

SYLLABUS

BACHELOR OF TECHNOLOGY

ELECTRICAL ENGINEERING
SEMESTER SCHEME

Four Year Degree Course

B.Tech. , Second Year Examination, 2016

B.Tech. , Third Year Examination, 2017

B.Tech. , Fourth Year Examination, 2018



JODHPUR NATIONAL UNIVERSITY
JODHPUR

Jodhpur National University

(Faculty of Engineering & Technology)

School of Electrical Engineering

II B.Tech. III Semester Teaching & Examination scheme

Subject Code	Subject	Lectures	Tutorials	Practical	Exam. H.	Theory		Practical & Sessional		Total
						Internal	External	Internal	External	
A.	Written Papers					Internal	External	Internal	External	
BEE301	Electrical Machines - I	3	1		3	20	80			100
BEE302	Electrical Measurement & Instrumentation	3	1		3	20	80			100
BEE303	Electronics Devices & Circuits-I	3	1		3	20	80			100
BEE304	Computer Programming-I	3			3	20	80			100
BEE305	Circuit Analysis-I	3	1		3	20	80			100
BEE306	Mathematics	3	1		3	20	80			100
BSGE 307 A*	Special Mathematics - I**	3	1		3	20	80			100
Total (A)		21	6		21	120	480			600
B. Practical & Sessional										
BEE307	Electrical Machine-I Lab			2				60	40	100
BEE308	Electrical Measurement & Instruments Lab			2				60	40	100
BEE309	Electronic Devices & Circuits-I Lab			2				60	40	100
BEE310	Computer Programming-I Lab			2				60	40	100
Total (B)				8				240	160	400
Grand Total (A+B)				31						1000

** Sessional Exam: marks shall not be counted for awarding division.

Jodhpur National University
(Faculty of Engineering & Technology)
School of Electrical Engineering
II B.Tech. IV Semester Teaching & Examination scheme

Subject Code	Subject	Lectures	Tutorials	Practical	Exam. H.	Theory		Practical & Sessional		Total
						Internal	External	Internal	External	
A.	Written Papers									
BEE401	Electrical Machines-II	3	1		3	20	80			100
BEE402	Electronics Devices & Circuit-II	3	1		3	20	80			100
BEE403	Computer Programming-II	3			3	20	80			100
BEE404	Digital Electronics	3	1		3	20	80			100
BEE405	Circuit Analysis - II	3	1		3	20	80			100
BEE406	Advanced Mathematics	3	1		3	20	80			100
BGE407 A*	Special Mathematics - II**	3								
Total (A)		18	5		18	120	480			600
B. Practical & Sessional										
BEE407	Electrical Machine-II Lab			2				60	40	100
BEE408	Electronics Devices & Circuit - II Lab			2				60	40	100
BEE409	Computer Programming-II Lab			2				60	40	100
BEE410	Digital Electronics Lab			2				60	40	100
Total (B)				8				240	160	400
Grand Total (A+B)				31						1000

** Sessional Exam: marks shall not be counted for awarding division.

Jodhpur National University

(Faculty of Engineering & Technology)

School of Electrical Engineering

III B.Tech.V Semester Teaching & Examination scheme

Subject Code	Subject	Lectures	Tutorials	Practical	Exam. H.	Theory		Practical & Sessional		Total
						Internal	External	Internal	External	
A. Written Papers										
BEE501	Power Transmission & Distribution	3	1		3	20	80			100
BEE502	Power Electronics-I	3	1		3	20	80			100
BEE503	Microprocessor & Computer Architecture	3	1		3	20	80			100
BEE504	Control System Engineering	3			3	20	80			100
BEE505	Electromagnetic Field Theory	3	1		3	20	80			100
BEE506	Communication Engineering	3	1		3	20	80			100
Total (A)		18	5		18	120	480			600
B. Practical and Sessional										
BEE507	Power Transmission & Distribution Lab			2				60	40	100
BEE508	Power Electronics-I Lab			2				60	40	100
BEE509	Microprocessor Lab			2				60	40	100
BEE510	Entrepreneurship Development			2				60	40	100
Total (B)				8				240	160	400
Grand Total (A+B)				31						1000

Jodhpur National University

(Faculty of Engineering & Technology)

School of Electrical Engineering

III B.Tech.VI Semester Teaching & Examination scheme

Subject Code	Subject	Lectures	Tutorials	Practical	Exam. H.	Theory		Practical & Sessional		Total
						Internal	External	Internal	External	
A. Written Papers										
BEE601	Advanced Microprocessor	3	1		3	20	80			100
BEE602	High Voltage Engineering	3	1		3	20	80			100
BEE603	Power Electronics-II	3	1		3	20	80			100
BEE604	Power System Instrumentation	3	1		3	20	80			100
BEE605	Generation of Electrical Power	3	1		3	20	80			100
BEE606	Non-conventional Energy Sources	3			3	20	80			100
Total (A)		18	5		18	120	480			600
B. Practical and Sessional										
BEE607	Advanced Microprocessor Lab			2				60	40	100
BEE608	High Voltage Lab			2				60	40	100
BEE609	Power Electronics-II Lab			2				60	40	100
BEE610	MAT & Ps-Pice Lab			2				60	40	100
Total (B)				8				240	160	400
Grand Total (A+B)				31						1000

Jodhpur National University
(Faculty of Engineering & Technology)
School of Electrical Engineering
IV B.Tech.VII Semester Teaching & Examination scheme

Subject Code	Subject	Lectures	Tutorials	Practical	Exam. H.	Theory		Practical & Sessional		Total
						Internal	External	Internal	External	
A. Written Papers										
BEE701	Switch Gear & Protection	3	1		3	20	80			100
BEE702	Utilization of Electrical Power	3	1		3	20	80			100
BEE703	Power System Engineering	3	1		3	20	80			100
BEE704	Power System Analysis	3	1		3	20	80			100
BEE705	Artificial Intelligence Techniques	3			3	20	80			100
BEE706	Elective*	3	1		3	20	80			100
BEE706.1	Power System Transients									
BEE706.2	E-Commerce & Internet									
BEE706.3	Optimization Techniques									
Total (A)		18	5		18	120	480			600
B. Practical and Sessional										
BEE707	Computer Based Power System Design lab			2				75	50	125
BEE708	Industrial Economics & Management Lab			2				75	50	125
BEE709	Practical Training & Seminar			2				60	40	100
BEE710	Project Stage 1			2				30	20	50
Total (B)				8				240	160	400
Grand Total (A+B)				31						1000

Jodhpur National University

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School of Electrical Engineering

IV B.Tech.VIII Semester Teaching & Examination scheme

Subject Code	Subject	Lectures	Tutorials	Practical	Exam. H.	Theory		Practical & Sessional		Total
						Internal	External	Internal	External	
A. Written Papers										
BEE801	EHV AC DC Transmission	3	1	-	3	20	80	-	-	100
BEE802	Electrical Machine Design	3	1	-	3	20	80	-	-	100
BEE803	Electrical Drives & Controls	3	1	-	3	20	80	-	-	100
BEE804	Elective*	3	1	-	3	20	80	-	-	100
BEE804.1	Principles of Nuclear Engineering							-	-	
BEE804.2	Network Operating System							-	-	
BEE804.3	Static Protective Relays							-	-	
Total (A)		12	4		12	80	320			400
B. Practical and Sessional										
BEE805	Advanced Power Electronics lab			3		-	-	60	40	100
BEE806	CB Electrical M/C Design Lab			3		-	-	60	40	100
BEE807	Electric Drives & Control Lab			3		-	-	60	40	100
BEE808	Project Stage 2			3		-	-	120	80	200
BEE809	Seminar			2		-	-	60	40	100
Total (B)				14				360	240	600
Grand Total (A+B)				30						1000

BEE301 ELECTRICAL MACHINES -I

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION	Basic principle of electromechanical energy conversion, salient aspects of conversion, energy balance equation, Energy & Co energy, Faraday's law of electromagnetic-induction , Fleming's right & left hand rules, right hand palm rule, Bio-savart's law.
II	DC GENERATORS	Construction, Types of DC generators, emf equation, lap & wave windings, equalizing connections, Armature reaction, commutation, methods of improving commutations, demagnetizing and cross magnetizing m.m.f , interpoles, characteristics, parallel operation. Rosenberg generator.
III	DC MOTORS	Principle of operation, comparison between motor and generator action, significance of back emf, types, production of torque, armature reaction & inter-poles, characteristics of shunt, series & compound motor, DC motor starting. Speed Control of DC Motor: Armature and field control method, Ward Leonard method. Braking, losses and efficiency, direct & indirect test, Swinburne's test, Hopkinson test, field & retardation test, single-phase series motor
IV	SINGLE PHASE TRANSFORMER	Construction, types, emf equation. No load and load conditions. Equivalent circuits, Vector diagrams, OC and SC tests, Sumpner's back-to-back test, efficiency. voltage regulation, effect of frequency, parallel operation, autotransformers, switching currents in transformers, separation of losses.
V	POLYPHASE TRANSFORMERS	Single unit or bank of single-phase units, polyphase connections, Open delta and V connections, Phase conversion: 3 to 6 phase and 3 to 2 phase conversions, Effect of 3-phase winding connections on harmonics, 3-phase winding transformers, tertiary winding.

BEE302 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.

Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	MEASURING INSTRUMENTS	Moving coil, moving iron, electro-dynamics and induction instruments-construction, operation, torque equation and errors. Applications of instruments for measurement of current, voltage, single-phase power and single-phase energy, Errors in wattmeter and energy meter and their compensation and adjustment Testing and calibration of single-phase energy meter by phantom loading., 3- phase induction type energy meter
II	POLYPHASE METERING	Blonde's Theorem for n-phase, p-wire system. Measurement of power and reactive KVA in 3-phase balanced and unbalanced systems: One-wattmeter, two-wattmeter and three-wattmeter methods. 3-phase induction type energy meter. Instrument Transformers: Construction and operation of current and potential transformers. Ratio and phase angle errors and their minimization. Effect of variation of power factor, secondary burden and frequency on errors. Testing of CTs and PTs. Applications of CTs and PTs for the measurement of current, voltage, power and energy.
III	POTENTIOMETERS	Construction, operation and standardization of DC potentiometers- slide wire and Crompton potentiometers. Use of potentiometer for measurement of resistance and voltmeter and ammeter calibrations. Volt ratio boxes. Construction, operation and standardization of AC potentiometer - in-phase and quadrature potentiometers. Applications of AC potentiometers.
IV	MEASUREMENT OF RESISTANCES	Classification of resistance. Measurement of medium resistances - ammeter and voltmeter method, substitution method, Wheatstone bridge method. Measurement of low resistances - Potentiometer method and Kelvin's double bridge method. Measurement of high resistance: Price's Guard-wire method. Measurement of earth resistance.
V	AC BRIDGES	Generalized treatment of four-arm AC bridges. Sources and detectors. Maxwell's bridge, Hay's bridge and Anderson bridge for self-inductance measurement. Heaviside's bridge for mutual inductance measurement. De Sauty Bridge for capacitance measurement. Wien's bridge for capacitance and frequency measurements. Sources of error in bridge measurements and precautions. Screening of bridge components. Wagner earth device.

