UNIVERSITY OF MUMBAI

Bachelor of Engineering

Electrical Engineering

(Second Year – Sem. III & IV), Revised course

(REV- 2012) from Academic Year 2013 -14,

Under

FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

Syllabus Scheme for Second Year Electrical Engineering
(Semester III & IV)
Revised course (Rev 2012) from Academic Year 2012 -13
(Electrical Engineering)

Scheme for Semester III

Sub Code	Subject Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
EEC301	Applied Mathematics – III*	4	--	1	4	--	1	5
EEC302	Electronic Devices and Circuits	4	2	--	4	1	--	5
EEC303	Conventional and Non-conventional Power Generation	4	1	--	4	1	--	5
EEC304	Electrical Networks	4	2	--	4	1	--	5
EEC305	Electrical and Electronic Measurements	4	2	--	4	1	--	5
EEC306	Object Oriented Programming and Methodology*	-	4#	--	--	2	--	2
	Total	20	11	1	20	6	1	27

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical and Oral	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of Test 1 & Test 2					
EEC301	Applied Mathematics – III*	20	20	20	80	25	--	--	125
EEC302	Electronic Devices and Circuits	20	20	20	80	25	25*	--	150
EEC303	Conventional and Non-conventional Power Generation	20	20	20	80	25	--	--	125
EEC304	Electrical Networks	20	20	20	80	25	--	--	125
EEC305	Electrical and Electronic Measurements	20	20	20	80	25	--	--	125
EEC306	Object Oriented Programming and Methodology*	--	--	--	--	25	50*	--	75
Total		--	--	100	400	150	75	--	725

Out of four hours, 2 hours theory shall be taught to entire class followed by 2 hrs. practical in batches.

*Common for Electrical, Bio-medical Engineering, Instrumentation, Electronics and Electronics & Telecommunication branches.

Subject Code	Subject Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract./Tut.	Theory	Pract./Tut.	Total
EEC 301	Applied Mathematics III	04	--	01	04	05

Subject Code	Subject Name	Examination Scheme							
		Theory					Term Work	Pract. / oral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test 1	Test 2	Avg					
EEC 301	Applied Mathematics III	20	20	20	80	03	25	-	125

Subject Code	Subject Name	Credits
EEC301	Applied Mathematics III	05
Course Objectives	• To provide students with a sound foundation in Mathematics and prepare them for graduate studies in Electronics and Telecommunication Engg. • To provide students with mathematics fundamental necessary to formulate, solve and analyze engg. problems. • To provide opportunity for students to work as part of teams on multi disciplinary projects.	
Course Outcomes	• Students will demonstrate basic knowledge of Laplace Transform. Fourier series, Bessel Functions, Vector Algebra and Complex Variable. • Students will demonstrate an ability to identify formulate and solve electronics and telecommunication Engg. Problem using Applied Mathematics. • Students will show the understanding of impact of Engg. Mathematics on Telecom Engg. • Students who can participate and succeed in competitive exams like GATE, GRE.	

Module No.	Unit No.	Topics	Hrs.
1. 0		**Laplace Transform**	12
	1.1	**Laplace Transform (LT) of Standard Functions:** Definition. unilateral and bilateral Laplace Transform, LT of *sin(at), cos(at),* e^{at}, t^{n} , *sinh(at), cosh(at), erf(t),* Heavi-side unit step, dirac-delta function, LT of periodic	

		function	
	1.2	**Properties of Laplace Transform:** Linearity, first shifting theorem, second shifting theorem, multiplication by t^n , division by t , Laplace Transform of derivatives and integrals, change of scale, convolution theorem, initial and final value theorem, Parsavel's identity	
	1.3	**Inverse Laplace Transform:** Partial fraction method, long division method, residue method	
	1.4	**Applications of Laplace Transform:** Solution of ordinary differential equations	
2.0		**Fourier Series**	**10**
	2.1	**Introduction:** Definition, Dirichlet's conditions, Euler's formulae	
	2.2	**Fourier Series of Functions:** Exponential, trigonometric functions, even and odd functions, half range sine and cosine series	
	2.3	Complex form of Fourier series, orthogonal and orthonormal set of functions, Fourier integral representation	
3.0		**Bessel Functions**	**08**
	3.1	**Solution of Bessel Differential Equation:** Series method, recurrence relation, properties of Bessel function of order +1/2 and -1/2	
	3.2	Generating function, orthogonality property	
	3.3	Bessel Fourier series of functions	
4.0		**Vector Algebra**	**12**
	4.1	**Scalar and Vector Product**: Scalar and vector product of three and four vectors and their properties	
	4.2	**Vector Differentiation:** Gradient of scalar point function, divergence and curl of vector point function	
	4.3	**Properties:** Solenoidal and irrotational vector fields, conservative vector field	
	4.4	**Vector Integral:** Line integral, Green's theorem in a plane, Gauss' divergence theorem, Stokes' theorem	
5.0		**Complex Variable**	**10**
	5.1	**Analytic Function:** Necessary and sufficient conditions, Cauchy Reiman equation in polar form	

