UNIVERSITY OF MUMBAI
Syllabus Structure (R-2007)
at
S.E.(ELECTRICAL ENGINEERING)

Semester III

Sr.No	Subjects	Scheme of Instructions, Periods per week (60 min)			Scheme of Evaluation					
		Lectures	Practicals	Tutorials	Paper		Term work	Practical and oral	Oral	Total
					Hours	Marks				
1	Engineering Mathematics III*	5	**	**	3	100	**	**	**	100
2	Power Plant Engineering	3	**	1	3	100	25	**	**	125
3	Basic Electronics	3	2	**	3	100	25	50	**	175
4	Electrical Network	3	2	**	3	100	25	**	25	150
5	Electrical Measurements & Measuring Instruments	3	2	**	3	100	25	**	**	125
6	Numerical Techniques	3	**	1	3	100	25	**	**	125
7	Presentation & Communication Techniques	2	2	**	**	**	50	**	**	50
	Total	22	8	2		600	175	50	25	850

* Subject is common to Instrumentation, Electrical Engineering and Bio medical Engineering

University of Mumbai

Class: S.E.	Branch: Electrical Engineering	Semester: III

Subject: Numerical Techniques

Periods per Week (Each 60 min)	Lecture	3	
	Practical	---	
	Tutorial	1	

		Hours	Marks
Evaluation System	Theory	3	100
	Practical and Oral	---	---
	Oral	---	---
	Term Work	---	25
	Total	3	125

Module	Contents	Hours
1	**Errors in numerical computation:** Error types, analysis and estimation, error propagation.	02
2	**Roots of equations:** The bisection method, the false position method, the Newton-Raphson method, The Secant method.	05
3	**System of Linear Algebraic equations:** Gauss-Elimination method, Gauss-Jordan method. LU decomposition and matrix inversion. Gauss-Seidal method.	05
4	**Curve fitting:** Interpolation- Newton's divided difference, Lagrange Interpolating polynomials, approximation- least square approximation techniques, linear regression and polynomial regression.	06
5	**Numerical differentiation:** Methods based on interpolation and finite differences.	05
6	**Solution to ordinary differential equation:** Picard's method, Euler's method, Modified Euler's method, Predictor-corrector method, Adams-Bashforth method.	05
7	**Optimization:** One-dimensional unconstrained- Golden-section search, quadratic interpolation, Newton's method, linear programming –graphical solution, simplex method.	06
8	**Numerical Integration:** Simpson's 1/3rd rule, Simpson's 3/8th rule	02

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Q.1 will be compulsory and based on the entire syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus

Term work:

Term work consists of minimum eight computer programs and a written test. The distribution of the term work shall be as follows,

Laboratory work (Programs and Journal)	:10 marks
Test (at least one)	:10 marks
Attendance (Practical and Theory)	:05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Books Recommended:

Text books:

1. Chappa Seven C , Canale R P ,*Numerical Methods for Engineers*, Tata McGraw Hill.
2. *Numerical Methods for Engineers*, (using MATLAB and C), Thomson Asia Pvt. Ltd.

University of Mumbai		
Class: S.E.	**Branch:** Electrical Engineering	**Semester:** III
Subject: : Presentation and Communication Techniques		

Periods per Week (each 60 min)	Lecture	02	
	Practical	02	
	Tutorial	--	

Evaluation System		Hours	Marks
	Theory	---	---
	Practical and Oral	--	--
	Oral	---	--
	Term Work	---	50
	Total	--	50

	Contents	Hours
1.	**Communication in a business organization:** Internal and external communication, Types of meetings, strategies for conducting successful business meetings, documentation (notice, agenda, minutes, resolution) of meetings. Introduction to modern communication techniques. (e-mail, internet, video-conferencing, etc.) Legal and ethical issues in communication (Intellectual property rights: patents, TRIPS, Geographical indications).	05
2	**Advanced technical writing**: Report writing: Definition and importance of reports, qualities of reports, language and style in reports, types of reports, formats (letter, memo, project-repots). Methods of compiling data for preparing report. A computer-aided presentation of a technical project report based on survey-based or reference based topic. The topics are to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages. Technical paper-writing, Writing business proposals.	07
3	**Interpersonal skills:** Introduction to emotional intelligence, motivation, Negotiation and conflict resolution, Assertiveness, team-building, decision-making, time-management, persuasion	03