BEE303 ELECTRONIC DEVICES & CIRCUITS -I

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	PN JUNCTION DIODES	<p>Open-circuited p-n junction and space charge region. The biased p-n junction, volt-ampere characteristics, cut-in voltage. Minority carrier density distribution in (a) a forward biased junction and (ii) a reverse biased junction ,diode capacitance, junction diode switching times and characteristics</p> <p>Other diodes: Avalanche breakdown and zener breakdown, working principles of zener diodes, photo-diodes, light emitting diodes, solar cell and varactor diodes.</p>
II	ANALYSIS OF DIODE CIRCUITS	<p>Diode as a circuit element, load line ,small signal and large signal diode model, analysis of half wave and full wave single- phase rectifiers, peak inverse voltage , various types of filters, their analysis and applications, voltage multipliers, clipping and clamping circuits.</p>
III	TRANSISTOR FUNDAMENTALS	<p>Transistor configurations and input and output characteristics, operating regions: active region, saturation region and cutoff region, Hybrid model , h- parameter equivalent circuits, Conversion formulae for the parameters of the three transistor Configurations, DC and AC analysis of CE, CC and CB amplifiers, Emitter follower, Phototransistor.</p> <p>Transistor Biasing and Thermal Stabilization: Ebers-Moll model, Transistor biasing, Bias stability, Stability factor, Transistor Biasing Circuits, Stabilization against variations in I_{CO}, V_{BE} and β, Bias Compensation, Thermal Runaway, Thermal Stability, Transistor switching times.</p>
IV	FIELD EFFECT TRANSISTORS	<p>Construction, working, V-I characteristics and transfer characteristics and comparison of JFET and MOSFET (Enhancement type and depletion type), Pinch-off voltage, Equivalent circuits and biasing of JFET's & MOSFETs. FET as a voltage amplifier and voltage variable resistor. FET as a switch, FET small signal amplifier models, CMOS.</p>
V	SMALL SIGNAL TRANSISTOR AMPLIFIERS	<p>Analysis of BJT Cascading Transistor Amplifiers, Direct-Coupled and R-C Coupled Transistor Amplifier, Frequency response, gains at low and high frequency, Miller's theorem and its dual, Darlington pair and Bootstrapped Darlington circuit, Emitter followers.</p>

BEE304 COMPUTER PROGRAMMING-I

Teaching Hrs.
L-3, T-0, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	PROGRAMMING IN C	Review of basics of C, structure & pointer type, variables, singly and doubly linked lists, I/O and text file handling, command line arguments.
II	OOP FUNDAMENTALS	Concept of class and object, attributes, public, private and protected members, derived classes, single & multiple inheritance.
III	PROGRAMMING IN C++	Enhancements in C++ over C in data types, operators and functions. Inline functions, constructors and destructors. Friend function, function and operator overloading.
IV	OOPS CONCEPT PROGRAMMING IN C++	Working with class and derived classes. Single and multiple and multilevel inheritances and their combinations, virtual functions, pointers to objects.
V	FILE HANDLING IN C++	Working with text files, templates, file handling in C++, Input output flags and formatting operations.

BEE305 CIRCUIT ANALYSIS-I

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION NETWORK ANALYSIS	Introduction to circuit elements and their characteristics. Current and voltage reference. Response of single element, double element and triple element circuits. Resonance, selectivity & Q-factor in ac circuits. Network voltages. Mesh & node systems of network equations and their comparison. Graph of network, tree, incidence matrix, fundamental circuit functions, cut sets, f-circuits analysis and f-cut set analysis, node and node pair analysis. Duality. Method of obtaining dual network.
II	NETWORK THEOREMS	Thevenin's, Norton's, Superposition, Reciprocity, Compensation, Millman's, Tellegen's, Maximum power transfer and Miller's theorems.
III	POLYPHASE CIRCUITS	General Circuit Relations: Three Phase Star, Three Phase Delta, Star and Delta Combination, Four Wire Star Connections, Balanced Three Phase Voltages And Unbalanced Impedances. Power and Reactive Volt-Amperes in a 3-Phase System. Power Relations in AC Circuits: Instantaneous Power in AC Circuits, Power Factor, Apparent Power, Reactive Power, Power Triangle, Complex Power.
IV	NON-SINUSOIDAL WAVES	Complex Periodic Waves And Their Analysis By Fourier Series. Different Kinds of Symmetry, Determination of Co-Efficient. Average and Effective Values of a Non-Sinusoidal Wave, Power in a Circuit of Non-Sinusoidal Waves of Current and Voltage, Form Factor, Equivalent Sinusoidal Wave and Equivalent Power Factor. Response of Linear Network to Non-Sinusoidal Periodic Waves.
V	TIME DOMAIN AND FREQUENCY DOMAIN ANALYSIS	Response of networks to step, ramp, impulse, pulse and sinusoidal inputs. Time domain and frequency domain analysis of circuits. Shifting theorem, initial and final value theorems. Special signal waveforms with Laplace transform & applications to circuit operations.

BEE306 MATHEMATICS

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	LAPLACE TRANSFORM	Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant coefficients with special reference to wave and diffusion equations, digital transforms.
II	FOURIER TRANSFORM	Discrete Fourier transform, Fast Fourier transform, Complex form of Fourier transform and its inverse applications, Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation
III	FOURIER SERIES	Expansion of simple functions in Fourier series, half range series, change of interval, harmonic analysis. Calculus of Variation: Functional, strong and weak variations, simple variation problems, Euler's equation.
IV	COMPLEX VARIABLES	Analytic functions, Cauchy-Riemann equations, elementary conformal mapping with simple applications, line integral in complex domain, Cauchy's theorem, Cauchy's integral formula.
V	COMPLEX VARIABLES	Taylor's series, Laurent's series, poles residues. Evaluations of simple definite real integrals using the theorem of residues, simple contour integration.

BGE 307 A Special Mathematics I
(Common for all branch, Diploma Holder)

L-3,T-1

Exam. Hrs.:- 3
M.M. :- 100

UNIT 1

Trigonometry – Trigonometric functions, simple identities, range and values of trigonometric functions, inverse functions, De Moivre's theorem, Euler's theorem

UNIT 2

Basic Algebra – Binomial theorem for positive and negative index, logarithmic and simple properties, exponential, Logarithmic and trigonometric series.

UNIT 3

Differential Calculus – Function single variable and multivariable function, polynomial trigonometric, logarithmic and exponential function's derivative of a function elementary formulae.

UNIT 4

Differential Calculus – Derivative of sum and difference of two functions, derivative of product and quotient of two functions, logarithmic differentiation, partial differentiation.

UNIT 5

Integral Calculus – Integration of a function standard integrals and properties, integration by substitution, Integration by parts, definite integral and properties.

It will be sessional paper: marks shall not be counted for awarding division.

BEE307 ELECTRICAL MACHINE-I LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

S. No. List of Experiments:

- 1 Speed control of D.C. Shunt motor by
 - a) Field control method and plot the curve for speed v/s field current.
 - b) Armature control method and plot the curve for speed v/s armature voltage.
- 2 Speed control of a D.C. motor by Ward Leonard method and to plot the curve for speed v/s applied armature voltage.
- 3 To determine the efficiency of D.C. Shunt motor by loss summation (Swinburne's) method.
- 4 To determine the efficiency of two identical D.C. machine by Hopkinson's regenerative test.
- 5 To perform O.C. and S.C. test on a 1-phase transformer and find their efficiency & parameters of its equivalent circuit.
- 6 To perform parallel operation of two 1-phase transformer and their load sharing.
- 7 To perform back-to-back test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.
- 8 To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.

BEE308 ELECTRICAL MEASUREMENT & INSTRUMENTATION LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

S. No. List of Experiments:

- 1 Measure power and power factor in 3-phase load by (i) Two-wattmeter method and (ii) One wattmeter Method
- 2 Calibrate an ammeter using DC slide wire potentiometer
- 3 Calibrate a voltmeter using Crompton potentiometer
- 4 Measure low resistance by Crompton potentiometer
- 5 Measure Low resistance by Kelvin's double bridge
- 6 Measure earth resistance using fall of potential method
- 7 Calibrate a single-phase energy meter by phantom loading at different power factors
- 8 Measure self-inductance using Anderson's bridge
- 9 Measure capacitance using De- Sauty Bridge.

BEE309 ELECTRONICS DEVICES AND CIRCUITS LAB -I

Teaching Hrs.
L-0, T-0, P-2

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University (40)}

CONTENTS OF SYLLABUS

S. No. List of Experiments:

- 1 Study the following devices: (i) Analog & digital multi-meter (ii) Function/ Signal generators (iii) Regulated d. c. power supplies (constant voltage and constant current operations)
- 2 Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures
3. Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.
4. Plot V-I characteristic of zener diode and study zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
5. Plot frequency response curve for audio amplifier and to determine gain bandwidth product.
- 6.
7. Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure I_{dss} & V_p
7. Plot gain- frequency characteristic of two stages RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
8. Plot input and output characteristics of BJT in CB, CC and CE configurations.
9. Study half wave rectifier and effects of filters on wave. Also calculate ripple factor
- 10 Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor

B EE310 COMPUTER PROGRAMMING LAB-I

Teaching Hrs.
L-0, T-0, P-2

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University (40)}

CONTENTS OF SYLLABUS

S. List of Experiments:

No.

