DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS
FOR

B. TECH. III YEAR

ELECTRICAL ENGINEERING /
ELECTRICAL & ELECTRONICS ENGINEERING

ON

CHOICE BASED CREDIT SYSTEM (CBCS)

[Effective from the Session: 2018-19]

EVALUATION SCHEME

B-TECH. ELECTRICAL ENGINEERING
B-TECH. ELECTRICAL & ELECTRONICS ENGINEERING

YEAR 3rd / SEMESTER-V

S. No.	Subject Code	Subject Name	Department	L-T-P	Th./Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1	RAS501	MANAGERIAL ECONOMICS	Applied Science	3--0--0	70	20	10	100	3
2	RAS502/ RUC501	SOCIOLOGY /CYBER SECURITY	Applied Science	3--0--0	70	20	10	100	3
3	REE501	ELECTRICAL MACHINES -II	Core Deptt.	3--0--0	70	20	10	100	3
4	REE502	POWER TRANSMISSION & DISTIBUTION	Core Deptt.	3--1--0	70	20	10	100	4
5	REE503	CONTROL SYSTEM	Core Deptt.	3--0--0	70	20	10	100	3
6	REE051 -054	DEPTT ELECTIVE COURSE-1	Core Deptt.	3--1--0	70	20	10	100	4
7	REE551	ELECTRICAL MACHINES –II LAB	Core Deptt.	0--0--2	50		50	100	1
8	REE553	CONTROL SYSTEM LAB	Core Deptt.	0--0--2	50		50	100	1
9	REE554	SOFTWARE BASED POWER SYSTEM LAB	Core Deptt.	0--0--2	50		50	100	1
10	REE555	SEMINAR – I		0--0--2	50		50	100	1
	TOTAL				620	120	260	1000	24

DEPTT. ELECTIVE COURSE-1

1. **REE051:Power System Optimization**
2. **REE052: Principles of Communication**
3. **REE053:Fundamentals of Digital Signal Processing**
4. **REE054: Internet of Things**

EVALUATION SCHEME

B-TECH. ELECTRICAL ENGINEERING
B-TECH. ELECTRICAL & ELECTRONICS ENGINEERING

YEAR 3rd / SEMESTER-VI

S. No.	Subject Code	Subject Name	Department	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1	RAS601	INDUSTRIAL MANAGEMENT	Applied Science	3--0--0	70	20	10	100	3
2	RAS602 / RUC601	SOCIOLOGY /CYBER SECURITY	Applied Science	3--0--0	70	20	10	100	3
3	REE601	POWER ELECTRONICS	Core Deptt.	3--0--0	70	20	10	100	3
4	REE602	MICROPROCESSOR	Core Deptt.	3--1--0	70	20	10	100	4
5	REE603	POWER SYSTEM ANALYSIS	Core Deptt.	3--0--0	70	20	10	100	3
6	REE061 -064	DEPTT ELECTIVE COURSE-2	Core Deptt.	3--1--0	70	20	10	100	4
7	REE661	POWER ELECTRONICS LAB	Core Deptt.	0--0--2	50		50	100	1
8	REE662	MICROPROCESSOR LAB	Core Deptt.	0--0--2	50		50	100	1
9	REE664	ELECTRICAL DESIGN & FABRICATION LAB	Core Deptt.	0--0--2	50		50	100	1
10	REE665	SEMINAR – II		0--0--2	50		50	100	1
	TOTAL				620	120	260	1000	24

DEPTT. ELECTIVE COURSE-2

1. **REE061 - Intelligent Sensors & Instrumentation**
2. **REE062 - Bio-medical Instrumentation**
3. **REE063 - High Voltage Engineering**
4. **REE064 - Special Electrical Machines**

REE501	ELECTRICAL MACHINES	L T P: 3 0 0	3 Credit

Unit – I: Synchronous Machine-I

Constructional features, Armature winding, EMF Equation, Winding coefficients, Equivalent circuit and phasor diagram, Armature reaction, O.C.& S.C. tests, Voltage regulation using Synchronous Impedance method, MMF method, Potier's Triangle method, Parallel operation of synchronous generators, Operation on infinite bus, Synchronizing power and torque co-efficient.

Unit – II: Synchronous Machine-II

Two reaction theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics.

Synchronous Motor-Starting methods, Effect of varying field current at different loads, V- curves, Hunting & damping, Synchronous condenser.