	5.2	Harmonic function, orthogonal trajectories	
	5.3	**Mapping:** Conformal mapping, bilinear transformations, cross ratio, fixed points, bilinear transformation of straight lines and circles	
		Total	**52**

Text books:

1. P. N. Wartikar and J. N. Wartikar, *"A Text Book of Applied Mathematic",* Vol. I & II, Vidyarthi Griha Prakashan
2. A. Datta, *"Mathematical Methods in Science and Engineering",* 2012
3. B.S. Grewal, *"Higher Engineering Mathematics",* Khanna Publication

Reference Books:

1. B. S. Tyagi, *"Functions of a Complex Variable,"* Kedarnath Ram Nath Publication
2. B. V. Ramana, *"Higher Engineering Mathematics",* Tata Mc-Graw Hill Publication
3. Wylie and Barret, *"Advanced Engineering Mathematics",* Tata Mc-Graw Hill 6th Edition
4. Erwin Kreysizg, *"Advanced Engineering Mathematics",* John Wiley & Sons, Inc
5. Murry R. Spieget, *"Vector Analysis",* Schaum's outline series, Mc-Graw Hill Publication

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered for final Internal Assessment.

End Semester Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.

2. The students need to solve total 4 questions.

3. Question No.1 will be compulsory and based on entire syllabus.

4. Remaining question (Q.2 to Q.6) will be selected from all the modules.

Term Work/ Tutorial:

At least 08 assignments covering entire syllabus must be given during the '**class wise tutorial'**. The assignments should be students' centric and an attempt should be made to make assignments more meaningful, interesting and innovative.

Term work assessment must be based on the overall performance of the student with every assignment graded from time to time. The grades will be converted to marks as per '**credit and grading system'** manual and should be added and averaged. Based on above scheme grading and term work assessment should be done.

Subject Code	Subject Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract./Tut.	Theory	Pract./Tut.	Total
EEC302	Electronic Devices and Circuits (abbreviated as EDC)	4	2	4	1	5

Subject Code	Subject Name	Examination Scheme							
		Theory					Term Work	Pract. / oral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test 1	Test 2	Avg					
EEC302	Electronic Devices and Circuits	20	20	20	80	03	25	25*	150

Subject Code	Subject Name	Credits
EEC302	Electronic Devices and Circuits (abbreviated as EDC)	05
Course Objectives	• To teach the basic concept of various electronic devices, circuits and their application • To develop ability among students for problem formulation, system design and solving skills	
Course Outcomes	• Students will be able to build, develop, model, and analyze the electronic circuits along with learning the device ratings and characteristics • Students will be able to design electrical and electronic circuits	

Module	Contents	Hours
1	**Diode:** Construction Principle of operation and application of special diode – 1) Zener, 2) LED, 3) Schottky, 4) Photodoide. Full Wave Rectifier and Filter Analysis: specification of the devices and components required for C, LC, CLC & RC filter.	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 CE 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, Study of frequency response of BJT amplifier.	12
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 amplifiers. **MOSFET**- Types, construction and their characteristics	08
4	**Feedback Amplifier:** Introduction to positive and negative feedback, negative feedback -current, voltage, Series and Shunt type. It's effect on input impedance, output impedance, voltage gain, current gain and bandwidth **Cascade amplifiers:** Types of coupling, effect of coupling on performance of BJT and JFET amplifiers, cascade connection, Darlington-pair	09
5	**DC and AC analysis of Differential amplifier**, single and dual inputs and balanced and unbalanced outputs using BJT. FET differential amplifier.	05
6	**Oscillators:** Positive feedback oscillators, frequency of oscillation and condition for sustained oscillations of a) RC phase shift, b)Wien bridge, c)Hartley/ Colpitts with derivations, crystal Oscillator, UJT relaxation oscillator	08