4	**Presentation skills:** Elements of an effective presentation, Structure of a presentation, Presentation tools, Audience analysis, Language: Articulation, Good pronunciation, Voice quality, Modulation, Accent and Intonation.	03
5	**Career skills:** Preparing resumes and cover letters. Types of Resumes, Interview techniques: Preparing for job interviews, facing an interview, verbal and non-verbal communication during interviews, observation sessions and role-play techniques to be used to demonstrate interview strategies (mock interviews).	03
6	**Group discussion:** Group discussions as part of selection process. Structure of a group discussion, Dynamics of group behavior, techniques for effective participation, Team work and use of body language.	03

Term work:
Part-I (25 Marks): Assignments;
Two assignments on communication topics
Three assignments on report-writing
Three assignments on interpersonal skills
Two assignments on career skills
At least one class test (written)
Distribution of term work marks will be as follows:
Assignments   : 10 marks
Written test   : 10 marks
Attendance (Theory and Practical)   : 05 marks

Term work:
Part-II (25 Marks): Presentation;
Distribution of term work marks will be as follows:
Project report presentation   : 15 marks
Group discussion   : 10 marks
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Books recommended:
Text books:
1. Fred Luthans: Organizational behavior, McGraw Hill
2. Lesikar and Petit, Report writing for business, Tata McGraw Hill
3. Huckin & Olsen, Technical writing and professional communcation, McGraw Hill

Reference Books:

1. Wallace & Masters, Personal development for Life & work, Thomson Lerning.
2. Heta Murphy, Effective Business Communication, McGraw Hill
3. Raman and Sharma, Report writing.

University of Mumbai		
Class: S.E.	**Branch:** Electrical Engineering	**Semester:** III

Subject: Electrical Network			
Periods per Week (each 60 min)	Lecture	3	
	Practical	---	
	Tutorial	2	
		Hours	Marks
Evaluation System	Theory	3	100
	Practical and Oral	---	---
	Oral	---	25
	Term Work	---	25
	Total	3	150

Module	Contents	Hours
1	**Network Theorems** Solution of network using dependent sources, mesh analysis, super mesh analysis, nodal analysis, super node analysis, superposition theorem, Thevenin's theorems and Norton's theorem, maximum power transfer theorem. Solution of network with A.C. sources: mesh analysis, nodal analysis, superposition theorem, Thevenin's theorems and Norton's theorem, maximum power transfer theorem, Tellegen's theorem, Millman's theorem, reciprocity theorem, magnetic coupling	07
2	**Graph theory and network topology** Introduction ,graph of network, tree, co-tree, loop incidence matrix, cut set matrix, tie set matrix and loop current, number of possible tree of a graph, analysis of network Network equilibrium equation, duality, general network transformation	04
3	**First Order differential equations** General and partial solutions, time constant, integrating factor more complicated network, initial conditions in elements geometrical interpretation of derivative, procedure for evaluating initial condition, initial condition of networks	05
4	**The Laplace Transform** The Laplace transform and its application to network analysis, transient and steady state response to step, ramp, impulse and sinusoidal input function, transform of other signal waveform, shifted step, ramp and impulse function, waveform synthesis	05
6	**Network Functions; Poles and Zeros** Terminal pairs or ports, network functions for one port and two	05

		ports, the calculation of Network functions, ladder network General network, poles and zeros of network functions, restrictions on Pole and zero locations for driving point functions, restrictions on Pole and zero locations for Transfer functions, time domain behavior from pole and zero plot	
7	**Two port parameters** Relationship of two port variables, short circuit admittance parameters, open circuit admittance parameters, transmission parameters, the hybrid Parameters, relationships between parameter sets, parallel connection of two port networks		05
8	**Network Synthesis** Properties of positive real function, testing of positive real functions, driving point synthesis of LC, RC, RL network.		05

Theory Examination:

Question paper will comprise of total 7 questions, each of 20 marks.
1. Only 5 questions need to be solved.
2. Q.1 will be compulsory and based on the entire syllabus.
3. Remaining questions will be mixed in nature.
4. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus
5. No question should be asked from the pre-requisite module

Oral Examination:
Oral examination will be based on entire subject.

