	2	25	25	50	0	0	2
ERE-532	Microprocessor & Interfacing	2	25	25	50	0	0	2
ERE-533	Control System-I	2	25	25	50	0	0	2
Total			**75**	**75**	**150**			
Total (Theory + Lab)			**315**	**435**	**750**			

Semester V

Course Title: : Power System-II **Max Marks: 100**
Course Code: ERE-521 **University Exam:60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Objective: This subject familiarizes a student with the basic concepts of generation transmission and distribution of electricity. It also introduces various faults of power system and the behavior of the power system during these faults.

Unit-1

Per Unit Representation of Power Systems: Single line diagram, impedance and reactance diagram of a system, per unit calculations, per unit representation of a power system.

Unit-II

Fault Analysis (Balanced/Unbalanced Faults): Faults, types of faults, symmetrical 3-phase balanced faults – calculation of fault currents, current limiting reactors.
Fault Analysis (Un-symmetrical Faults): Symmetrical components, sequence impedances, sequence networks, unsymmetrical faults –single line to ground, line-to-line, double line to ground faults on unloaded alternators and on power systems.

Unit-III

Insulation Co-ordination: Generation of over-voltages in a power system, lightning phenomena, lightning surges, switching surges-interruption of short circuits and switching operations, switching surges – interruption of capacitive circuits, resonance over voltages, protection of power system components against over voltages – ground wires, lightning arrestors. Concept of insulation coordination, Basic impulse insulation level, standard impulse test wave, volt-time curve, location and rating of lightning arrestors.

Unit-IV

Surge Performance of Transmission Lines: Traveling waves on transmission lines, open-end line, short-circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at a T-junction, line terminated through a capacitance, line terminated through an inductance, Attenuation of traveling waves.

Unit-V

Interference of Power Lines with communication Circuits:
Electrostatic and Electromagnetic effects, methods of reducing interference, introduction to FACTS devices.

Text Books:

1. **Kothari** & **Nagrath,** Modern Power System Analysis.
2. **J. J. Grainger** and **W.D Stevenson,** Elements of Power System Analysis.

Reference books:

1. **B. W. Weedy** and **B. J. Cory,** Electric Power Systems.
2. **C. L. Wadhwa**, Electric Power Systems.
3. **H. Cotton**, Transmission and Distribution of Electrical Energy.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

Semester V

Course Title: Microprocessor & Interfacing **Max Marks: 100**
Course Code: ERE-522 **University Exam:60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Objective: The objective of this course is to introduce to the students the fundamental of 8085 microprocessor and its interfacing.

Unit-I

Introduction To Microprocessor: History and Evolution, types of microprocessors, 8085 Microprocessor, Architecture, Bus Organization, Registers, ALU, Control section, Instruction set of 8085, Instruction format, Addressing modes, Types of Instructions.

Unit-II

Assembly Language Programming and Timing Diagram: Assembly language programming in 8085, Macros, Labels and Directives, Microprocessor timings, Instruction cycle, Machine cycles, T states, State transition diagrams, Timing diagram for different machine cycles.

Unit-III

Serial I/O, Interrupts and Comparison of Contemporary Microprocessors: Serial I/O using SID, SOD. Interrupts in 8085, RST instructions, Issues in implementing interrupts, Multiple interrupts and priorities, Interrupt handling in 8085 with RIM and SIM, Enabling, disabling and masking of interrupts. Brief comparison of contemporary 8-bit microprocessors like Z-80, M68000 with 8085.

Unit-IV

Data Transfer techniques: Data transfer techniques, Programmed data transfer, Parallel data transfer using 8155. Programmable parallel ports and handshake input/output, Asynchronous and Synchronous data transfer using 8251A. Programmable interrupt controller 8259A. DMA transfer, cycle stealing and burst mode of DMA, 8257 DMA controller.

Unit-V

Microprocessor Interfacing Techniques: Interfacing and refreshing dynamic RAMs, Interfacing a keyboard, Interfacing LED and seven segment displays, Interfacing A/D converters, D/A converters.

Text Books:

1. **R. S. Gaonkar**, µprocessor Architecture, Programming & applications with the 8085/8086A, Wiley Eastern Ltd.
2. **Douglas V Hall**, Microprocessors & Interfacing.

Reference Books:

1. **A. P. Mathur**, Introduction to Microprocessor, Tata McGraw Hill.
2. **Yu-Cheng Liu** & **G A Gibson**, µprocessor System, Arch Programming & Design.

Note for Paper Setter: The Question paper shall comprise of 10 questions. Two questions will be set from each unit .The student has to attempt five questions at least one from each unit.

Semester V

Course Title: Control-I **Max Marks: 100**
Course Code: ERE-523 **University Exam:60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Objective: The course puts an emphasis on the Linear control systems. The course content has been designed to give a practical shape to the basic courses.

Unit–I

Introduction: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems. Transfer functions, Block diagram representation of systems–Reduction using Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.(Mechanical Systems are excluded).