Assessment:

Internal Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

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.
3. David Bell, *Electronic Devices and Circuits*, Oxford University Press

Reference Books:

1. Thomas Floyd, '*Electronic Devices'*, Prentice-Hall of India
2. Ramakant A. Gayakwad, *Op-Amps and Linear Integrated Circuits*
3. Neamen D.A., *Electronic Circuit Analysis and Design*, McGraw Hill International.
1. S. Salivahanan, N. Suresh Kumar, "*Electronic Devices and Circuits" TMH*

List of Experiments Recommended:

1. Study of VI characteristics of standard PN junction diode, zener diode, schottkey diode.
2. Rectifier- Filter performance analysis
3. BJT biasing network stability analysis
4. Frequency response of BJT CE amplifier
5. Study of JFET characteristics and calculation of coefficients
6. Study of MOSFET characteristics and calculation of coefficients
7. Frequency response of JFET CS amplifier
8. Study of negative feedback on amplifier performance
9. Study of photo devices applications
10. Study of differential BJT amplifier
11. Study of Darlington pair amplifier
12. Study of a RC phase shift oscillator
13. Study of a Wien Bridge oscillator
14. Study of a Hartley/ Colpitts oscillator
15. Study of UJT Relaxation Oscillator

Term work:

Term work shall consist of minimum eight experiments, assignments (min two)
The distribution of marks for term work shall be as follows:

Laboratory work (Experiments)**:**	**10 marks**
Assignments**:**	**10 marks**
Attendance (Theory and Practical)**:**	**05 marks**

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

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total four questions need to be solved.
3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4: Remaining question will be randomly selected from all the modules.

Subject Code	Subject Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract./Tut.	Theory	Pract./Tut.	Total
EEC303	Conventional and Non-conventional Power Generation (abbreviated as CNPG)	4	1	4	1	5

Subject Code	Subject Name	Examination Scheme							
		Theory					Term Work	Pract. / oral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test 1	Test 2	Avg					
EEC303	Conventional and Non-conventional Power Generation	20	20	20	80	03	25	--	125

Subject Code	Subject Name	Credits
EEC303	**Conventional and Non-conventional Power Generation (abbreviated as CNPG)**	**05**
Course Objectives	• To impart the knowledge of basics of different types of power generation & power plants in detail so that it helps them in industry oriented learning	
Course Outcomes	• Student will be familiar with techniques of power generation, operation and maintenance of power plants • Helps in understanding of impact of power solutions on the society and will be aware of contemporary issues	

Module	Contents	Hours
1	**Conventional and Non- Conventional sources of energy** Present energy scenario world wide and Indian perspective. **Economics of the power plant** Load curve, load duration curve, various factors and effects of fluctuating load on operation and methods of meeting fluctuating load. Selection of generating equipment, load sharing cost of electrical energy, basic tariff methods(numericals)	10

2	**Thermal power plant** Law of Thermodynamics. Analysis of steam cycle-Carnot, Rankine, Reheat cycle and Regenerative cycle. Layout of power plant Lay out of pulverized coal burners, fluidized bed combustion, coal handling systems, ash handling systems. Forced draught and induced draught fans, boiler feed pumps, super heater regenerators, condensers, boilers, de-aerators and cooling towers.	10
3	**Hydro power plant** Rainfall, run off and its measurement hydrograph, flow duration curve, reservoir storage capacity, classification of plants-run off river plant, storage river plant, pumped storage plant, layout of hydroelectric power plant, turbine-pelton, Kaplan, Francis(Francis)	6
4	**Nuclear power plant** Introduction of nuclear engineering, fission, fusion, nuclear material, thermal fission reactor and power plant - PWR BWR , liquid metal fast breeder, reactors, reactor control, introduction to plasma technology.	6
5	**Diesel and gas turbine power plant** General layout, Advantages and disadvantages, component, performance of gas turbine power plant, combined heat power generation.	4
6	**Power Generation using non-conventional energy sources** **Solar Energy** Solar concentrators and tracking ; Dish and Parabolic trough concentrating generating systems, Central tower solar thermal power plants ; Solar Ponds. Basic principle of power generation in a PV cell ; Band gap and efficiency of PV cells solar cell characteristics, Manufacturing methods of mono- and poly-crystalline cells; Amorphous silicon thin film cells. **Wind Energy** Basic component of WEC, Types of wind turbine-HAWT, VAWT, Performance parameters of wind turbine, Power in wind, Wind electric generators, wind characteristics and site selection; Wind farms for bulk power supply to grid. **Fuel Cell** Introduction to fuel cell, principle of operation of fuel cell, Types of fuel cell	12