Term work:
Term work consists of minimum eight experiment /computer simulations and a written test. The distribution of the term work shall be as follows,

Laboratory work (Experiments and Journal)   :10 marks
Test (at least one)   :10 marks
Attendance (Practical and Theory)   :05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Books Recommended:

Text books:
1. M.E. Van Valkenburg, *Network Analysis*, Printce Hall India Private Limited,third Edission.
2. Choudhary D. Roy, *Networks and Systems*, New Age International Publisher

Reference books:
1. Hayt W.H Jr. and Kammerly J.E., *Engineering Circuit Analysis*, T.M.H. Publication, 5th edition

University of Mumbai		
Class: S.E.	**Branch:** Electrical Engineering	**Semester:** III
Subject: Electrical Measurements and Measuring Instruments		

Periods per Week (Each 60 min)	Lecture	3	
	Practical	2	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical and Oral	--	--
	Oral		
	Term Work	--	25
	Total	3	125

Module	Contents	Hours
1	**Units & standards:** Errors in measurements, system of units, Dimensions of electrical qualities in CGS & SI units.	03
2	**Galvanometers:** D.C. permanent magnet moving coil type, ballistic galvanometer, flux meter, A.C. Vibration Galvanometer. (only the basic working principle)	04
3	**Potentiometers:** Principle of D.C. potentiometer (only Crompton's type) & its applications.	04
4	**A.C. bridge methods:** A.C. bridge circuits for measurements of self inductance, capacitance, Q factor & frequency.(only the basic type)	05
5	**Magnetic properties of materials:** The magnetic dipole moment of current loop, diamagnetism, the origin of permanent magnetic dipoles in matter, paramagnetism, ferromagnetism.	04
6	**Magnetic measurements:** Hysterisis loop & B-H curve determination (using step by step method), A.C. power loss in sheet steel by wattmeter method (Epstein square and Llyod- Fisher square).	05
7	**Measuring instruments:** General features of indicating, recording & integrating type of instruments, principles of moving iron, moving coil, rectifier, thermocouple type ammeter & voltmeter, electrostatic voltmeter, extension of ranges for moving coil ammeters & voltmeters, theory of dynamometer type wattmeter, principle of induction type energy meters, errors, testing & adjustments, principles of power factor meter, (dynamometer type only) frequency meters (reed type & moving coil type) &	07

	synchroscope (Weston type only).	
8	**Instrument transformers:** Theory of current & potential transformers- definition, importance & applications only, definition of Ratio & Phase Angle errors (no derivations).	4

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Q.1 will be compulsory and based on the entire syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus

Term work:

Term work consists of minimum eight experiments and a written test. The distribution of the term work shall be as follows,

Laboratory work (Experiments and Journal)　　　　　:10 marks
Test (at least one)　　　　　:10 marks
Attendance (Practical and Theory)　　　　　:05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of Laboratory Experiments:

1. Demonstration of working parts of types of meter by opening the devices & showing it to students
2. Measurement of low, medium & high resistances
3. Extension of Ranges of Ammeters & Voltmeters

Study of D.C. potentiometer & its applications for
4. Calibration of Voltmeter
5. Measurement of resistance
6. Calibration of Ammeter
7. Calibration of Wattmeter

Measurements using A.C. Bridges
8. Maxwell's Bridge
9. Hay's Bridge
10. Andersons Bridge

Books Recommended:

Text books:

1. Sawhney A. K. – *A course in Electrical & Electronic Measurements & Instrumentation* by Dhanpat Rai & Sons 1993
2. Golding E.W. –*Electrical Measurements & Measuring Instruments* by Wheeler Publishing, 5th edition 1994

Reference Books:

3. Delvicar A-J. :- Electrical Engg. Materials by PHI, 12th Reprint 1987

University of Mumbai		
Class: S.E.	**Branch:** Electrical Engineering	**Semester:** III
Subject: Basic Electronics		

Periods per Week (Each 60 min)	Lecture	3	
	Practical	2	
	Tutorial	---	
Evaluation System		Hours	Marks
	Theory	3	100
	Practical and Oral	2	50
	Oral	---	---
	Term Work	---	25
	Total	5	175

Module	Contents	Hours
1	**Types of Diodes & Application:** **Types of diodes:** Zener, Varactor, Schottkey and PIN diodes. **Rectifier and Filter Analysis:** specification of the devices and components required for C, L, LC, CLC & RC filter. **Clippers and clampers:** Single and double ended clipping circuits, clamping circuits, voltage doubler circuit	06
2	**Bipolar Junction Transistor:** **Biasing Circuits:** Types, dc circuit analysis, load line, thermal runaway, stability factor analysis, thermal stabilization and compensation. **Modeling:** Small signal analysis of all configurations with different biasing network using h-parameter model. Introduction to r_e-model and hybrid-pi model. **Amplification.** Derivation of expression for voltage gain, current gain, input impedance and output impedance of CC, CB, CE amplifiers.	07
3	**Field Effect Transistor:** **JFET and MOSFET:** Types, construction and their characteristics, Biasing circuits for FET amplifiers, FET small signal analysis, derivation of expressions for voltage gain and output impedance of CS and CD amplifiers.	07
4	**Low and High Frequency Analysis of BJT and JFET amplifier circuits.**	04
5	**Feedback Amplifiers** (Negative Feedback): Introduction to positive and negative feedback, negative feedback -current, voltage, Series and Shunt type. It's effect on input impedance,	04