Unit-II

Time Response Analysis of First and second Order Control Systems: Standard test signals,Examples of First and second order control systems, Time response of Control systems to Impulse and step inputs,Time domain specifications of these systems,steady state response,steady state errors and error constants.

Unit-III

Stability Analysis in S-Domain : The concept of stability,BIBO stability,Relation between characteristic equation roots and BIBO stability,Routh Hurwitz stability criterion,Difficulties encountered in rouths criterion,Relative stability analysis,Root locus concept,construction of root loci,effects of adding poles and zeros to G(s)H(s) on the root loci.

Unit-IV

Frequency Response Analysis : Introduction, Frequency domain specifications,Polar plots,Nyquist criterion,Procedure for using Nyquist criterion,Bode diagrams,Determination of Frequency domain specifications and transfer function from the Bode Diagram,Phase margin and Gain margin-Stability Analysis from Bode Plots.

Unit-V

Dynamic Control systems: Proportional Controller,Integral controller,Derivative Controller,Proportional plus integral controller(PI),Proprtional plus derivative controller(PD),Proportional plus integral plus derivative controller(PID) and their effects on system dynamics.

Text Books:

1. **Nise S-** Control Systems engineering 4th edition John wiley and son's
2. **Ogata Katsuhiko**- Modern Control Engineering Prentice Hall of India Pvt. Ltd., 3rd edition.

Reference Books:

1. **Nagrath. J and Gopal M**- Control Systems Engineering –New Age International (P) Limited Publishers, 2nd edition.

Note for Paper Setter: -The Question paper shall comprise of 10 questions. Two questions will be set from each unit .The student has to attempt five questions at least one from each unit.

Semester V

Course Title: Communication Systems **Max Marks: 100**
Course Code: ERE-524 **University Exam:60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Objective: The objective of this course is to provide students with a working knowledge of the basic principles underlying the Communication Systems.

Unit-I

Modulation Techniques: Introduction to Amplitude modulation, Frequency spectrum of AM Waves, Representations of AM waves, Power relation in AM waves, Need and description of SSB, suppression of carrier, suppression of unwanted side bands, vestigial side band system, frequency modulation (FM), Mathematical representation of FM, frequency spectrum & Band width of FM waves, Carson's rule.

Unit-II

AM Transmitters And Receivers: AM Transmitters: Generation of AM, low level and high level modulation, comparison of levels, AM transmitter block diagram, collector class C modulator, Base modulator.
AM RECEIVERS: Tuned radio frequency (TRF) receiver. Superheterodyne receiver, RF section and characteristics, mixers, frequency changing and tracking, IF rejection and IF amplifiers, AM receiver characteristics.

Unit-III

FM Transmitters and Receivers: Basic requirements and generation of Frequency Modulation (FM), & methods, direct methods, variable capacitor modulator, varactor diode modulator, reactance modulators, disadvantages of direct method, Indirect modulators, RC phase shift modulator, Armstrong FM systems.
FM RECEIVERS: Limiters, balanced slope detector, foster seely or phase discriminator, block diagram of FM receiver, FM receiver characteristics.

Unit-IV

Pulse Digital Modulation : Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding ,proof of sampling theorem, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Bandwidth of PCM.

Unit-V

Digital Modulation Techniques: Introduction, Generation & Demands of ASK, FSK, PSK, DPSK, QPSK, M-ary, ASK, similarity of BFSK and BPSK.

Text books:

1. **Taub** & **Schilling,** Principles of Communication, Tata McGraw Hill Publication, 1990.
2. **Simon Haykins**, Principles of Communication, PHI, 1990.

Reference books:

1. **B. P. Lathi**, Analog and Digital Communication Systems, PHI, 1992.
2. **Proakis,** Digital Communication, McGraw Hill, 1992.
3. **B. Carlson**, Communication Systems, McGraw Hill, 1992.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one question from each unit.

Semester V

Course Title: Power Engineering **Max Marks: 100**
Course Code: ERE-525 **University Exam:60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Objective: The objective of power engineering is to expose the students about the various methods of power generation, tariff calculations.

Unit-1

Economic Aspects And Power Factor Improvement: Economics of generation, factors affecting the cost of generation, reduction of costs by interconnection of stations, curves useful in system operation, choice of size and number of generating units. Power factor disadvantages of low power factor, methods of improving power factor, location of power factor improvement apparatus, economics of power factor improvement.

Unit-II

Power Tariff: Cost of generating station, fixed capital, running capital annual cost running charges, fixed charges, methods of depreciation, factors influencing the rate of tariff, designing tariff, different types of tariff, flat rate tariff, block rate tariff, two part tariff maximum demand tariff, power factor tariff.

Unit-III

Thermal and Nuclear Power Plants: General layout, choice of site, super heater, air pre heater, economizer, coal handling plant, cooling towers, electrostatic precipitator, advantage and disadvantages. Introduction to nuclear energy, choice of site of the plant, advantages and disadvantages, main components of the plant and type of reactors.
Introduction to Diesel power stations and gas turbine plants.