- I. Write a program to find the greatest between four numbers.
- II. Write a program to prepare mark sheet of students using structures.
- III. Write a C program to read several different names and addresses, rearrange the names in alphabetical order and print name in alphabetical order using structures.
- IV. Write a program to implement concatenation of two strings using pointers.
- V. write a program to create a singly link list of ten students names and implement add node, delete node and isemptylist operations.

PROGRAMMING IN C++

- 1. Write a program to search a pattern in a string.
- 2. Write a program to print the following output using FOR loop.

```
    1
   2 2
  3 3 3
 4 4 4 4
5 5 5 5 5
```

```
    1
   2 2
  3 3 3
 4 4 4 4
5 5 5 5 5
```

- 3. Write a program to add, subtract and multiply integer matrices.
- 4. Write a program to calculate the power function (m^n) using the function overloading technique; implement it for power of integer and double.
- 5. Implement file creating and operate it in different modes: seek, tell, read, write and close operations.
- 6. Using multiple inheritances, prepare student's mark sheet. Three classes containing marks for every student in three subjects. The inherited class

BEE401 ELECTRICAL MACHINE-II

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs.: 3 Hrs.

Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION TO ROTATING AC MACHINE	General equation of induced e.m.f, AC armature windings: concentric and distributed winding, chording, skewing, effect on induced emf. Armature and field mmf, effect of power factor and current on armature mmf, harmonics. Methods for eliminating harmonics Rotating fields.
II	INDUCTION MOTOR	Construction of squirrel cage & slip ring induction motor, basic principles, flux and mmf waves, induction motor as a transformer. Equivalent circuits, torque equation, torque-slip curves, no load & block rotor tests, Circle diagram. Performance calculation Torque-slip curves. Effect of rotor resistance. Cogging, Crawling. Double cage squirrel cage induction motor, induction generator, induction regulator
III	STARTING & SPEED CONTROL OF INDUCTION MOTORS	Various methods of starting & speed control of squirrel cage & slip ring motor, cascade connection, braking. Single- Phase Induction Motor: Revolving field theory, starting methods, equivalent circuits
IV	SYNCHRONOUS GENERATOR	Construction, types, excitation systems, principles. Equation of induced emf, flux and emf waves, theory of cylindrical rotor and salient pole machines, two-reactance theory, phasor diagrams, power developed, voltage regulation, OC & SC tests, zero power factor characteristics, potier triangle and ASA method of finding voltage regulation, synchronization, parallel operation, hunting and its prevention.
V	SYNCHRONOUS MOTORS	types, construction, principle, phasor diagrams, speed torque characteristics, power factor control, V-curves, starting methods, performance calculations, applications, synchronous condenser, synchronous induction motor.

BEE402 ELECTRONIC DEVICES & CIRCUITS –II

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	FEEDBACK AMPLIFIERS	Classification, feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifier, feedback topologies, input and output resistance, Analysis of voltage series, current series, voltage shunt and current shunt feedback amplifiers, stability criterion.
II	OSCILLATORS	Concept of feedback, Oscillator Circuit, Classification of oscillators and Criterion for oscillation. RC-phase shift oscillator, Hartley oscillator, Colpitts oscillator, Clapp oscillator, Tuned collector oscillator, Wein bridge and crystal oscillator. Multivibrators: Astable, monostable and bistable multivibrators, Schmitt trigger.
III	OP-AMP AND ITS APPLICATIONS	Characteristics of Ideal Op -Amp, Offset voltage and currents, Common mode rejection ratio, slew rate, Open-Loop and Closed-Loop Op-Amp Configuration (Inverting and Non-inverting), Basic op-amp applications, Differential DC amplifier and stable ac coupled amplifier. Logarithmic & anti-logarithmic amplifiers, Analog computation, comparators, sample and hold circuits
IV	POWER AMPLIFIERS	Classification of power amplifiers, collector efficiency, class-A large signal amplifier, transformer coupled power amplifier, second harmonic distortion, higher order harmonic generation, Push-pull amplifiers: Class-A, Class-B & Class AB operations, cross-over distortion, difference between voltage and power amplifiers.
V	INTEGRATED CIRCUITS	Precision AC/DC converters- Precision Rectifiers, peak detectors, A to D and D to A converters. IC 555 timer: Pin configuration, block diagram, working of Timer, 555 Timer as an Astable and a Monostable Multivibrator. Regulated power supplies, Series and shunt voltage regulators

BEE403 COMPUTER PROGRAMMING-II

Teaching Hrs.
L-3, T-0, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	UNIX	Introduction to following basic commands (excluding shell programming): who, touch, cat, cp, rm, mv, ls, unmask, pwd, mkdir, rmdir, bc, expr, factor, logname, id, uname, try, date, banner, dspace, du, ulimit, passwd, cal, wc, sort, cut, grep, dd, head, pg, lp, tail, compress, man, tee.
II	VI Editor	Text entry and command modes, cursor movement commands, string replacement commands and set commands.
III	JAVA	Variation from C++ to JAVA. Introduction to JAVA bytecode, virtual machine, application, application & applets of Java, integer, floating point, characters, Boolean, literals, and array declarations.
IV	OPERATORS AND CONTROL STATEMENTS	Arithmetic operators, bitwise operators, relational operators, Boolean logic operators, the assignment operators, operators, operator precedence. Switch and loop statements.
V	PACKAGE AND INTERFACES	Packages, access protection, importing & defining packages. Defining and implementing interfaces. I/O APPLET: I/O basics, reading console I/O, input and print stream classes, applet fundamental and string handling, mouse and keyboard interfaces, awt tools and controls.

BEE404 DIGITAL ELECTRONICS

Teaching Hrs.
L-3, T-0, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	NUMBER SYSTEM AND CODES	Radix and radix conversions, sign , magnitude & Complement notation. Weighted and non-weighted codes, BCD codes, self-complementing codes, cyclic codes, error detecting and correcting codes, ASCII & EBCDIC codes. (alphanumeric codes).Fixed point and floating point arithmetic .BCD arithmetic
II	BOOLEAN ALGEBRA AND DIGITAL LOGIC GATES	Features of Boolean algebra, postulates of boolean algebra, theorems of boolean algebra. Fundamental logic gates, derived logic gates, logic diagrams and boolean expressions. Converting logic diagrams to universal logic. Positive, negative and mixed logic. Minimization Techniques: Minterm, Maxterm, Karnaugh's maps, simplification of logic functions with K-map, conversions of truth tables in SOP & POS form, incompletely specified functions,variable mapping, Quinn-Mcklusky Technique
III	SWITCHING CIRCUITS AND LOGIC FAMILIES	Diode, BJT, FET as switch. Different types of logic families: RTL, TTL, open collector TTL, three state output logic, TTL subfamilies, MOS, CMOS,ECL, IIL.
IV	COMBINATION SYSTEMS	Combinational logic circuit design, Half and full adder & subtractors. Binary serial and parallel addres, BCD adder. Binary multiplier, comparator, decoders, encoders, multiplexer, demultiplexers, code converters.
V	SEQUENTIAL SYSTEMS	Latches, Flip-Flops: R-S, D, J-K, T, Master slave. Flip-Flop conversions. Counters -Ripple Counters, Modulus Counter, Ring Counter, Synchronous Counter, UP and DOWN Counters, Timing Sequences. Registers –Buffer Register, Shift Registers,.

BEE405 CIRCUIT ANALYSIS-IITeaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.

Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	IMPEDANCE AND ADMITTANCE FUNCTIONS NETWORK FUNCTIONS:	The concept of complex frequency, transform impedance and admittance, series and parallel combinations. Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Restrictions on pole and zero location in s-plane. Time domain behavior from pole and zero plot. Procedure for finding network functions for general two terminal pair networks.
II	NETWORK SYNTHESIS	Hurwitz polynomial, positive real functions, reactive networks. Separation property for reactive networks. The four-reactance function forms, specification for reactance function. Foster form of reactance networks. Cauer form of reactance networks. Synthesis of R-L and R-C networks in Foster and Cauer forms.
III	TWO PORT GENERAL NETWORKS	Two port parameters (impedance, admittance, hybrid, ABCD parameters) and their inter relations. Equivalence of two ports. Transformer equivalent, inter connection of two port networks. The ladder network, image impedance, image transfer function, application to L-C network, attenuation and phase shift in symmetrical T and pi networks.
IV	TWO PORT REACTIVE NETWORKS (FILTERS)	Constant K filters. The m-derived filter. Image impedance of m-derived half (or L) sections, composite filters. Band pass and band elimination filters. The problem of termination, lattice filters, Barlett's bisection theorem. Introduction to active filters.
V	COUPLED CIRCUITS	Conductively coupled circuits. Mutual impedance, magnetic coupling, mutual inductance, co-efficient of magnetic coupling, circuit directions and sign of mutual inductance, mutual inductance between portions of the same circuit, mutual inductance between parallel branches, transferred impedance. Transformer equivalent inductively and conductively coupled circuits; Resonance in Single tuned and Double tuned circuits, effect of coefficient of coupling.

BEE406 ADVANCED MATHEMATICS

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	NUMERICAL ANALYSIS	Finite differences - Forward backward and central difference. Newton's forward and backward differences interpolation formulae. Sterling's formulae, Lagrange's interpolation formula. Solution of non-linear equations in one variable by Newton Raphson and Simultaneous algebraic equation by Gauss and Regula Falsi method. Solution of simultaneous equations by Gauss elimination and Gauss Seidel methods. Fitting of curves (straight line and parabola of second degree) by method of least squares.
II	NUMERICAL ANALYSIS	Numerical differentiation, numerical integration trapezoidal rule, Simpson's one-third and one eighth rule. Numerical Integration of ordinary differential equations of first order, Picard's method, Euler's & modified Euler's methods. Miline's method and Runga Kutta fourth order method. Simple linear difference equations with constant coefficients.
III	SPECIAL FUNCTIONS	Bessel's function of first and second kind, simple recurrence relations, orthogonal property of Bessel functions, Transformation, Generating functions, Legendre's function of first kind, simple recurrence relations, orthogonal property, Generating functions.
IV	STATISTICS & PROBABILITY	Elementary theory of probability, Baye's theorem with simple applications, Expected value. Theoretical probability distributions – Binomial, Poisson and Normal distributions
V	STATISTICS & PROBABILITY	Lines of regression, co-relation and rank correlation .TRANSFORMS: Z-transforms, its inverse, simple properties and application to difference equations.