	output impedance, voltage gain, current gain and bandwidth	
6	**DC and AC analysis of differential amplifier**, single and dual inputs and balanced and unbalanced outputs using BJT. FET differential amplifier	04
7	**Optoelectronic devices**: Photoconductive , photo emissive and photovoltaic devices, principle, construction and applications, LED, photodiode, phototransistor , solar cell, optoisolators	04

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Q.1 will be compulsory and based on the entire syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus

Practical and Oral Examination:

Practical examination will be based on one experiment performed from the list of experiments given in the syllabus and the oral will be based on entire subject.

Term work:

Term work consists of minimum eight experiments and a written test. The distribution of the term work shall be as follows,

Laboratory work (Experiments and Journal)   :10 marks
Test (at least one)   :10 marks
Attendance (Practical and Theory)   :05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of Laboratory Experiments:

1. Study of VI characteristics of standard PN junction diode, zener diode, schottkey diode.
2. Rectifier- Filter performance analysis
3. Study of various clipping and clamping circuits
4. BJT biasing network stability analysis
5. Frequency response of BJT CE amplifier
6. Study of JFET characteristics and calculation of coefficients
7. Study of MOSFET characteristics and calculation of coefficients
8. Frequency response of JFET CS amplifier
9. Study of negative feedback on amplifier performance
10. Study of photo devices applications
11. Study of differential BJT amplifier

Books Recommended:

Text Books:
1. Robert Boylestad and Louis Nashelsky, *Electronic Devices and Circuits*, Prentice-Hall of India.
   2. Millman and Halkias, '*Electronic Devices and Circuits*', Tata McGraw-Hill.

Reference Books:
1. Thomas Floyd, '*Electronic Devices*' , Prentice-Hall of India
2. Ramakant A. Gayakwad, *OP – AMPs and Linear IC's*,
3. Newman D.A., *Electronic Circuit Analysis and Design*, 2nd edition, McGraw Hill International.
4. David Bell, *Electronic Devices and Circuits*,5e Oxford University Press

University of Mumbai		
Class: S.E.	**Branch:** Electrical Engineering	**Semester:** III
Subject: Engineering Mathematics-III		

Periods per Week (Each 60 min)	Lecture	04	
	Practical	---	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	05	100
	Practical & Oral	---	---
	Oral	---	---
	Term Work	---	---
	Total	04	100

Module	Contents	Hours
1	**Laplace Transform** Functions of bounded variations Laplace Transforms of 1, t^n, e^{at}, sin at, cos at, sinh at, cosh at, erf(t) Linear property of L.T .First shifting theorem Second shifting theorem $L\{t^n f(t)\}$, $L\{f(t)/t\}$, $L\{\int f(u)du\}$, $L\{d^n/dt^n f(t)\}$.Change of scale property of L.T. Unit step function , Heavyside, Dirac delta functions, Periodic functions and their Laplace Transforms. **a) Inverse Laplace Transforms** Evaluation of inverse L.T., partial fractions method, convolution theorem. **b) Applications** to solve initial and boundary value problems involving ordinary diff. Equation with one dependant variable.	21
2	**Complex Variables** Functions of complex variables, continuity and derivability of a function, analytic functions, necessary condition for f(z) to be analytic, sufficient condition (without proof), Cauchy – Riemann conditions in polar forms. Analytical and Milne – Thomson method to find analytic functions f(z) = u + iv where (i) u is given (ii) v is given (iii) u+v (iv) u-v is given. Harmonic functions and orthogonal trajectories. **a) Mapping** Conformal mapping, Bilinear mapping, fixed points and standard transformation, inversion, reflection, rotation and magnification. **b)Line Integral** of function of complex variable, Cauchy's theorem for analytical function (with proof), Cauchy's Goursat theorem (without proof), properties of line integral, Cauchy's	21