Unit – III: Three phase Induction Machine–I

Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, Equivalent circuit, Torque and power equations, Torque-slip characteristics, No-load & blocked rotor tests, Efficiency, Induction generator & its applications

Unit – IV: Three phase Induction Machine-II

Starting, Deep bar and double cage rotors, Cogging &Crawling, Speed control (with and without emf injection in rotor circuit)

Unit – V: Single phase Induction Motor

Double revolving field theory, Equivalent circuit, No-load and blocked rotor tests, Starting methods, Repulsion motor, Universal motor, Brushless DC Motors

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOC, ' Course on ExpEYES', IIT Bombay (http://spoken-tutorial.org/)

Text Books:

1. D.P. Kothari &I.J. Nagrath, "Electric Machines", Tata Mc GrawHill

2. Smarajit Ghosh, "Electric Machines", Pearson

3. Fitzerald, A.E., Kingsley and S.D. Umans, "Electric Machinery", McGraw Hill.

4. P.S. Bimbhra, "Electrical Machinery", Khanna Publisher

ReferenceBooks:

5. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers

6. M.G.Say, "AlternatingCurrentMachines", Pitman & Sons

REE502	POWER TRANSMISSON & DISTRIBUTION	L T P: 3 1 0	4 Credit

Unit – I: Power System Components:

Single line diagram of Power system,
Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator.

Supply System: Different kinds of supply system and their comparison, choice of transmission voltage.

Transmission Lines:

Configurations, types of conductors, resistance of line, skin effect, Kelvin's law, Proximity effect.

Unit – II: Over Head Transmission Lines

Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines

Representation and performance of short, medium and long transmission lines, Ferranti effect, Surge impedance loading.

Unit – III: Corona and Interference:

Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference

Electrostatic and electromagnetic interference with communication lines.

Overhead line Insulators:

Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.

Unit – IV: Mechanical Design of transmission line:

Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers.

Insulated cables:

Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Unit – V: Neutral grounding:

Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices.

Distribution Systems:

Distribution system layout, Introduction of Distribution System, Primary & Secondary distribution, Design consideration, distribution system losses, Classification of Distributed system- Radial Ring interconnected systems, Stepped distribution.

Text Books:

1. W.D. Stevenson, "Element of Power System Analysis", McGraw Hill

2. C.L. Wadhwa, “Electrical Power System”, New age international Ltd. Third Edition

3. AsfaqHussain, “Power System”, CBS Publishers and Distributors

4. B. R. Gupta, “Power System Analysis and Design”, Third Edition, S. Chand & Co.

5. M. V. Deshpande, “Electrical Power System Design”, Tata McGraw Hill

6. S. Sivanagaraju & S. Satyanarayana, “Electric Power Transmission and Distribution”, Pearson Education

7. Kothari &Nagrath, “Power System Engineering”,Tata McGraw-Hill Education

8. T.A. Short, “Electric Power Distribution Handbook”, CRC

Reference Books:

9. Soni, Gupta &Bhatnagar, “A Course in Electrical Power “, Dhanpat Rai & Sons

10. S.L. Uppal, “Electric Power”, Khanna Publishers

11. S.N. Singh, “Electric Power Generation, Transmission &Distribution”, PHI Learning

REE503	CONTROL SYSTEM	L T P: 3 0 0	3 Credit

Unit-I: **Control System Concepts**:

Concept of Control system, Physical Systems and their Mathematical Modeling, Constructional and working of AC & DC servomotor, synchros, stepper motor and tachometer. Transfer function models,Block diagram algebra, Signal flow graph, Mason's gain formula,Open loop and closed loop systems and their sensitivity analysis.

Unit-II: Time Response Analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants.

Design specifications of second order systems,Proportional, Derivative, Integral and PID compensations, design considerations for higher order systems and performance indices.

Unit-III: Stability and Algebraic Criteria:

Concept of stability and its necessary conditions, Routh-Hurwitz criteria and its limitations.

Root Locus Technique:

Root contour, Construction of root loci, Effect of transportation lag and Root locus of non minimal phase system and Effect of pole-zero cancellation.

Unit-IV: Frequency Response Analysis:

Frequency Response analysis from transfer function model, Construction of polar and inverse polar plots.

Stability in Frequency Domain: Nyquist stability criterion, Determination of gain and phase margin from Bode &Nyquist Plots, Nichol Charts, Correlation between time and Frequency Responses.

Unit-V: Introduction to Design:

The design problems and preliminary considerations of lead, lag and lead-lag compensation networks, design of closed loop systems using compensation techniques in time and frequency domains.

State Space Technique:

The concept of state & space, State-space model of physical system, conversion of state-space to transfer function model and vice-versa, Similarity transformation of the control system, Concept of controllability and observability and their testing.