BGE 407* Special Mathematics **II
(Common for all branch, Diploma Holder)

Teaching Hrs.
3L+1T

Exam Hrs. 3 Hrs.
MM - 100

Unit	Topics
I Differential equation of first Order	Definition, order and degree of differential equation, Method of separation of variable, Homogeneous differential equation.
II Differential equation of first Order	Exact differential equation of first order, Reducible to exact form, Linear form, Reducible to linear form.
III Differential equation of second second Order	Linear differential equation with constant coefficients, complementary function, particular integral.
IV Elementary Complex Variable	Complex Numbers, Real and imaginary parts of complex, complex conjugate, modulus and argument of complex number. Euler's theorem and De'moivre's theorem (Only statement) polar form of complex number.
V Matrices and Determinants	Determinants and Matrices of order two and three properties of determinants, Evaluation of Determinants, Addition, Subtraction, Multiplication, Transpose, Ad joint and inverse of Matrix.

**** It will be sessional paper.**

BEE407 ELECTRICAL MACHINE II- LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

S. No.	List of Experiments:
1	To perform OC & SC test on a 3 phase transformer & find its efficiency and parameters for its equivalent circuit.
2	To perform parallel operation of two 3-phase transformer and determine their load sharing.
3	To study the performance of 3-phase transformer for its various connections, i.e. star/star delta delta/star and delta/delta and find the magnitude of 3rd harmonic current.
4	To make scott connection and measure the phase difference of secondary voltage by (i)voltmeter method (ii) CRO method.
5	Separation of transformer core losses and to determine the hysteresis and eddy current loss at rated voltage and frequency.
6	To plot the O. C. C & S.C.C of an alternator and to determine its regulation by synchronous impedance method.
7	To synchronise an alternator across the infinite bus (RVPNL) & summarise the effects of variation of excitation on load sharing.

BEE408ELECTRONICS DEVICES & CIRCUIT - II LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

- | S. No. | List of Experiments: |
|--------|--|
| 1 | Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback. |
| 2 | Study of series and shunt voltage regulators and measure line and regulation and ripple factor. |
| 3 | Plot and study the characteristics of small signal amplifier using FET. |
| 4 | Study of push pull amplifier. To study variation of output power & distortion with load. |
| 5 | Study wein's bridge oscillator and observe the effect of variation in R & C on oscillator frequency. |
| 6 | Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value. |
| 7 | Study the following oscillators and observe the effect of variation of C on oscillator frequency:
a) Hartley
b) Colpitts |
| 8 | a) Study op-amp in inverting and non-inverting modes.
a) Use op-amp as scalar, summer and voltage follower. |
| 9 | Use of op-amp as differentiator and integrator. |

BEE409 COMPUTER PROGRAMMING-11 LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

- | S. No. | List of Experiments: |
|--------|---|
| 1 | Exercising Vi advanced commands. |
| 2 | Experiments (four experiments) using Unix advanced commands and their combinations. |

Writer programs in Java on:

- | | |
|---|---------------------------------|
| 3 | Package creation and importing. |
| 4 | Implementing interfaces. |
| 5 | String computation. |
| 6 | Stream classes. |
| 7 | Applets. |

BEE410 DIGITAL ELELCTRONICS LAB

Teaching Hrs.
L-0, T-0, P-2

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University (40)}

CONTENTS OF SYLLABUS

S. No.	List of Experiments:
1	Study of following combinational circuits: Multiplexer, Demultiplexer and Encoder, Decoder. Verify truth tables of various logic functions.
2	Study of various combinational circuits based on:AND/NAND Logic blocks and OR/NOR Logic blocks.
3	To verify the universal NOR Gate
4	To verify the universal NAND Gate.
5	To verify the combinational logic circuit- half adder, full adder, half subtractor, full subtractor.
6	To perform the conversion of binary to gray code.
7	To perform the conversion of gray to binary code.
8	To study the different types of flip-flops.
9	Implementation of full adder using two half adder.

BEE501 POWER TRANSMISSION AND DISTRIBUTIONTeaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.

Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	SUPPLY SYSTEMS	Basic network of power system. Transmission and distribution voltage, effect of system voltage on size of conductor and losses. Comparison of DC 2- wire, DC 3- wire, 1- phase AC and 3- phase AC (3- wire and 4- wire) systems. (ii) Distribution Systems: - Primary and secondary distribution systems, feeder, distributor and service mains. Radial and ring- main distribution systems. Kelvin's law for conductor size.
II	MECHANICAL FEATURES OF OVERHEAD LINES	Conductor material and types of conductor. Conductor arrangements and spacing. Calculation of sag and tension, supports at different levels, effect of wind and ice loading, stringing chart and sag template. Conductor vibrations and vibration dampers.
III	PARAMETERS OF TRANSMISSION LINES	Resistance inductance and capacitance of overhead lines, effect of earth, line transposition. Geometric mean radius and distance. Inductance and capacitance of line with symmetrical and unsymmetrical spacing Inductance and capacitance of double circuit lines. Skin and proximity effects. Equivalent circuits and performance of short and medium transmission lines.
IV	INSULATORS	Pin, shackle, suspension, post and strain insulators. Voltage distribution across an insulator string, grading and methods of improving string efficiency. (ii) Underground Cables: Conductor, insulator, sheathing and armoring materials. Types of cables. Insulator resistance and capacitance calculation. Electrostatic stresses and reduction of maximum stresses. Causes of breakdown. Thermal rating of cable. Introduction to oil filled and gas filled cables.
V	LINE CONSTANTS AND CORONA	Generalized ABCD line constants, equivalent circuit and performance of long transmission line. Ferranti effect. Interference with communication circuits. Power flow through a transmission line (ii) Corona: Electric stress between parallel conductors. Disruptive critical voltage and visual critical voltage, Factors affecting corona. Corona power loss. Effects of corona.

BEE502 POWER ELECTRONICS-I

Teaching Hrs.
L-3, T-1, P-0

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topic	Details of Coverage
I	POWER SEMICONDUCTOR DEVICES	Characteristics of power transistor, Thyristor , GTO, Traic, Diac, MCT, operation and switching characteristics of snubber, IGBT, power MOSFET, Two Transistor model of Thyristor.
II	SCR	Construction and characteristics of Thyristor, turn-on methods of SCR, turn-on switching characteristics, turn-off methods, rating of Thyristor, protection of SCR-voltage and current protection, fusing and crow-bar protection, UJT relaxation oscillator, pulse transformer, optical isolators.
III	CONVERTERS-I	Single Phase half & full wave controlled converters with resistive and inductive load, Single phase dual converters, Three phase half controlled converters, Three phase full wave converters with RL load, Three phase dual converters.
IV	CONVERTERS-II	Single and three-phase semi converters with RL load. Power Factor Improvement-Extinction angle control, symmetrical angle control, phase angle control, asymmetrical firing, pulse width modulation control and sinusoidal pulse width modulation control, Effect of load and source impedances.
V	DC CHOPPERS	Principle of Step Up/Down Chopper, Chopper Configurations- single, two, four quadrant chopper, Thyristor commutation in chopper, multiphase chopper, Switched Mode Regulators-buck, boost, and cuk regulator.

BEE 503 MICROPROCESSOR & COMPUTER ARCHITECTURE

Teaching Hrs.
L-3, T-0, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION	CPU, address bus, data bus and control bus. Input/Output devices, buffers, encoders, latches and memories. Brief introduction to comparison of different features in 8085 and 8086 microprocessors.
II	8085 MICROPROCESSOR ARCHITECTURE	Internal Data Operations and Registers, Pins and Signals, Peripheral Devices and Memory Organization, Interrupts.
III	8085 MICROPROCESSOR INSTRUCTIONS	Classification, Format and Timing. Instruction Set. Programming and Debugging, 8 Bit And 16 Bit Instructions.
IV	8085 MICROPROCESSOR INTERFACING	8259, 8257, 8255, 8253, 8155 chips and their applications. A/D conversion, memory, keyboard and display interface (8279).
V	BASIC COMPUTER ARCHITECTURE	Central Processing Unit, memory and input/output interfacing. Memory Classification: Volatile and non-volatile memory, Primary and secondary memory, Static and Dynamic memory, Logical, Virtual and Physical memory. Types of memory: Magnetic core memory, binary cell, Rom architecture and different types of ROM, RAM architecture, PROM, PAL, PLA, Flash and Cache memory, SDRAM, RDRAM and DDRAM. Memory latency, memory bandwidth, memory seek time.

BEE504 CONTROL SYSTEM ENGINEERING

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION	Elements of control systems, concept of open loop and closed loop systems. Examples and application of open loop and closed loop systems, brief idea of multivariable control systems.
II	MATHEMATICAL MODELING OF PHYSICAL SYSTEMS	Representation of physical system (Electro Mechanical) by differential equations, Determination of transfer function by block diagram reduction techniques and signal flow method, Laplace transformation function, inverse Laplace transformation
III	TIME RESPONSE ANALYSIS OF FIRST ORDER AND SECOND ORDER SYSTEMS	Characteristic equations, response to step, ramp and parabolic inputs, transient response analysis, steady state errors and error constants, Transient & steady state analysis of LTI systems.
IV	STABILITY OF SYSTEMS	Absolute stability and relative stability, Routh's stability criterion, root locus method of analysis, polar plots, Nyquist stability criterion. M and N Loci, Nichols chart.
V	ELEMENTARY IDEAS OF COMPENSATION NETWORKS	Lag, lead and log lead networks, brief idea of proportional, derivative and integral controllers.