	Integral formula and deduction. **c) Singularities and poles**: Taylor's and Laurent's development (without proof), residue at isolated singularity and it's evaluation. **d) Residue theorem** application to evaluate real integrals of type $$\int_{0}^{2\pi} f(\cos\theta, \sin\theta)d\theta \ and \int_{-\infty}^{+\infty} f(x)dx$$	
3	**Fourier series** Orthogonality & orthogonal functions, Expression for the function in a series of orthogonal functions, Dirichlet's conditions, Fourier series of periodic functions with period 2pi or 2*l*. (Derivation of Fourier coefficients a0, an, bn is not expected) Dirichlet's theorem Even & Odd functions. Half range sine & cosine expressions Parsaval's identities (without proof) **a) Complex form of Fourier Series**: Fourier transform & Fourier integral in detail	18

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Q.1 will be compulsory and based on the entire syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Books Recommended:

Text books:
1. Wartikar P.N. / Wartikar J. N., *Textbook of Applied Mathematics*, Pune Vidyarthi Griha Prakashan, 1981.
2. Churchil, *Coplex variables*, Mc Graw Hill.

Reference Books:
1. Shantinarayan, *Theory of function Complex Variable*, S. Chand & co.
2. Shastri S.S., *Engineering Mathematics*, Prentice Hall.

University of Mumbai		
Class: S.E.	**Branch:** Electrical Engineering	**Semester:** III
Subject: Power Plant Engineering		

Periods per Week (each 60 min)	Lecture	3	
	Practical	---	
	Tutorial	1	

		Hours	Marks
Evaluation System	Theory	3	100
	Practical and Oral	---	---
	Oral	---	---
	Term Work	---	25
	Total	3	125

Module	Contents	Hours
1	**Introduction** Conventional and non conventional sources of energy Structure of power industry	02
2	**Economics of the power plant** Load curve, load duration curve, various factors and effects of fluctuating load on operation and design of plant, methods of meeting fluctuating load. selection of generating equipment , load shearing cost of electrical energy , tariff methods, performance and operating of power plants.	05
3	**Thermal power plant** Fuels and their handling, combustion process- fluidized bed combustion, typical layout of power plant , components, working efficiency of thermal power plant, selection criteria	04
4	**Hydro power plant** Rainfall, run off and its measurement , hydrograph, flow duration curve mass curve reservoir storage capacity, classification of plants-run off river plant , storage river plant , pumped storage plant	05
5	**Nuclear power plant** Introduction of nuclear engineering –radioactive decay , half life fission, fusion, nuclear material , thermal fission reactor and power plant – PWR BWR , liquid metal fast breeder reactors , reactor control	05
6	**Diesel and gas turbine power plant** General layout, application of diesel power plant , advantages and disadvantages component, performance of gas turbine power plant , gas turbine material .	05
7	**Environmental impact of power plant**	05

	Social and economical issue of power plant, green house effect, Acid precipitation – acid rain and acid snow , dry deposition and acid fog thermal pollution, air pollution , radiation from nuclear power plant effluents		
8	**Renewable energy sources** **Solar energy**: most common type of plant solar energy & the environment, solar active & passive collector, solar thermal power plant, parabolic trough solar dish & solar power tower. **Wind energy**: – basic, advantages, component of wind electric generator, wind farms, comparison with other energy, limitation efficiency, geothermal energy, tidal energy	05	

Theory Examination:

Question paper will comprise of total 7 questions, each of 20 marks.

1. Only 5 questions need to be solved.
2. Q.1 will be compulsory and based on the entire syllabus.
3. Remaining questions will be mixed in nature.
4. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus
5. No question should be asked from the pre-requisite module

Term work:

Term work consists of minimum eight assignments and a written test. A power plant visit should be arranged and report of the same must be submitted as a part of term work .The distribution of the term work shall be as follows,

Laboratory work (Experiments and Journal)   :10 marks
Test (at least one)   :10 marks
Attendance (Practical and Theory)   :05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Books Recommended:

Text books:

1. M.V. Deshpande , *Elements of power station design* , Tata Mc Graw Hill
2. D.H.Bacon, *Engineering Thermodynamics*, London butterworth
3. P. K. Nag, *Power plant Engineering* - stream & nuclear, Tata Mc Graw Hill

Reference books:

1. Fredrick T. Morse. *Power plant Engineering* , east west press private Ltd
2. Mahesh Varma : *Power plant Engineering* , Metrolitan book Co Pvt Ltd
3. George W. Sutten (Editor) : *Direct Energy Conversion* , Latur university, Electronics series Vol-3, Mc Graw hill