Text Books:

1. Nagrath & Gopal, "Control System Engineering", New age International.

2. K. Ogata, "Modern Control Engineering", Pearson India.

3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" McGraw Hill, 2018.

4. D. Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

5. Ambikapathy, "Control Systems",Khanna Publishers

Reference Books:

5. Norman S. Mise, Control System Engineering , Wiley Publishing Co.

6. Ajit K Mandal, “Introduction to Control Engineering” New Age International.

7. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, “Design of Feedback Control Systems” Oxford University Press.

8. Samarjit Ghosh, “ Control Systems theory and Applications”, Pearson Education

REE551	ELECTRICAL MACHINES – II LABORATORY	L T P: 0 0 2	1 Credit

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.

2. To perform load test on a three phase induction motor and draw Torque -speed characteristics

3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.

4. To study speed control of three phase induction motor by varying supply voltage and by keeping V/f ratio constant.

5. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.

6. To determine V-curves and inverted V-curves of a three phase synchronous motor.

7. To determine X_d and X_q of a three phase salient pole synchronous machine using the slip test and to draw the power-angle curve.

8. To study synchronization of an alternator with the infinite bus by using: (i) dark lamp method (ii) two bright and one dark lamp method.

9. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.

10. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.

11. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.

12. To draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.

13. To determine steady state performance of a three phase induction motor using equivalent circuit.

***For Software based experiments (Develop Computer Program in 'C' language or use MATLAB or Equivalent open source software i.e. - Scilab)**

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

REE553	CONTROL SYSTEM LABORATORY	L T P: 0 0 2	1 Credit

Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output vs input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions atvarious loads.
10. To study characteristics of positional error detector by angular displacement of two servo potentio-meters.

Software based experiments (Use MATLAB, LABVIEW etc. or equivalent open source freeware software like Scilab using Spoken Tutorial MOOCs)

11. To simulate PID controller for transportation lag.
12. To determine time domain response of a second order system for step input and obtain performance parameters.
13. To convert transfer function of a system into state space form and vice-versa.
14. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' fir stability.
15. To plot a Bode diagram of an open loop transfer function.
16. To draw a Nyquist plot of an open loop transfers functions and examine the stability of the closed loop system.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

Reference Books:

1. K.Ogata,"Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata McGraw Hill.

REE554	SOFTWARE BASED POWER SYSTEM LAB	L T P: 0 0 2	1 Credit

Note: Minimum ten experiments are to be performed from the following list

1. Calculate the parameters of single phase transmission line
2. Calculate the parameters of three phase single circuit transmission line
3. Calculate the parameters of three phase double circuit transmission line
4. Determine the ABCD constant for transmission line.
5. Simulate the Ferranti effect in transmission line
6. Calculate the corona loss of transmission line
7. Calculation of sag & tension of transmission line
8. Calculation of string efficiency of insulator of transmission line
9. Calculation for grading of underground cables
10. Simulate the skin effect in the transmission line
11. Calculation of ground clearance of transmission line
12. Calculate the parameters for underground cable

REE601	POWER ELECTRONICS	L T P: 3 0 0	3 Credit

Unit-I: Power semiconductor devices:

Introduction: Concept of Power Electronics, scope and applications, desired Characteristics of controllable switches

Power semiconductor switches and their characteristics: Power Diode, Power BJT, Power MOSFET, IGBT, SCR, TRIAC, GTO.

Unit-II: Thyristor:
Rating & protection, Methods of SCR commutation, Gate Drive Circuit, Series and Parallel operation.

DC-DC Converters:
Introduction, Control Strategies, Buck converter, Boost Converter, Buck-Boost converter, Analysis of buck converter, Switched Mode power Supply (SMPS).

Unit-III: Phase Controlled Converters:

Single phase half wave controlled rectifier with various loads, Effect of free wheeling diode.
Single phase fully controlled and half controlled bridge converters with various loads. Performance Parameters of single phase uncontrolled and controlled converters.
Three phase half wave converters, Three phase fully controlled and half controlled bridge converters, Effect of source impedance, Single phase and three phase dual converters

Unit-IV: AC Voltage Controllers:

Principle of On-Off and phase controls, Single phase ac voltage controller with resistive and inductive loads, sequence control, Introduction to Matrix converter.

Cyclo Converters:

Basic principle of operation, single phase to single phase, three phase to single phase output voltage equation.