BEE505 ELECTROMAGNETIC FIELD THEORY

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION	Vector-Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Concept and physical interpretation of gradient, Divergence and curl, Green's Stoke's and Helmholtz theorems.
II	ELECTROSTATICS	Electric field vectors-electric field intensity, flux density & polarization. Electric field due to various charge configurations. The potential functions and displacement vector. Gauss's law. Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy, field determination by method of images. boundary conditions. Field mappings and concept of field cells.
III	MAGNETOSTATICS	Magnetic field vector: Magnetic field intensity, flux density & magnetization, Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field mapping and concept of field cells.
IV	TIME VARYING FIELDS	Faraday's law. Displacement currents and equation of continuity. Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflections, refraction & polarization of UPW, standing wave ratio. Pointing vector and power considerations.
V	RADIATION & EMI, EMC	Retarded potentials and concepts of radiation, Alternating current element and power radiated by Hertzian dipole. Radiation resistance. Introduction to EMI & EMC : EMI coupling modes methods to eliminate EMI : Grounding , Shielding , Filtering EMI Testing

BEE506 COMMUNICATION ENGINEERING

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	NOISE EFFECTS IN COMMUNICATION SYSTEM	Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth, effective input noise temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits.
II	AMPLITUDE MODULATION	Frequency translation, Recovery of base band signal, Spectrum & power relations in AM systems. Methods of generation & demodulation of AM-DSB, AMDSB/ SC and AM-SSB signals. Modulation & detector circuits for AM systems. AM transmitters & receivers.
III	FREQUENCY MODULATION	Phase & freq. modulation & their relationship, Spectrum & bandwidth of a sinusoidally modulated FM signal, phasor diagram, Narrow band & wide band FM. Generation & demodulation of FM signals. FM transmitters & receivers, Comparison of AM, FM & PM. Pre emphasis & de-emphasis. Threshold in FM, PLL demodulator.
IV	NOISE IN AM AND FM	Calculation of signal-to-noise ratio in SSB-SC, DSB-SC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Calculation of S/N ratio in FM demodulators, Super-heterodyne receivers.
V	PULSE MODULATION SYSTEM	Sampling theorem, Generation and demodulation methods of PAM, PWM, PPM.

BEE507 POWER TRANSMISSION AND DISTRIBUTION LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

S. No. List of Experiments:

- 1 GENERATING STATION DESIGN : Design consideration of hydro & thermal generating stations, Basic schemes of hydro, thermal, nuclear & gas power plants. Auxiliary power supply scheme for thermal power plant. Electrical equipment for power stations.
- 2 TRANSMISSION SYSTEM DESIGN : Design Consideration of HV Transmission line – route survey , supports – structure , choice of conductor , spacing sag & sag template.
- 3 DISTRIBUTION SYSTEM DESIGN : Design of feeders & distributors. Types of primary and secondary distribution systems, Electrical & Mechanical Design choice of voltage selection of supports & Conductors voltage drops in distributors. , voltage drop in distributors fed from one end both ends. Kelvin's law. Radial and ring distribution systems. Distribution substations.
- 4 SUBSTATIONS : Basic network of power system, Types of substations, bus-bar arrangements, Electrical equipment for substations. Concept ional layout of 132 -33-11 KV substations
- 5 INSTRUMENT TRANSFORMERS : Design consideration of CTs & PTs for measurement & protection. Measurement of power using CTs & PTs.
- 6 Indian Electricity Act 2003 : its importants & salient aspects

BEE508 POWER ELECTRONICS-I LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

List of Experiments:

S. No.

- 1 Study the characteristics of SCR: Observe the terminal configuration, Measure the breakdown voltage, Measure latching and holding current and V-I characteristics.
- 2 Study the different triggering circuits for SCR:R-triggering circuit, R-C triggering circuit and UJT triggering circuit.
- 3 Study the firing circuit for single-phase converters using ramp comparator scheme.
- 4 Study the firing circuit for single-phase converters using cosine wave comparator scheme.
- 5 Study the firing circuit for single-phase converters using op-amps and gates.
- 6 Study and obtain the characteristics of Diac.
- 7 Study and obtain the waveforms for single-phase half wave controlled converter.
- 8 study and obtain the wave forms for single-phase fully controlled bridge converter.
- 9 Study and show the effect of freewheeling diode in single-phase fully controlled bridge converter.
- 10 Study and obtain the waveforms for voltage-commutated chopper.
- 11 Study and obtain the waveforms for current-commutated chopper.

BEE509 MICROPROCESSOR LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

S. No. List of Experiments:

- 1 Study the hardware, function, memory structure and operation of DYNAL-8085 microprocessor dit.
- 2 Program to perform integer division (i) 8-bit (ii)16-bit by 8-bit.
- 3 Transfer of a block of data in memory to another place in memory.
- 4 Transfer of block to another location in reverse order.
- 5 Searching a number in an array.
- 6 Sorting of array in: (i)Ascending (ii)Descending order
- 7 Finding parity of a 32 bit no.
- 8 Programme to perform following conversion:(i)BCD to ASCII (ii) BCD to Hexadecimal.
- 9 Programme to multiply two 8-bit numbers.
10. Programme to generate and sum 15 fabonacci numbers.
11. Programme for rolling display of message "INDIAN"
12. To insert a number at correct place in a sorted array.
13. Reversing bits of an 8-bit no.
14. Fabrication of 8-bit LED interfaces for 8085 kit though 8155 and 8255
15. Data transfer on output port 8155 & 8255 & designing of discolignt, running light, and sequential lights on off by above hardware.
16. Parallel data transfer between two DYNAL-85 kits using 8253 ports.
17. Generation of different waveform on 8253/8254 programmable timer.

BEE510 ENTREPRENEURSHIP DEVELOPMENT

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

S. List of Experiments:

- No.
- 1 Definition of entrepreneur, qualities of a successful entrepreneur, Charms of being an entrepreneur, achievement- motivation, leadership and entrepreneurial competencies
 - 2 Decision-making, procedures and formalities for starting own business, financial support system.
 - 3 Identification and selection of business opportunities and market survey, business plan. Implementation and customer satisfaction.
 - 4 Business crises, problem-solving attitude, communication skill. Government policies for entrepreneurs.
 - 5 Knowledge based enterprises, Scope of entrepreneur in present context, area of future entrepreneurship
 - 6 Marketing & Sales Promotion, Techno-Economic Feasibility Assessment by Preparation of Preliminary & Detailed project report

BEE601 ADVANCED MICROPROCESSORS

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.

Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION TO 8086/8088	Internal architecture of 8086/8088. The Bus interface unit. The execution unit. Pin diagram, addressing modes concepts of virtual memory.
II	ASSEMBLY LANGUAGE PROGRAMMEING OF 8086	Construction of the machine codes for 8086 instructions, Data transfer Instructions, Arithmetic Instructions. Writing simple assembly Language Programmers. Bit manipulation and starting instructions. Implementation of WHILEDO, REPEAT-UNTIL and IF-THEN structures.
III	MICROPROCESSOR SYSTEM PERIPHERALS	Description programming and interfacing of 8279 display and key board controller. 8275 programmable CRT controller, DMA Controller 8257.
IV	SERIAL COMMUNICATION	Basic idea of serial communication Description, programming and interfacing of 8251 USART.
V	ADVANCED MICROPROCESSORS	Basic idea and Architecture of 80186, 80286, and 80386.

BEE602 HIGH VOLTAGE ENGINEERINGTeaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.

Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	BREAKDOWN IN GASES, LIQUIDS & SOLIDS	Introduction to mechanism of breakdown in gases, Townsend's breakdown mechanism. Breakdown in electronegative gases. Application of gases in power system. (ii) Breakdown in Liquids: Introduction to mechanism of breakdown in liquids, suspended solid particle mechanism and cavity breakdown. Application of oil in power apparatus. (iii) Breakdown in solids: Introduction to mechanism of breakdown in solids, electromechanical breakdown, treeing & tracking breakdown and thermal breakdown.
II	HIGH DC VOLTAGE GENERATION	(i) High DC Voltage Generation: Generation of high dc voltage, basic voltage multiplier circuit. (ii) High AC Voltage Generation: Cascaded Transformers. (iii) Impulse Voltage generation: Impulse voltage, basic impulse circuit, Mark's multistage impulse generator. (iv) Measurement of High Voltage: Potential dividers - resistive, capacitive and mixed potential dividers. Sphere gap- Construction and operation. Klydonograph.
III	NONDESTRUCTIVE INSULATION TEST	(i) Measurement of resistivity, dielectric constant and loss factor. High Voltage Schering Bridge- measurement of capacitance and dielectric loss. (ii) Partial Discharges: Introduction to partial discharge, partial discharge equivalent circuit. Basic wide-band and narrow band PD detection circuits.
IV	OVER VOLTAGES & TRAVELLING WAVES	Causes of over voltages, introduction to lightning phenomena, over voltages due to lightning. 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 and line terminated through a capacitance. Attenuation of travelling waves.
V	OVER VOLTAGE PROTECTION & INSULATION COORDINATION	(i) Basic construction and operation of ground wires- protection angle and protective zone, ground rods, counterpoise, surge absorber, rod gap and arcing horn, lightning arresters - expulsion type, non-linear gap type and metal oxide gapless type. (ii) Insulation Coordination: Volt - time curves, basic impulse insulation levels, coordination of insulation levels.

BEE603 POWER ELECTRONICS-II

Teaching Hrs.
L-3, T-1, P-0

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topic	Details of Coverage
I	AC VOLTAGE CONTROLLERS	Principle of On-Off Control, Principle of Phase control, Single phase half and full wave bidirectional AC voltage controllers with resistive and inductive load, sequence control of AC regulators, Three Phase full wave AC controllers, AC Voltage Controller with PWM Control.
II	INVERTERS	Voltage Source Inverters-Single phase half bridge and full bridge Inverter with resistive and RL load, three phase inverter with 120° and 180° mode, voltage control of single phase and three phase Inverters. Current Source Inverters, comparison between VSI and CSI, Harmonics and its reduction techniques.
III	CYCLOCONVERTERS	principle of operation, single phase to single phase, three-phase to three-phase and three phase to single phase cyclo-converters. Output equation, Control circuit, load commutated cyclo-converters.
IV	DC POWER SUPPLIES	Switched Mode DC Power Supplies, flyback converter, forward converter, half and full bridge converter, resonant DC power supplies, bi-directional power supplies.
V	AC POWER SUPPLIES	Switched mode power supplies, Resonant AC power supplies, bidirectional AC power supplies. Multistage conversions, Control Circuits: Voltage Mode

BEE604 POWER SYSTEM INSTRUMENTATION

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	THEORY OF ERRORS	Accuracy and precision, systematic and random errors, limits of error, probable error and standard deviation Gaussian error curves, combination of errors.
II	TRANSDUCERS	.Construction & Operating Characteristics of active and digital transducers, Measurement of temperature, pressure, displacement, acceleration, noise level, Instrumentation for strain, displacement, velocity, acceleration, force, torque and temperature.
III	SIGNAL CONDITIONING	Instrumentation amplifiers, isolation amplifiers, analog multipliers, analog dividers, function generators, timers, sample and hold, frequency to voltage converters, Shielding and grounding.
IV	POWER SYSTEM INSTRUMENTATION-I	Measurement of voltage, current, phase angle, frequency, active power and reactive power in power plants. Energy meters. and multipart tariff meters.
V	POWER SYSTEM INSTRUMENTATION-II	Capacitive voltage transformers and their transient behavior, Current Transformers for measurement and protection, composite errors and transient response.