Unit-IV

Hydroelectric power plants: Hydrology, load flow duration curve, hydro graph, mass curve, choice of site of the plant, advantages and disadvantages of the plant, layout of the plant, classification of the hydroelectric plant, introduction to mini & micro hydro.

Unit-V

Substations And Grounding: Neutral grounding, solid grounding resistance grounding, reactance grounding, are suppression coil grounding earthing transformers, choice of methods of neutral grounding equipment, grounding for safety. Introduction to substations and substation equipment.

Text Books:

1. **Deshpande M.V.,** Elements of power station design, TMH.
2. **H. Pratab,** The art and Science of Utilisation of Electric energy, PHI.

Reference Books:

1. **Satnam**, Substation Design and Equipment.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

Semester V

Course Title: Design of Power Apparatus **Max Marks: 100**
Course Code: ERE-526 **University Exam:60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Objective: The objective of this course is to make students familiar with various designing procedures involved in designing electrical machines.

Unit-I

Principles of Electrical Machine Design: Considerations in design, design factors, limitations in design, modern trends in design.

Unit-II

Design of single-phase and three-phase Transformers: Output equation, core design, winding design, yoke design, Design of transformer tank with tubes, design of insulation.

Unit-III

Design of D.C Machines: Output equation, Main dimensions, Armature design, Armature windings, Design of commutator and brushes, Design of Field systems, Design of interpoles.

Unit-IV

Armature Winding Design: Winding design, integrated approach for windings, A.C armature windings, production of emf in windings, Mmf distribution of armature windings, eddy current losses in conductors.

Unit-V

Design of Induction Motor: Output equator, stator design, rotor design, relationship between Dia(D) and length(l) for best power factor, squirrel cage rotor design, effect of saliency magnetic circuit calculation.

Text Books:

1. **A. K. Sawhney**, A Course in Electrical Machine Design, Dhanpat Rai Publication.
2. **V. N. Mittle,** Design of Electrical Machines, Standard Publishers Distributors.

Reference Books:

1. **R. K. Agarwal,** Principles of Electrical machine Design, S. K. Kataria & Sons
2. **S. K. Sen,** Principles of Electrical machine Design, Oxford & Ibh Publishing Co. Pvt Ltd

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

Semester V

Course Title: Power System Lab **Max Marks: 50**
Course Code: ERE-531 **University Exam: 25**
Duration of Exam: 2 hours **Internal Assessment: 25**

1. To study the performance of an artificial DC distributor.
2. Study the performance of an AC distributor.
3. Determination of regulation, efficiency and A, B, C, and D constants of an artificial transmission line.
4. Determine the string efficiency of suspensions insulators.
5. Study various types of insulators.
6. MATLAB Application in transmission line analysis.
7. Study of cables and finding of charging current.

Note: These are only the suggested list of practicals. Instructor may add or change some practicals relevant to the course contents

Semester V

Course Title: Microprocessor & Interfacing Lab **Max Marks: 50**
Course Code: ERE-532 **University Exam: 25**
Duration of Exam: 2 hours **Internal Assessment: 25**

List of Experiments:

1. Study of 8085 Microprocessor Kit.
2. Write a program to add two 8-bit number using 8085 .
3. Write a program to add two 16-bit number using 8085 .
4. Write a program to subtract two 8-bit number using 8085 .
5. Write a program to subtract two 16-bit number using 8085 .
6. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
7. Write a program to multiply two 8 bit numbers by rotation method using 8085
8. Write a program to multiply 16-bit number with 8-bit number using 8085.
9. Write a program to generate Fibonacci series using 8085.
10. Write a program to sort series using bubble sort algorithm using 8085.
11. Write a program to control the operation of stepper motor using 8085 microprocessors and 8255 PPI.
12. Write a program to control the temperature using 8085 microprocessors and 8255 PPI.
13. Write a program to control the traffic light system using 8085microprocessors and 8255 PPI.
14. Write a program to control speed of DC motor using 80856 microprocessors and 8255 PPI.

Note: These are only the suggested list of practicals. Instructor may add or change some practicals relevant to the course contents.

Semester V

Course Title: Control System Lab **Max Marks: 50**
Course Code: ERE-533 **University Exam: 25**
Duration of Exam: 2 hours **Internal Assessment: 25**

List of Experiments:

1. To study the performance of Relay control Combination of P,I and D control schemes in a typical thermal system.(oven)
2. To study the torque-speed characteristics of an AC servomotor.
3. To study the time response of a variety of simulated linear systems.
4. To study the role of feedback in a DC speed control system.
5. To study the role of feedback in a DC position control system.
6. To study the role of a combination of P,I and D control actions in a variety of simulated linear systems.
7. To study the computer simulation of a number of systems.
8. Use of MATLAB / SIMULINK /Control System tool boxes.

Note: These are only the suggested list of practicals. Instructor may add or change some practicals relevant to the course contents.