Unit-V: Inverters:

Single phase and Three phase bridge inverters, VSI, CSI, Voltage control of single phaseinverters, PWM Techniques, Introduction to Multi level inverter.

Text Books:

1. M.H. Rashid,"Power Electronics: Circuits, Devices & Applications", Pearson India, 4th Edition,2018.

2. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics:Converters, Applications and Design", Wiley India Ltd,2008

3. P.C. Sen, " Power Electronics", McGraw Hill Education (India) Pvt. Ltd.

4. P.S. Bhimbra, " Power Electronics", Khanna Publishers.

Reference Books:

5. M.S. Jamil Asghar, “Power Electronics” Prentice Hall of India Ltd., 2004

6. Chakrabarti &Rai, “Fundamentals of Power Electronics &Drives”, Dhanpat Rai & Sons.

7. V.R. Moorthy, “ Power Electronics : Devices, Circuits and Industrial Applications” Oxford University Press,2007

8. S.N. Singh, “A Text Book of Power Electronics” DhanpatRai& Sons

REE602	MICROPROCESSOR	L T P: 3 1 0	4 Credit

Unit-I: Introduction to Microprocessor:

Introduction to Microprocessor and its applications, Microprocessor Evolution Tree, Microprocessor Architecture (Harward & Princeton), General Architecture of the Microprocessor and its operations, Component of Microprocessor system: Processor, Buses, Memory, Inputs-outputs (I/Os) and other Interfacing devices.

Unit-II: 8-bit Microprocessor:

Intel 8085 microprocessor:

Pin Diagram, Internal architecture: ALU, Registers, Timing and control unit, interrupt:

Instruction Set of 8085:

Instruction format, op-codes, mnemonics, no. of bytes computation of the instruction, Machine cycles and T-states and Execution time computation of an instruction. Classification of instruction with their examples. Writing of assembly Language programs.

Unit-III: 16-bit Microprocessor:

Architecture of Intel 8086:

Pin Diagram, Bus Interface Unit, Execution unit, Register organization, Memory addressing, Memory Segmentation, Pipelining, Min & Max operating Modes

8086Instruction set:

Format, Addressing Modes, Instruction Set Groups: Data transfer, Arithmetic, Logic, String, Branch control transfer and Processor control.

Interrupts: Hardware and software interrupts.

Unit-IV: Fundamental of Programming:

Program structure for microprocessors, Flowcharts of series, parallel, and controls structures.

Assembler Level Programming:

Memory space allocation for monitor and user program.Assembly language program using Debug or MASM assembler.

Unit-V: Peripheral Interfacing:

Programmed I/O, Memory Mapped I/O, Interrupt Driven I/O, DMA I/O interface, Serial and Parallel communications.

Peripheral Devices:

DMA controller (Intel 8237), Programmable peripheral interface (Intel 8255), Programmable timer/counter (Intl 8253/8254),Programmable Interrupt Controller (Intel 8259).

Text Books:

1. Gaonkar, Ramesh S, “Microprocessor Architecture, programming and applications with the 8085” Pen ram International Publishing 5th Ed.
2. Avtar Singh& Walter A. Triebel “8088 & 8086 Microprocessor” Pearson Education.
3. Ray, A.K. &Burchandi, K.M., “Advanced Microprocessors and Peripherals: Architecture, Programaming and Interfacing” Tata Mc. Graw Hill.
4. AK Gautam, “Advanced Microprocessors”, Khanna Publishers.

Reference Books:

5. Brey, Barry B. “INTEL Microprocessors” Prentice Hall (India)
6. Aditya P Mathur, “Introduction to Microprocessor” Tata McGraw Hill
7. M. Rafiquzzaman, “Microprocessors- Theory & applications”, Pearson India.
8. B. Ram, “Advanced Microprocessor & Interfacing” Tata McGraw Hill
9. Renu Singh & B.P. Singh, “Microprocessor and Interfacing and applications” New Age International
10. Liu and Gibson G.A., “Microcomputer Systems: The 8086/8088 Family Architecture Programming & Design” Pearson India.

REE603	POWER SYSTEM ANALYSIS	L T P: 3 0 0	3 Credit

Unit-I: Representation of Power System Components:

Synchronous machines, Transformers, Transmission lines, One-line diagram, Impedance and reactance diagram, per unit system.

Symmetrical Components:

Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Unit-II: Symmetrical Fault Analysis:

Transient if R-L series circuit, calculation of 3-phase short circuit current and reactance of Synchronous machine, internal voltage of loaded machines under transient conditions.

Unsymmetrical Faults:

Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance.

Formation of Zbus using singular transformation and algorithm, computer method for short circuit calculations.

Unit-III: Load Flows:

Introduction, bus classifications, nodal admittance matrix (YBUS), development of load flow equations, load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equation sand fast decoupled method.

Unit-IV: Power System Stability:

Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement.

Unit-V: Traveling Waves:

Wave Equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves.

Text Book:

1. W.D. Stevenson, Jr. "Elements of Power System Analysis",McGraw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborthy, Soni, Gupta &Bhatnagar, "Power System Engineering", DhanpatRai& Co.
4. T.K. Nagsarkar& M.S. Sukhija, "Power System Analysis" Oxford University Press, 2007.

Reference Books:

5. O.I. Elgerd, “Electric Energy System Theory” Tata McGraw Hill.
6. Hadi Sadat, “Power System Analysis”, Tata McGraw Hill.
7. D.Das, “Electrical Power Systems” New Age International.
8. J.D. Glover, M. S. Sharma & T. Overbye, “Power System Analysis and Design”, Cengage.
9. P.S.R. Murthy “Power System Analysis” B.S. Publications.
10. Stagg and E1- Abiad, “Computer Methods in Power System Analysis” Tata McGraw Hill
11. Kothari &Nagrath, “Modern Power System Analysis” Tata McGraw Hill
12. A.J. wood, B.F. Wollenberg, ”Power Generation, Operation and Control” John Wiley & Sons

REE661	POWER ELECTRONICS LABORATORY	L T P: 0 0 2	1 Credit

Note: The minimum of 10 experiments is to be performed out of which at least three should be software based.

1. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
2. To study V-I characteristics of SCR and measure latching and holding currents.
3. To compare the R, RC &UJT trigger circuit for SCR.
4. To study the commutation circuit for SCR.
5. To study single phase fully controlled bridge rectifiers with resistiveand inductive loads.
6. To study single phase fully controlled bridge rectifiers with DC motor load.
7. To study three-phase fully controlled bridge rectifier with resistive and inductive loads.
8. To study single-phase ac voltage regulator with resistive and inductive loads.
9. To study single phase cyclo-converter
10. To study the four quadrant operation of chopper circuit
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments(PSPICE/MATLAB or equivalent open source freeware software like Scilab using Spoken Tutorial MOOCs**)**

12. To obtain the simulation of single phase half wave controlled rectifier with R and RL load and plot load voltage and load current waveforms.
13. To obtain simulation of single phase fully controlled bridge rectifier and plot load voltage and load current waveform for inductive load.
14. To obtain simulation of single phase full wave ac voltage controller and draw load voltage andload current waveforms for inductive load.
15. To obtain simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in output voltage and load current.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

Text/Reference Books:

1. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, Prentice Hall of India.
2. D.W. Hart, “Introduction to power Electronics”, Prentice Hall of India.

REE662	MICROPROCESSOR LABORATORY	L T P: 0 0 2	1 Credit

A. Study Experiments (any two):

1. To study 8085 based microprocessor system

2. To study 8086 and 8086A based microprocessor system

3. To study Pentium Processor

B. Programming based Experiments (any four):

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.

5. To develop and run a program for arranging in ascending/descending order of a set of Numbers

6. To perform multiplication/division of given numbers

7. To perform conversion of temperature from 0F to 0C and vice-versa

8. To perform computation of square root of a given number

9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four):

10. To obtain interfacing of RAM chip to 8085/8086 based system

11. To obtain interfacing of keyboard controller

12. To obtain interfacing of DMA controller

13. To obtain interfacing of PPI

14. To obtain interfacing of UART/USART

15. To perform microprocessor based stepper motor operation through 8085 kit

16. To perform microprocessor based traffic light control

17. To perform microprocessor based temperature control of hot water

REE664	ELECTRICAL DESIGN & FABRICATION LAB	L T P: 0 0 2	1 Credit

Note: Minimum ten experiments are to be performed from the following list:

1. PCB Design & Fabrication.
2. Transformer design & Fabrication.
3. Small Power Supply design & Fabrication.
4. Filter design & Fabrication.
5. Controller design & Fabrication.
6. Inductor design and Fabrication.
7. Measurement of electrical parameters of AC & DC machine.
8. Design & Fabrication of High Power factor controlled rectifier.
9. Design & Fabrication of Microcontroller based digital energy meters / sensors.
10. Design & Fabrication of Power amplifier.
11. Design Fabrication of AC phase converter and its firing circuit.
12. IGBT based single phase inverter design and Fabrication.
13. Design & Fabrication of chopper.

DEPTT. ELECTIVE COURSE-1

REE051	POWER SYSTEM OPTIMIZATION	L T P: 3 1 0	4 Credit

Unit –I

Introduction to optimization and classical optimization techniques Linear Programming:Standard form, geometry of LPP, Simplex Method pf solving LPP, revised simplex method, duality, decomposition principle, and transportation problem.

Unit –II

Non-Linear Problem (NLP): One dimensional methods, Elimination methods, Interpolation methods, Unconstrained optimization techniques-Direct search and Descent methods, constrained optimization techniques, direct and indirect methods.

Unit –III

Dynamic Programming: Multistage decision processes, concept of sub-optimization and principle of optimality, conversion of final value problem into an initial value problem CPM and PERT

Unit –IV

Genetic Algorithm: Introduction to genetic Algorithm, working principle, coding of variables, fitness function. GA operators; Similarities and difference s between Gas and traditional methods; Unconstrained and constrained optimization using Genetic Algorithm, real coded gas, Advanced Gas, global optimization using GA.

Unit –V

Applications to Power system: Economic Load Dispatch in thermal and Hydro-thermal system using GA and classical optimization techniques, Unit commitment problem, reactive power optimization. Optimal power flow, LPP and NLP techniques to optimal flow problems.

Reference Books:

1. S.S.Rao,"Optimization - Theory and Applications", Wiley-Eastern Limited.
2. David G. Luenberger,"Introduction of Linear and Non-Linear Programming ", Wesley Publishing Company.
3. Polak,"Computational methods in Optimization ", Academic Press.
4. Pierre D.A., "Optimization Theory with Applications", Wiley Publications.
5. Kalyanmoy deb,"Optimization for Engineering Design: Algorithms and Examples", PHI Publication
6. D.E. Goldberg,"Genetic Algorithm in Search Optimization and Machine Learning ", Addision-Wesley Publication, 1989
7. L.P. Singh,"Advanced Power System Analysis and Dynamics ", Wiley Eastern Limited.

8. Olle I. Elewgerd " Electrical Energy System: An Introduction ", TMH Publication, New Delhi

REE052	PRINCIPLES OF COMMUNICATION	L T P: 3 1 0	4 Credit

Unit –I

Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Passband signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver.

Unit –II

Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, Bandwidth of FM Signals using Bessel's Function, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting.

Unit –III

Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation, Digital Representation of Analog Signals Pulse Code Modulation (PCM), PCM System Issues in digital transmission: Frequency Division Multiplexing Time Division Multiplexing, T1 Digital System, TDM Hierarchy.

Unit –IV

Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.

Unit –V

Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital.

Text Book:

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill

Reference Books:

1. B.P.Lathi,"ModernDigitalandAnalogcommunicationSystems",3rd Edition, Oxford University Press.
2. Simon Haykin, "Communication Systems", 4th Edition, Wiley India.
3. H.P.Hsu& D. Mitra "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill.

REE053	FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING	L T P: 3 1 0	4 Credit

Unit-I: Discrete-Time Signals and Systems:

Sequences, discrete time systems, LTI systems, frequency domain representation of discrete time signals and systems, discrete time signals and frequency domain representation, Fourier Transform.

Implementation of discrete time systems:
Structure for FIR system, Structure for IIR systems

Unit-II: Sampling of Continuous Time Signals:

Sampling and reconstruction of signals, frequency domain representation of sampling, discrete time processing of continuous time signals, continuous time processing of discrete time signals, changing the sampling rate using discrete time processing, multi rate signal processing, digital processing of analog signals, over sampling and noise shaping in A/D and D/A conversion

Unit-III: Transform Analysis of LTI Systems:

Frequency response of LTI systems, system functions, frequency response for rational system functions, magnitude-phase relationship, all pass systems, minimum phase systems, and linear systems with generalized linear phase

Discrete Fourier Transform:
Discrete Fourier Transform, properties, linear convolution and circular convolution,

Unit-IV: Filter Design Techniques:

Design of IIR filters using Impulse Invariant Response method and Bilinear Transformation method. Butterworth filters and chebyshev Filter's response, Design of FIR filters by windowing, Kaiser Window method, optimum approximations of FIR filters,

Unit-V:Efficient computation of the DFT:

FFT algorithms- decimation in time and decimation in frequency, Goertzel algorithm, Implementation of the DFT using convolution,

Introduction to wavelet transform:

Wavelet comparison with Fourier transforms, Applications of Wavelet cosine transform, Discrete cosine transform (DCT).