BEE605 GENERATION OF ELECTRIC POWER

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.

Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	CONVENTIONAL ENERGY GENERATION METHODS	<p>(i) Thermal Power plants: Basic schemes and working principle.</p> <p>(ii) Gas Power Plants: open cycle and closed cycle gas turbine plants, combined gas & steam plants – basic schemes.</p> <p>(iii) Hydro Power Plants: Classification of hydroelectric plants. Basic schemes of hydroelectric and pumped storage plants.</p> <p>(iv) Nuclear Power Plants: Nuclear fission and Nuclear fusion. Fissile and fertile materials. Basic plant schemes with boiling water reactor, heavy water reactor and fast breeder reactor. Efficiencies of various power plants.</p>
II	NEW ENERGY SOURCES	Impact of thermal, gas, hydro and nuclear power stations on environment. Green House Effect (Global Warming). Renewable and non-renewable energy sources. Conservation of natural resources and sustainable energy systems. Indian energy scene. Introduction to electric energy generation by wind, solar and tidal.
III	LOADS AND LOAD CURVES	Types of load, chronological load curve, load duration curve, energy load curve and mass curve. Maximum demand, demand factor, load factor, diversity factor, capacity factor and utilization. <p>(ii) Power factor improvement: Causes and effects of low power factor and advantages of power factor improvement. Power factor improvement using shunt capacitors and synchronous condensers</p>
IV	POWER PLANT ECONOMICS	<p>(i) Capital cost of plants, annual fixed and operating costs of plants, generation cost and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics.</p> <p>(ii) Calculation of most economic power factor when (a) kW demand is constant and (b) KVA demand is constant.</p> <p>(iii) Energy cost reduction: off peak energy utilization, co-generation, and energy Conservation.</p>
V	TARIFFS	Objectives of tariffs. General tariff form. Flat demand rate straight meter rate, block meter rate. Two part tariff power factor dependent tariffs , three- part tariff. Spot (time differentiated) pricing Selection of power plants : comparative study of thermal hydro nuclear and gas power plants base load and peak load plants. Size and types of generating units types of reserve and size of plant . selection and location power plants

BEE606 NON-CONVENTIONAL ENERGY SOURCES

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION	Energy sources & their classification, conventional and non conventional energy sources, energy scenario: - World, Asian & Indian energy scenario. Transmission and distribution losses, renewable sources: Need for renewable sources, renewable energy resources, renewable energy scene in India.
II	SOLAR ENERGY	Solar radiations, ways & harnessing solar energy, various generations of solar cell, solar photovoltaic technology photovoltaic, design trends, solar cell configurations, solar chimney, solar pond, solar energy programmer by MNES, Pole of nanotechnology to increase the efficiency of solar cells.
III	WIND ENERGY	Working of wind power arrangement, Basic components of wind energy conversion systems, potential of wind power in India, wind energy scenario in India, types of wind machines. Comparison between fossil fuels and wind, wind energy & photo voltaic, Application of wind energy, advantages and disadvantages.
IV	BIOMASS ENERGY	Introduction, Biomass project and support from the government, Biomass and the environment, Application of biomass, advantages and disadvantages.
V	OTHER NON-CONVENTIONAL ENERGY SOURCES	Geothermal energy, suitable places, geothermal power plants, Advantages and disadvantages, Tidal power plants & working, Advantages and disadvantages, mini & micro hydro electric plants, advantages & limitations, hydrogen as a wonder fuel, Nuclear fusion energy.

BEE607 ADVANCED MICROPROCESSORS LAB

Teaching Hrs.
L-0, T-0, P-2
(30)}

Exam Hrs. : 3 Hrs.
Exam Marks: 75 {Internal (45) & University

CONTENTS OF SYLLABUS

S. No.	List of Experiments:
1	To add two 8 bit nos. & result may be (a) 8 bit (b) 16 bit.
2	To find largest of 2 No's, 3 No's & from array.
3	To find smallest of 2 No's, 3 No's & from array.
4	To transfer block of bytes from one set of memory location to another set of memory location (a) in some order (b) in resource order.
5	To perform multi byte addition.
6	To perform multi byte subtraction.
7	To perform multi byte decimal addition.
8	To generate to terms for febonic series.
9	To arrays given data array in ascending order.
10	To arrays given data array in descending order.

BEE608 HIGH VOLTAGE LAB

Teaching Hrs.
L-0, T-0, P-2
(80)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University

CONTENTS OF SYLLABUS

S. No.	List of Experiments:
1	(i) Measurement of flashover voltage of 11 KV pin type insulator and string type insulator (ii) Calculation of string efficiency of the string of suspension insulators (iii) Measurement of High Voltage using electrostatic voltmeter (iv) Improvement of string efficiency by connecting guard ring.
2	Find out the dielectric strength of the transformer oil.
3	Perform puncture voltage testing on (i)Healthy cable (ii)cable having pinhole in the insulation.
4	Study of zero sequence current in three phase transformers.
5	To find out the sequence component of synchronous machines.
6	To see the burden effect on the performance of CT and measure the phase angle and ratio error.
7	(i) Study of over current relay. (ii)to draw the current/time characteristics of an over current relay for TMS=1 & 0.5 and PSM=1.25 & 1.0.
8	(i)Study of percentage bias differential relay (ii)To plot the characteristics of a percentage bias differential relay for 30%, 40% and 20%.

- 9 Study of Gas actuated Buchholz relay.
- 10 Study of under frequency relay and checking it's setting experimentally.
- 11 Study of over flux relay.
- 12 Study of auxiliary relays.

BEE609 POWER ELECTRONICS-II LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

- | S. No. | List of Experiments: |
|---------------|---|
| 1 | Study the single-phase inverter. |
| 2 | Study ac regulator using triac, anti parallel thyristor and triac & diac. |
| 3 | Study single-phase PWM inverter. |
| 4 | Study buck, boost and buck-boost regulators. |
| 5 | Study the forced commutated circuits. |
| 6 | Determine the dv/dt limitation of given SCR. |
| 7 | Study and test the triggering circuit of three phase half controlled bridge converter. |
| 8 | Study and test three phase half controlled bridge converter. |
| 9 | Study and test the triggering circuit of three-phase fully controlled bridge converter. |
| 10 | Study and test three-phase filly controlled bridge converter. |

BEE610 MATLAB & Ps-Pice Lab

Teaching Hrs.
L-, T-, P-2

Exam. Hrs. : 2 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	MATLAB	Basics of MATLAB matrices and vectors, matrix and array operations, Saving and loading data, plotting simple graphs, scripts and functions, Script files, Function files, Global Variables, Loops, Branches, Control flow, Advanced data objects, Multi-dimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation. Numerical integration, Ordinary differential equation. (All contents is to be covered with tutorial sheets)
II	SIMULINK	Idea about simulink, problems based on simulink. (All contents is to be covered with tutorial sheets)
III	PSPICE PROGRAMS	1. Calculate the resistance of a conductor, given its dimensions & resistivity or determine the change in conductor resistance when the temp changes. 2. D.C.-analyze resistor networks to determine all junction voltages, component voltages, and component currents. 3. Transient –analyze RC & RL circuits to produce tables of component voltage & current levels for a given set of time instants. 4. Convert Y-connected resistor networks to delta-connected circuits.

BEE701 SWITCHGEAR & PROTECTION

Teaching Hrs.
L-3, T-1, P-0
(80)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University

CONTENTS OF SYLLABUS

Units	Topic	Details of Coverage
I	Introduction	Causes and consequences of dangerous currents Faults Basic operation and classification relay, Selectivity, discrimination, sensitivity, reliability, economic of relay, Primary and backup protection. Pickup value, reset value.
II	ELECTROMAGNETIC RELAYS	Construction, operation and characteristics Electromagnetic over current relay, directional relay and direction over current relay, direction earth fault relay.
III	DISTANCE PROTECTION OF TRANSMISSION LINES	Construction and characteristics of impedance relays, C.T. and P.T. connection for distance protection, Reactance and mho characteristics, Transmission line and feeder protection. Frame leakage and circulating current protection.
IV	PROTECTION OF SYNCHRONOUS GENERATORS & TRANSFORMERS	Faults in stator winding of alternators differential protection. Single and multiple ground faults on the rotor, protection against excitation failure and prime mover failure. Differential protection of generator transformer unit. Differential protection of 3-phase transformers, effect of magnetizing inrush currents and methods for minimizing the effects, Buchholz protection.
V	CIRCUIT BREAKERS	Classification of switchgear and fields of application and relative merits. Theories of current interruption, energy balance and recovery rate theories. Practical systems of arc quenching in oil circuit breakers. Recent trends in H.V. circuit breakers, use of sulphur Hexafluoride, Rating of circuit breakers. Testing of circuit breakers, current chopping, resistance switching.