	Introduction to other sources Basics of power generation by using Biomass, geothermal and tidal energy sources, MHD	

Assessment:

Internal Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

Books Recommended:

Text Books:

1. MV Deshpande, *Elements of Power station design*, Tata McGraw Hill
2. DH Bacon, *Engineering Thermodynamics*, London Butterworth
3. PK Nag, *Power Plant Engineering-Steam & Nuclear*, Tata McGraw Hill

Reference Books:

1. Fredrick T Morse, *Power Plant Engineering*, East-West Press Pvt Ltd
2. Mahesh Verma, *Power Plant Engineering*, Metrolitan Book Co Pvt Ltd
3. RK Rajput, *A Text Book of Power System engineering*, Laxmi Publication
4. George W Sutton-(Editor), *Direct Energy Conversion*, Lathur University, Electronic Series Vol 3, McGraw Hill

Term work:

Term work shall consist of minimum two group assignments based on the syllabus followed by the seminar on the same and three tutorials based on the syllabus

The distribution of marks for term work shall be as follows:

Laboratory work (Tutorial)**:**	**10 marks**
Seminar**:**	**10 marks**
Attendance (Theory and Practical)**:**	**05 marks**

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

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total four questions need to be solved.
3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4: Remaining questions will be randomly selected from all the modules.

Subject Code	Subject Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract./Tut.	Theory	Pract./Tut.	Total
EEC304	Electrical Networks (abbreviated as EN)	4	2	4	1	5

Subject Code	Subject Name	Examination Scheme							
		Theory					Term Work	Pract. / oral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test 1	Test 2	Avg					
EEC304	Electrical Networks	20	20	20	80	03	25	--	125

Subject Code	Subject Name	Credits
EEC304	**Electrical Networks (abbreviated as EN)**	**05**
Course Objectives	• To impart the knowledge of various fundamental techniques for analysis and synthesis of electrical network. • To mould creative engineers needed in education and industrial development along with problem solving skills	
Course Outcomes	• Students will be familiar with the various techniques to analyze electrical systems in transient and steady state conditions. • Will be able to demonstrate skills to use modern engineering tools, software and equipments to analyse problems.	

Module	Contents	Hours
1	**Network Theorems** Solution of network using dependent sources, mesh analysis, super mesh analysis, nodal analysis, super node analysis, source transformation and source shifting, superposition theorem, Thevenin's theorems and Norton's theorem, maximum power transfer theorem. Solution of network with A.C. sources: magnetic coupling, mesh analysis, nodal analysis, superposition theorem, Thevenin's theorems, Norton's theorem, maximum power transfer theorem, Tellegen's theorem, Millman's theorem, reciprocity theorem.	12

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 equilibrium equation, duality.	06
3	**First Order and Second order differential equations** Initial condition of networks, General and partial solutions, time constant, integrating factor, more complicated network, geometrical interpretation of derivative.	06
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	06
5	**Network Functions; Poles and Zeros** Network functions for one port and two port networks, Driving point and transfer functions, ladder network, General network, poles and zeros of network functions, restrictions on Pole and zero locations for driving point functions and Transfer functions, time domain behavior from pole - zero plot. **Two port parameters** Open circuit, short circuit, transmission and hybrid Parameters, relationships between parameter sets, reciprocity and symmetry conditions, parallel connection of two port networks	12
6	**Network Synthesis** Concept of stability, Hurwitz polynomials, Properties and testing of positive real functions, Driving point synthesis of LC, RC, RL network.	06

Assessment:

Internal Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

Books Recommended:

Text Books:

1. W H Hayt, S M Durbin, J E Kemmerly, '*Engineering Circuit Analysis',* 7th Edition Tata McGraw-Hill Education.
2. M. E. Van Valkenburg, '*Network Analysis',* 3rd Edition, PHI Learning.
3. D. Roy Choudhury, '*Networks and Systems',* 2nd Edition, New Age International.
4. M. E. Van Valkenburg, '*Linear Circuits'*, Prentice Hall.