Text Books:

1. S. Salivahanan, "Digital Signal Processing", McGraw Hill Education (India) Private Limited.

2. Oppenheim A.V., Schafer, Ronald W. & Buck, John R,"Discrete Time Signal processing", Pearson Education .

Reference Books:

3. Proakis, J.G. &Manolakis, D.G.," Digital Signal Processing: Principles Algorithms and Applications", Prentice Hall of India.

4. Rabiner, L.R. and Gold B., "Theory and applications of DSP", Prentice Hall of India.

5. Oppenheim, Alan V. &Willsky, Alan S. , "Signals and Systems" , Prentice Hall of India, 2nd Edition

6. Johnson, J.R. , "Introduction to Digital Signal Processing", Prentice Hall of India.

REE054	INTERNET OF THINGS	L T P: 3 1 0	4 Credit

Unit-I: IoT Web Technology

The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

Unit-II: IoT Applications for Value Creation

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT for Oil and Gas Industry, Opinions on IoTApplication and Value for Industry, Home Management, eHealth.

Unit-III: Internet of Things Privacy, Security and Governance

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smarty Approach. Data Aggregation for the IoT in Smart Cities, Security

Unit-IV: Architectural Approach for IoT Empowerment

Introduction, Defining a Common Architectural Ground, IoT Standardization,M2M Service Layer Standardization, OGC Sensor Web for IoT, IEEE, IETF and ITU-T Standardization activities, Interoperability Challenges, Physical vs. Virtual, Solve the Basic First, Data Interoperability, Semantic Interoperability, Organizational Interoperability, Eternal Interoperability, Importance of Standardization, Plan for Validation and testing, Important Economic Dimension, Research Roadmap for IoT Testing Methodologies. Semantic as an Interoperability Enabler and related work.

Unit-V: Identity Management Models in IoT

Introduction, Vulnerabilities of IoT, Security requirements, Challenges for a secure Internet of Things, identity management, Identity portrayal, Different identity Management model: Local identity, Network identity, Federated identity, Global web identity, Identity management in Internet of Things, User-centric identity management, Device-centric identity management, Hybrid identity management.

Text Books/ Reference Books:

1. Olivier Hersent,DavidBoswarthick, Omar Elloumi, “The Internet of Things key applications and protocols”,Wiley

2. Michael Miller “The Internet of Things” Pearson

3. Adrian McEwen,HakinCassimally, ”Designing the Internet of Things” Wiley India

DEPTT. ELECTIVE COURSE-2

REE061	INTELLIGENT SENSORS & INSTRUMENTATION	L T P: 3 1 0	4 Credit

Unit-I: Intelligent Sensors:

Integrated, smart and intelligent sensors, General Structure of smart sensors& its components, Characteristic of smart sensors: Self calibration, Self-testing&self-communicating, Applications of smart sensors.

Unit-II: Data Acquisition Methods:

Analog and Digital IO, Counters, Timers, Basics ADC designs, Interfacing methods of DAQ hardware, Software structure, Use of simple and intermediate VIs Use of Data Sockets for Networked Communication and Controls.

Unit-III: PC Hardware Review & Instrumentation Buses:

Structure, Timing, Interrupts, DMA, Operating system, ISA, PCI, USB, PCMCIA buses. Parallel Interfaces: IEEE488.1 & 488.2, Serial Interfacing: RS232C, RS422, RS423, RS485; USB, VXI, SCXI, PXI.

Unit-IV: Introduction:

Introduction to Intelligent Instrumentation:

Historical Perspective, current status, software based instruments.

Virtual Instrumentation:

Introduction to graphical programming, Data flow & graphical programming techniques, Advantage of VI techniques, VIs and sub-VIs loops and charts, Arrays, Clusters and graphs, Case and sequence structures, Formula nodes, String and file I/O, Code Interface Nodes and DLL links.

References:

1. G.C. Barney / Intelligent Instrumentation / Prentice Hall, 195.
2. A.S. Moris / Principles of Measurement & Instrumentation / Prentice Hall, 1993.
3. S. Gupta, J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED / Instrument Society of America, 1994.
4. Gary Johnson / Lab VIEW Graphical Programing II Edition / McGraw Hill 1997.

REE062	BIO-MEDICAL INSTRUMENTATION	L T P: 3 1 0	4 Credit

Unit-I: Introduction to Biomedical Instrumentation:

Problems encountered in measurements of living systems, Block diagram of Biomedical Instrumentation System & its components and Biomaterials for medical instrument applications. Transducers for biomedical applications.