BEE702 UTILISATION OF ELECTRICAL POWER

Teaching Hrs.
L-3 T-1 P-0
100

Exam. Hrs. - 3 hrs
Marks Theory Exam.-80 Term Test – 20 Total –

Contents of Syllabus

Units	Topic	Details of Coverage
I	Electric Heating & Welding	Heating: Different methods of electric heating. Principle of high frequency induction and di-electric heating. Construction, operation, performance and applications of arc furnace and induction furnace. Welding: Welding process, welding transformer, Classification of Electric Welding: arc welding, resistance welding, Welding of various metals.
II	Illuminations	Definitions, laws of illuminations, polar curves, luminous efficiency, Photometer, incandescent lamps: filament materials, halogen lamp. Electric discharge lamps: sodium vapour lamp mercury vapour lamp and fluorescent lamp. Light Calculations: commercial, industrial, street and flood lighting.
III	Electric Traction	Systems of electric traction, DC & AC Systems, power supply systems for track electrification-Comparison and application of different systems. Traction Methods: Types of services, speed time and speed distance curves, average and schedule speed. Tractive effort, estimation of power and energy requirements: specific energy consumption, Mechanics of train movement. Coefficient of adhesion, Adhesive weight, effective weight
IV	Traction Motor Control	D.C. & A.C. traction motor, special requirement of selection of type, speed, torque /current characteristics various method of starting and speed control of DC,AC drives used in traction, series parallel starting, metadyne, bridge transition method, drum & contacted type control, multiple unit control, master controllers, methods of electric breaking of traction motors. Modern trend in electric traction Methods of obtaining unidirectional polarity and constant output voltage
V	Power Supply for Electric Traction	Substation equipment and layout. Feeding and distribution systems. Overhead equipment, current collection. System of train lighting, special requirements. Interference in telecommunication circuits, booster transformers, negative booster , protective devices

BEE703 POWER SYSTEM ENGINEERING

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (80) & University (20)}

CONTENTS OF SYLLABUS

Units	Topic	Details of Coverage
I	Economic Operation of Power Systems	Introduction, system constraints, optimal operation of power systems. Input output, heat rate and incremental rate curves of thermal generating units. Economic distribution of load between generating units within a plant. Economic distribution of load between power stations, transmission loss equation. Introduction to unit commitment and dynamic programming. Interconnected Power Systems: Introduction to isolated and interconnected powers systems. Reserve capacity of power stations, spinning and maintenance reserves. Advantages and problems of interconnected power systems. Power systems inter connection in India.
II	Voltage Control	Need of Voltage Control, Methods of voltage control, Tap Changing transformer, phase angle control and phase shifting transformer. Series compensation of transmission lines, location and protection of series capacitors, advantages and problems., (i) Introduction to voltage stability.
III	Power System Steady State Stability	Introduction to steady state and dynamic stabilities, steady state stability limit, Power angle equations and power angle curves under steady state and transient conditions. Rotor dynamics and swing equation (solution of swing equation not included), synchronizing power coefficient.
IV	Introduction to transient stability & its Analysis	Introduction to transient stability. Equal area criterion and its application to transient stability studies under basic disturbances, critical clearing angle and critical clearing time. Factors affecting stability and methods to improve stability.
V	Excitation Systems	Introduction of excitation systems of synchronous machines, types of excitation systems, Elements of various excitation systems and their control (functional block diagrams and their brief description)-DC excitation systems, AC excitation systems, brushless excitation system.

BEE704 POWER SYSTEM ANALYSIS

Teaching Hrs.
L-3, T-1, P-0

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topic	Details of Coverage
I	Symmetrical Fault Analysis	Percent and per Unit Quantities. Single line diagram for a balanced 3-phase system. Transient in R-L Circuit. Symmetrical and asymmetrical short circuit currents in synchronous generator. Equivalent circuits of synchronous machine under sub transient, transient and steady state conditions. Analysis of three phase faults.
II	Symmetrical Components	Fortes cue theorem. Symmetrical component transformation Phase shift in star-delta transformer. Sequence impedances of synchronous machine, transformers and transmission lines. Construction of sequence networks of power system. Zero sequence network of transformers and transmission lines.
III	Unsymmetrical Fault Analysis	Fault Analysis Signal line to ground, line-to-line and double line to ground faults. Connection of sequence networks under fault conditions. Analysis of unsymmetrical faults using symmetrical components.
IV	Load Flow Analysis -I	Formulation of load flow problem. Bus classification Static load low equations (SLFE). System variables solution of SLFE. Bus admittance matrix. Formation of Y-Bus by Singular Transformation.
V	Load Flow Analysis -II	Load flow problems. Gauss Seidel, Newton Raphson, Decoupled and fast decoupled methods for load flow analysis. Calculation of reactive power at voltage controlled buses in the Gausse-Seidel iterative method using Y-bus. Representation of transformers - Fixed tap setting transformer, Tap changing under load transformers, Phase shifting transformers, Tie line control. Comparison of methods of load flow analysis.

BEE705 ARTIFICIAL INTELLIGENCE TECHNIQUES

Teaching Hrs.
L-3, T-0, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	Artificial Intelligence	Introduction to AI and knowledge based Expert systems: Introduction, Importance and Definition of AI, ES, ES building tools and shells.
II	Knowledge Representation	Concept of knowledge, Representation of knowledge using logics rules, frames. Procedural versus. Declarative knowledge, forward versus backward chaining. Control Strategies: -Concept of heuristic search, search techniques depth first search, Breath first search, Generate & test hill climbing, best first search.
III	Artificial Neural Network	Biological Neurons and synapses, characteristics Artificial Neural Networks, types of activation functions.
	Perceptions	Perception representation, limitations of perceptions. Single layer and multiplayer perceptions. Perception learning algorithms.
IV	Basic Concepts in Learning ANN	Supervised learning, Back propagation algorithm, unsupervised learning, Kohonen's top field network & Algorithm.
V	Fuzzy Logic	Fuzzy logic concepts, Fuzzy relation and membership functions, Defuzzification, Fuzzy controllers Genetic algorithm: concepts, coding, reproduction, crossover, mutation, scaling and fitness.

BEE706.1 POWER SYSTEM TRANSIENTS

Teaching Hrs.
L-3, T-0, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	Introduction to Transient	Wave terminology, Development of wave equations, Terminal problems, Lattice diagrams, Origin and Nature of power system transients and surges, Surge parameters of plants, Equivalent Circuit representations. Lumped and distributed circuit transients
II	Line fault	Line energisation and de-energisation transients-Earth and earthwire effects. Current chopping in circuit breakers. Short line fault condition and its relation to circuit breaker duty. Trapped charge effects. Effect of source and source representation in short line fault studies
III	Control of transients	Control of transients, Lightning phenomenon, influence of tower footing resistance and earth resistance, Traveling waves in distributed parameters multiconductor lines, parameters as a function of frequency.
IV	Mechanism of Lightning Discharge & effect	Mechanism of Lightning Discharge Types of Lightning strokes, Harmful effects of lightning, protections against lightning, overhead Ground wires.
V	Lightening Arrester	Lightening Arresters, Types of lightening arresters, Surge Absorber simulation of surge diverters in transient analysis. Fourier integral and z transform methods in power system transient.

BEE706.2 E-COMMERCE

Teaching Hrs.
L-3, T-0, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION	Motivation, Forces behind E-Commerce Industry Framework, Brief history of ECommerce, Inter Organizational E-Commerce Intra Organizational E-Commerce, and Consumer to Business Electronic Commerce, Architectural framework, Network Infrastructure for E-Commerce Network Infrastructure for ECommerce, Market forces behind I Way, Component of I way Access Equipment, Global Information Distribution
II	MOBILE COMMERCE	Introduction to Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology, Mobile Information Devices, Web Security, Introduction to Web security, Firewalls & Transaction Security, Client Server Network, Emerging Client Server Security Threats, firewalls & Network Security.
III	ENCRYPTION	World Wide Web & Security, Encryption, Transaction security, Secret Key Encryption, Public Key Encryption, Virtual Private Network (VPM), Implementation Management Issues.
IV	ELECTRONIC PAYMENTS	Overview of Electronics payments, Digital Token based Electronics payment System, Smart Cards, Credit Card I Debit Card based EPS, Emerging financial Instruments, Home Banking, Online Banking.
V	NET COMMERCE	EDA, EDI Application in Business, Legal requirement in E-Commerce, Introduction to supply Chain Management, CRM, issues in Customer Relationship Management.

BEE706.3 OPTIMISATION TECHNIQUES

Teaching Hrs.
L-3, T-1, P-0

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topic	Details of Coverage
I	INTRODUCTION	Introduction, classification of optimization problem classical optimization techniques: single variable and multivariable optimization with and without constraints, Lagranges and Kaun Tuckers method.
II	LINEAR PROGRAMMING PROBLEM	Definition of linear programming problem, graphical method, simplex method, two phase method, big-M method, pivotal method, duality, primal-dual problem, solution of dual from the final simplex table of primal.
III	PROJECT SCHEDULING	Project scheduling by PERT and CPM, network analysis, sequencing theory: general sequencing problem, n-jobs through 2 machines, 3 machines and n-machines, 2 jobs on machines.
IV	TRANSPORTATION PROBLEM	Definition, inihial feasible solution, north west corner rule, lowest cost entry method, vogels approximation method, optimality test, unbalanced transportation problem, degeneracy in transportation problem, the dual simplex.
V	NON LINEAR PROGRAMMING	Unimodal function, unrestricted search method with fixed and accelerated step size, exhaustive search method, Dichotomous search method, direct search methods, Hooke Jeeves method, Powells method.

BEE707 COMPUTER BASED POWER SYSTEM AND PCB DESIGN LAB

Teaching Hrs.
L-0, T-0, P-2
(50)}

Exam Hrs. : 3 Hrs.
Exam Marks:125 {Internal (75) & University

CONTENTS OF SYLLABUS

S. No.	List of Experiments:
1	Methods of short term, medium term and long term load forecasting
2	Planning and designing of distribution system.
3	Planning and designing of transmission system
4	Sending end and receiving end power circle diagrams.
5	Real and reactive power control of generator using power circle diagram.
6	Use of electronics work bench for power system analysis.
7	Application of fuzzy logic for power system analysis
8	Study the design rules for PCBs in power electronics applications
9	Design a PCB for firing circuit of single-phase bridge converter using available computer software.
10	Based on designed PCB prepare the PCB.

BEE708 INDUSTRIAL ECONOMICS & MANAGEMENT LAB

Teaching Hrs.
L-0, T-0, P-2

Exam Hrs. : 3 Hrs.
Exam Marks:125 {Internal (75) & University (50)}

CONTENTS OF SYLLABUS

S. No. List of Experiments:

- 1 **Money Banking and Trade:** Functions of money, supply & demand for money, money price level & inflation, black money, meaning, magnitude & consequences. Functions of Commercial banks, banking system in India, shortcomings and improvements.. Function of RBI, monetary policy-making, objectives and features. Sources of public revenue, principles of taxation, direct and indirect taxes, Theory of international trade, balance of trade and payment, Foreign exchange control, devaluation New economic policy: Liberalization, extending privatization, globalization.
- 2 **Management Principles:** Management functions, responsibilities of management to society, development of management thought. Nature of planning, decision making, management by objectives, Line and staff authority relationships, decentralization and delegation of authority, span of management,
- 3 **Production Management:** Production planning and control, inventory control, quality control and Total quality management. Tools of project management - CPM, PERT, project information systems. Marketing functions, management of sales and advertising marketing research.
- 4 **Human Resource Management:** Function, application of industrial psychology for selection, training and recruitment. Communication process, media channels and barriers to effective communication, theories of motivation, leadership.
- 5 **Finance and Account Management: Engineering Economics:** Investment decision, present worth, annual worth and rate of return methods. Payback time. Need for good cost accounting system, cost control techniques of financial control, financial statements, financial ratios, break-even analysis, budgeting and budgetary control.