Reference Books:

1. F. F. Kuo,' *Network Analysis and synthesis'*, John Wiley and sons.
2. N Balabanian and T.A. Bickart, '*Linear Network Theory: Analysis, Properties, Design and Synthesis*', Matrix Publishers, Inc.
3. C. L.Wadhwa, '*Network Analysis and synthesis*', New Age international.
4. B. Somanathan Nair, "Network Analysis and Synthesis", Elsevier Publications

Term work:

Term work shall consist of minimum four tutorials and three simulations (minimum), assignments (min two)

The distribution of marks for term work shall be as follows:

Laboratory work (Experiment/ programs and journal)**:**	**10 marks**
Assignments**:**	**10 marks**
Attendance (Theory and Practical)**:**	**05 marks**

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

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total four questions need to be solved.
3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4: Remaining question will be randomly selected from all the modules.

Subject Code	Subject Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract./Tut.	Theory	Pract./Tut.	Total
EEC305	Electrical and Electronic Measurements (abbreviated as EEM)	4	2	4	1	5

Subject Code	Subject Name	Examination Scheme							
		Theory					Term Work	Pract. / oral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test 1	Test 2	Avg					
EEC305	Electrical and Electronic Measurements	20	20	20	80	03	25	--	125

Subject Code	Subject Name	Credits
EEC305	Electrical & Electronic Measurements	05
Course Objectives	• Students should be able to understand working principles of various instruments & devices used for measurement of the Electrical parameters	
Course Outcomes	• This knowledge helps them to build, assemble and use the instruments & devices for the relevant measurements	

Module	Contents	Hours
1	**Principles of Analog Instruments** Errors in Measurement, Difference between Indicating and Integrating Instruments. Moving coil and Moving iron Ammeters & Voltmeters. Extension of ranges by using shunt, Multipliers, Instrument Transformers (only a brief explanation), Dynamometer type Wattmeter & Power Factor meters. Reed Moving Coil type Frequency Meters. Principle of double voltmeter. Double frequency meter. Weston type Synchroscope. DC Permanent magnet moving coil type Galvanometers. Ballistic Galvanometer. AC Vibration Galvanometer (only the basic working Principle and Application).	16

2	**Principles of Digital Instruments** Advantages of digital meters over analogue meters. Resolution & sensitivity of digital meters. Working principles of digital Voltmeter, Ammeter, Frequency meter, Phase Meter, Energy meter, Tachometer and Multimeter	10
3	**Measurement of Resistance** Wheatstone's Bridge, Kelvin's Double Bridge and Megger	05
4	**Measurement of Inductance & Capacitance** Maxwell's Inductance bridge, Maxwell's Inductance & Capacitance Bridge, Hay's bridge, Anderson's Bridge, Desaugthy's Bridge, Schering Bridge, Q meter	05
5	**Potentiometer** Working principle of Crompton's Type and its applications for calibration of Ammeter, Voltmeter & Wattmeter	04
6	**Transducers** Electrical Transducers, Active & Passive Transducers Resistive Transducer-Potentiometer, Resistance Pressure Transducer, Resistive Position Transducer Temperature Transducer- Resistance Thermometer, Thermistor, Thermo couple, RTD Inductive Transducer-Using Self Inductance, Variable Reluctance type, Differential Output Transducers, LVDT, RVDT Capacitive Transducer-Capacitive Pressure Transducer Piezo Electrical Transducer, Photo Electric Transducer(Photo emissive, Photo Conductive, Photo Voltaic)	08

Assessment:

Internal Assessment consists of two tests out of which; one should be compulsory class test (on minimum 02 Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Examination: Some guidelines for setting the question papers are as, six questions to be set each of 20 marks, out of these any four questions to be attempted by students. Minimum 80% syllabus should be covered in question papers of end semester examination.

Books Recommended:

Text Books:

4. Electrical & Electronic Measurements and Instrumentation by AK Sawhney, Dhanpat Rai & Sons
5. Modern Electronic Instrumentation and Measurement Techniques by Helfric and Cooper, Prentice Hall of India
6. Electronic Instrumentation By H.S.Kalsi, Third Edition, Tata McGraw Hill

Reference Books:

1. Principle of Measurement & Instrumentation by Alan.S.Moris, Prentice Hall of India
2. Electrical Measurement & Instrumentation by RS Sirohi & Radhakrisnan, New Age International

List of Experiments Recommended:

1) Demonstration of working parts of moving coil, moving iron, Dynamometer, reed type instruments
2) Measurement of low, medium & high resistance
3) Calibration of ammeter, voltmeter, wattmeter by using potentiometer
4) Measurement of Inductance and Capacitance using Maxwell's, Hay's & Anderson Bridge
5) Study of digital voltmeter, Frequency meter & Energy meter by using Kits
6) Testing of CT & PT by using the Kit

Term work:

Term work shall consist of minimum six experiments, assignments (min two)

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments)**:** **10 marks**

Assignments**:** **10 marks**

Attendance (Theory and Practical)**:** **05 marks**

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

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total four questions need to be solved.
3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4: Remaining question will be randomly selected from all the modules.

Subject Code	Subject Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
EEC 306	Object Oriented Programming and Methodology	--	4#	--	--	2	--	2

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical and Oral	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. Of Test 1 and Test 2					
EEC 306	Object Oriented Programming Methodology	--	--	--	--	25	50*	--	75

Subject Code	Subject Name	Credits
EEC306	Object Oriented Programming and Methodology	05
Course Objectives	• To understand the concept of Object Oriented Programming • To help student to understand use of programming language such as JAVA to resolve problems. • To impart problems understanding, analyzing skills in order to formulate Algorithms. • To provide knowledge about JAVA fundamentals: data types, variables, keywords and control structures. • To understand methods, arrays, inheritance, Interface, package and multithreading and concept of Applet.	

Course Outcomes	• Students will be able to code a program using JAVA constructs. • Given an algorithm a student will be able to formulate a program that correctly implements the algorithm. • Students will be able to generate different patterns and flows using control structures and use recursion in their programs. • Students will be able to use thread methods, thread exceptions and thread priority. • Students will implement method overloading in their code. • Students will be able to demonstrate reusability with the help of inheritance. • Students will be able to make more efficient programs.

Module No.	Unit No.	Topic	Hrs.
1		**Fundamental concepts of object oriented programming**	**4**
	1.1	Overview of programming	
	1.2	Introduction to the principles of object-oriented programming: classes, objects, messages, abstraction, encapsulation, inheritance, polymorphism, exception handling, and object-oriented containers	
	1.3	Differences and similarity between C++ and JAVA	
2		**Fundamental of Java programming**	**4**
	2.1	Features of Java	
	2.2	JDK Environment & tools	
	2.3	Structure of Java program	
	2.4	Keywords , data types, variables, operators, expressions	
	2.5	Decision making, looping, type casting	
	2.6	Input output using scanner class	
3		**Classes and objects**	**6**
	3.1	Creating classes and objects	
	3.2	Memory allocation for objects	
	3.3	Passing parameters to Methods	
	3.4	Returning parameters	
	3.5	Method overloading	

	3.6	Constructor and finalize ( )	
	3.7	Arrays: Creating an array	
	3.8	Types of array : One dimensional arrays ,Two Dimensional array, string	
4		**Inheritance, interface and package**	**6**
	4.1	Types of inheritance: Single, multilevel, hierarchical	
	4.2	Method overriding, super keyword, final keyword, abstract class	
	4.3	Interface	
	4.4	Packages	
5		**Multithreading**	**4**
	5.1	Life cycle of thread	
	5.2	Methods	
	5.3	Priority in multithreading	
6		**Applet**	**2**
	6.1	Applet life cycle	
	6.2	Creating applet	
	6.3	Applet tag	
		Total	**26**

Text Books:

1. Rajkumar Buyya, "*Object-oriented programming with JAVA"*, Mcgraw Hill
2. E Balgurusamy, *"Programming with JAVA",* Tata McGraw Hill

Reference Books:

1. Herbert Schildt, *"The Complete Reference JAVA",* Tata McGraw Hill
2. Barry Holmes and Daniel T. Joyce, *"Object Oriented Programming with Java",* Jones & Bartlett Learning