Bio electric potential: Genesis, Propagation and Distribution (ECG, EEG and EMG).

Unit-II: Bio-potential Electrodes:

Basic types : Micro, Skin surface and needle electrodes and Biochemical transducers: Blood gas,PH and specific ions electrodes.

The cardiovascular system and measurements:

Heart and cardiovascular system and its block diagram, Blood pressure, Blood flow &Heart sound characteristics and their measurements.

Electrocardiography, ECG lead configurations and recordings of ECG.

Unit-III: The Nervous System:

The anatomy of nervous system, Neuronal communication, EPSP & IPSP.

Electroencephalogram characteristic features, Measurement scheme for EEG and 10-20 electrode configuration system.

Human Body & Skin Temperature Measurement:

Temperature measurements using infrared sensors and other sensors, Ultrasonic measurements and its applications in Blood flow measurement and soft tissue imaging.

Unit-IV: Automation of biochemical tests, Instrumentation for X-Ray Machine, CAT, Interfacing of computer with medical instrument, MRI imaging and its applications in biomedical engineering.

Unit-V: Patient care monitoring:

Elements of intensive care unit, Organization of the Hospital for patient-care monitoring, Pace-maker systems, their types and modes, Defibrillators and their types.

Shock hazards from electrical equipment and safety measures.

Bio-telemetry and its applications in patient care and sports.

Text Book:

1. T. Cromwell, F.J. Weibell&F.A.Pfieffer, “Biomedical Instrumentation & Measurements” Prentice Hall International

Reference Books:

1. R.S. Khanpur, “Handbook of Biomedical Instrumentation” Tata McGraw Hill

2. H.E. Thomas, “Handbook of Biomedical Instrumentation and Measurement” Restone Publishing Company

3. J.G. Webester, “Medical Instrumentation”, Houghton Mifflin.

REE063	HIGH VOLTAGE ENGINEERING	L T P: 3 1 0	4 Credit

UNIT-I: Electrostatic Field and Field Stress Control:

Electric field stresses, Numerical methods for Electric field computation, Finite Element Method, Charge simulation method.

Conduction and Break Down in Gases:

Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, break down in non-uniform field, and corona discharge.

Break Down in Liquid Dielectrics:

Conduction and breakdown in pure liquid and commercial liquid.

Break Down in Solid Dielectrics:

Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric and composite dielectrics.

UNIT-II: Generation of High Voltages and Currents:

Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT –III: Measurement of High Voltages and Currents:

Measurement of high direct current voltages, measurement of high alternating and impulse voltages, measurement of high direct, alternating and impulse currents, Cathode Ray Oscillographs for impulse voltage and current measurements.

Insulation Coordination in Electric Power Systems:

Principle of Isolation Coordination in High-Voltage & Extra-High Voltage Power System.

UNIT-IV: Non-Destructive Testing:

Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements

High Voltage Testing:

Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Books:

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering, Tata Mc-Graw Hill.
2. C. L. Wadhwa, "High Voltage Engineering", Wiley Eastern Ltd.

Reference Books:

3. E. Kuffel and W. S. Zacngal, High Voltage Engineering", Pergamon Press.
4. M. P. Chaurasia , "High Voltage Engineering", Khanna Publishers
5. R. S. Jha, "High Voltage Engineering", DhanpatRai& sons
6. M. Khalifa,' High Voltage Engineering Theory and Practice,' Marcel Dekker.
7. Subir Ray,' An Introduction to High Voltage Engineering' Prentice Hall of India

REE064	SPECIAL ELECTRICAL MACHINES	L T P: 3 1 0	4 Credit

Unit-I: Poly-phase AC Machines:

Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power),

Unit-II: Induction Generator:

SEIG, DFIG: Operating Principle, Equivalent Circuit, Characteristics, Application

Two Phase AC Servomotors:Construction, torque-speed characteristics, performance and applications.

Unit-III: Stepper Motors:

Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors:Construction; principle of operation; torque production, modes of operation, drive circuits.

Unit-IV: Permanent Magnet Machines:

Types of permanent magnets and their magnetization characteristics, demagnetizing effect,

permanent magnet dc motors, sinusoidal PM A C motors, brushless dc motors and their important features and applications, PCB motors.

Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators and applications

UNIT-V: Single Phase Commutator Motors:

Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.

2. P.C. Sen "Principles of Electrical Machines and Power Electronics" Johnwilley&Sons, 2001

Reference Books:

3. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987

4. M.G. Say "Alternating current Machines" Pitman & Sons.