BEE801 EHV AC DC TRANSMISSION

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	EHV AC Transmission	Bulk power transmission over long distance & need for EHV transmission problems of EHV transmission. Power Handling capacity and surge impedance loading. Choice of economic voltage, standard transmission voltages. Bundled Conductors: Properties of bundled conductors, geometric mean radius of bundle, inductance and capacitance. Electrostatic fields of EHV lines. Effect of E.S. field on Humans, Animals and Plants. Corona effects: Corona loss, audio and radio noise.
II	Load Frequency Control	Introduction to control of active and reactive power flow. Turbine speed governing system. Speed governing characteristic of generating unit and parallel operation of generations. Method of load frequency control. Flat frequency, flat tie line and tie line load bias control. Automatic generation control (description of block diagram only)
III	Series and Shunt compensation	Effect of series capacitors and location of series capacitors. No load receiving end voltage and reactive power generation. Sub-synchronous resonance in series-capacitor compensated lines and counter measures. Shunt compensation - Variation of no load receiving end voltage. Static VAR Systems: TCR-FC, TCR, TSC-TCR and MSC-TCR Schemes.
IV	HVDC Transmission-I	Rectification: The 3-phase Bridge rectifier or Graetz circuit, Inversion. Kinds of D.C links, Paralleled and Series connection of thyristors, Converter control characteristics, firing angle control and extinction angle control. Parallel operation of D.C. link with A.C. transmission line. Power flow in HVDC transmission system.
V	HVDC Transmission-II	Converter Station: Major components of a converter station-converter unit, filters, reactive power source. Ground return and ground electrode. Advantages and disadvantages of HVDC transmission. Introduction to multi-terminal HVDC systems. Comparison between AC and DC transmissions. Break even distance for overhead transmission lines and underground cables. Application of HVDC transmission.

BEE802 ELECTRICAL MACHINE DESIGN

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	General	Factors and limitations in design. Output coefficients, classification of magnetic materials and allowable flux densities. Calculation of magnetic circuits, magnetizing current, coils for given temperatures. Real and apparent flux densities. Tapered teeth. Carter's coefficient, leakage fluxes reactance's. Classifications of insulation materials and the temperature ranges.
II	Armature Winding	General features of armature windings, single layer, double layer and commutator windings, integral and fractional slot windings, winding factors. Harmonics, eddy current losses in conductors.
III	Heating Cooling and Ventilation	Heat dissipation, heat flow, heating cooling curves. Heating cooling cycles, estimation of maximum temperature rise, cooling media. Quantity of cooling media. Types of enclosures. Ratings, heat dissipation. Methods of ventilation.
IV	Design of Transformers:	Application of above design principles for the design of Power and Distribution Transformers, core and yoke cross sections, square and stepped core, output equations, main dimensions, types &, design of windings, optimization concepts.
V	Design of Synchronous Machines:	(i) Turbo and Hydro alternators, choice of specific magnetic & electric loading, short circuit ratio and its effects, air gap length, output equation, main dimensions, flow charts for design of synchronous machine, design of statorcore & winding. (ii) Design of Induction Machines: Output equation, main dimensions, design criteria, flow charts for design of induction motor, air gap length, design of stator core and winding, rotor design.

BEE803 ELECTRICAL DRIVES & CONTROLS

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	Dynamics of Electric Drives	Introduction : electric drives importants & selection Fundamental torque equations, speed-torque conventions and multiquardant operation, equivalent values of drive parameters, nature and classification of load torques, steady state stability, load equalization, close loop configurations of drives.
II	DC Drives	Speed torque curves, torque and power limitation in armature voltage and field control, Starting, Braking-Regenerative Braking, dynamic braking and plugging. Speed Control-Controlled Rectifier fed DC drives, Chopper Controlled DC drives.
III	Induction Motor Drives-I	Starting, Braking-Regenerative braking, plugging and dynamic braking. Speed Control-Stator voltage control, variable frequency control from voltage source, Voltage Source Inverter (VSI) Control.
IV	Induction Motor Drives-II	Variable frequency control from current source, Current Source Inverter (CSI) Control, Cyclo-converter Control, Static rotor resistance control, Slip Power Recovery- Static Scherbius drive, Static Kramer drive.
V	Synchronous Motor Drive	Control of Synchronous Motor-Separately Controlled and VSI fed Self-Controlled Synchronous Motor Drives. Dynamic and Regenerative Braking of Synchronous Motor with VSI. Control of Synchronous Motor Using Current Source Inverter(CSI)

BEE804.1 PRINCIPLES OF NUCLEAR ENGINEERING

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION	Role and importance of nuclear energy; Nuclear cross-sections. Reaction rates; Nuclear fission and chain reaction; Criticality conditions; Conversion and breeding
II	REACTOR COMPONENTS	Reactor components and their characteristics; Classification and design features of research, production, and thermal nuclear reactors, Introduction to fast and fusion reactor systems.
III	LAYOUT OF NUCLEAR POWER PLANTS	Containment buildings; Primary containment vessels; Structure of reactor core; and mechanical stress in various structures. Description and analysis of power plant systems and components including steam generator, steam dryer and separator, pressurizer, reheater, heat exchanger, condenser, demineralizer, pumps ,turbine, generator, cooling tower; Auxiliary cooling systems. Fuel handling mechanisms; Instrumentation Control and mechanisms; Radwaste systems; Electrical Systems; Reactor grid interface and load following.
IV	BASIC CONSIDERATIONS IN NUCLEAR PLANT DESIGN	Components of nuclear power cost; Economic Comparison of nuclear and fossil fueled plants; Dual and multipurpose nuclear plants; Future trends in nuclear power cost.

BEE804.2 NETWORK OPERATING SYSTEM

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION	Introduction to Operating Systems, Operating system services, multiprogramming, time-sharing system, storage structures, system calls, multiprocessor system. Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling I/O devices organization, I/O devices organization, I/O devices organization, I/O buffering
II	PROCESS SCHEDULING	Process concept, process scheduling, operations on processes, threads, inter-process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization. Deadlock problem, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Methods for deadlock handling
III	CONCEPT OF MEMORY MANAGEMENT	Concepts of memory management, logical and physical address space, swapping, contiguous and non-contiguous allocation, paging, segmentation, and paging combined with segmentation.
IV	CONCEPT OF VIRTUAL MEMORY	Concepts of virtual memory, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation. Security threads protection intruders-Viruses-trusted system
V	DISC SCHEDULING	Disk scheduling, file concepts, file access methods, allocation methods, directory systems, file protection, introduction to distributed systems and parallel processing case study

BEE 804.3 STATIC PROTECTIVE RELAYS

Teaching Hrs.
L-3, T-1, P-0

Exam. Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (20) & University (80)}

CONTENTS OF SYLLABUS

Units	Topics	Details of Coverage
I	INTRODUCTION	Basic for static relay development, classification of static relays, microprocessor based relays, Digital protection, advantages of digital protection. Basic protection scheme using microcomputer.
II	STATIC RELAY COMPONENTS	Semi conductor devices, static switching, logic circuits and relay logic. Integrated circuits, transducers and interface devices, replica impedances, time delay devices, sequence filters, voltage regulators.
III	STATIC COMPARATORS :	Single input multi-input comparators. Amplitude comparator-integrating, instantaneous and sampling techniques ;phase comparators-vector product & coincidence techniques. Direct phase comparison, phase splitting technique, integrating phase comparison. Duality of amplitude and phase comparison.
IV	STATIC RELAYS	Over current relays, directional over current relays using Hall crystal, rectifier bridge, instantaneous since comparator. Distance relay, impedance Reactance admittance, offset mho, trapezoidal and elliptical characteristics. Differential relays.
V	SCHEMES OF PROTECTION	Static switching scheme of distance relays. Poly-phase distance relays. Static differential protection for generators, transformer and Bus zone. static protection for motors, single-phase preventer.

BEE805 ADVANCED POWER ELECTRONICS LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

List of Experiments:

S. No.	
1	Study the modern power semiconductor devices and compare them.
2	Study the SCR regulated power supply.
3	Study the lamp flasher.
4	Study the SCR ring counter.
5	Study the SCR dc circuit breaker.
6	Study the zero volt switching.
7	Study the thyristor alarms.
8	Control the speed of dc motor using single-phase bridge converter.
9	Control the speed of dc motor using three-phase bridge converter.
10	Control the speed of dc motor using chopper.
11	Control the speed of ac motor using inverter.
12	Control the speed of ac motor using ac controller.

BEE806 COMPUTER BASED ELECTRICAL MACHINE DESIGN LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

S. No. List of Experiments:

1	GENERAL : Calculation of magnetic circuits-Determine of magnetizing current for transformer & 3-phase Induction motors, Determine of mmf required for air gap of rotating electrical machines.
2	ARMATURE WINDINGS : Design of armature windings of AC rotating machines, Integral & fractional slot windings.
3	HEATING & COOLING : Estimation of maximum temperature rises in electrical machines during their operation.
4	Design of distribution & power transformer.
5	Design of synchronous alternators.
6	Design of 3-phase induction motor.

BEE807 ELETRIC DRIVES & CONTROL LAB

Teaching Hrs.
L-0, T-0, P-2
(40)}

Exam Hrs. : 3 Hrs.
Exam Marks: 100 {Internal (60) & University

CONTENTS OF SYLLABUS

List of Experiments:

S. No.

- 1 Study and test the firing circuit of three phase half controlled bridge converter.
- 2 Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL loads.
- 3 Study and test the firing circuit of 3-phase full controlled bridge converter.
- 4 Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads.
- 5 Study and test 3-phase AC voltage regulator.
- 6 Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic.
- 7 Control speed of dc motor using 3-phase full controlled bridge converter. Plot armature voltage versus speed characteristic.
- 8 Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator.
- 9 Control speed of universal motor using AC voltage regulator.
- 10 Study 3-phase dual converter.
- 11 Study speed control of dc motor using 3-phase dual converter.
- 12 Study three-phase cycloconverter and speed control of synchronous motor using cycloconverter.
- 13 Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter.