BIRLA INSTITUTE OF TECHNOLOGY
MESRA
RANCHI, INDIA
CHOICE BASED CURRICULUM

Under Graduate Programme
Department of Mathematics

Programme Outcomes

The graduates of this program are expected to:

1. Gain sound knowledge on fundamental principles and concepts of Basic Mathematics: calculus, differential equations, complex analysis, probability theory and their applications related to Industrial, Engineering, Biological and Ecological problems.
2. Exhibit in depth the analytical and critical thinking to identify, formulate and solve real world problems of science and engineering.
3. Be proficient in arriving at innovative solution to a problem with due considerations to society and environment.
4. Be capable of undertaking suitable experiments/research methods while solving an engineering problem and would arrive at valid conclusions based on appropriate interpretations of data and experimental results.
5. Exhibit understanding of societal and environmental issues (health, legal, safety, cultural etc) relevant to professional practice and demonstrate through actions, the need for sustainable development
6. Be committed to professional ethics, responsibilities and economic, environmental, societal and political norms.
7. Demonstrate appropriate inter-personal skills to function effectively as an individual, as a member or as a leader of a team and in a multi-disciplinary setting.
8. Develop written and oral communications skills in order to effectively communicate design, analysis and research results.
9. Be able to acquire competent positions in industry and academia as well.
10. Be able to acquire lifelong learning and continuous professional development.
11. Be conscious of financial aspects of all professional activities and shall be able to undertake projects with appropriate management control and control on cost and time.
12. Recognize the need for continuous learning and will prepare himself/ herself appropriately for his/her all-round development throughout the professional career.

COURSE INFORMATION SHEET

Course code: MA 103
Course title: Mathematics I
Pre-requisite(s): Basic Calculus, Basic Algebra
Co- requisite(s): ---
Credits: L: 3 T: 1 P: 0 C: 4
Class schedule per week: 3 Lectures, 1 Tutorial.
Class: BE
Semester / Level: I / First
Branch: All
Name of Teacher:

Course Objectives:
This course enables the students to understand

1.	Infinite sequences and series.
2.	Theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations, eigenvalues, eigenvectors etc.
3.	Multivariable functions, their limits, continuity, partial differentiation, properties and applications of partial derivatives.
4.	Integrals of multivariable functions viz. double and triple integrals with their applications.
5.	Properties like gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions.

Course Outcomes: After the completion of this course, students will be able to

CO1	Decide the behaviour of sequences and series using appropriate tests.
CO2	Get an understanding of partial derivatives and their applications in finding maxima - minima problems.
CO3	Apply the principles of integral to solve a variety of practical problems in engineering and sciences.
CO4	Demonstrate a depth of understanding in advanced mathematical topics.
CO5	Enhance and develop the ability of using the language of mathematics in engineering.

(MA 103) Mathematics I

Syllabus

Module 1: Sequences and Series

Sequences, Convergence of Sequence. Series, Convergence of Series, Tests for Convergence: Comparison tests, Ratio test, Cauchyôs root test, Raabeôs test, Gauss test, Cauchy's Integral test, Alternating series, Leibnitz test, Absolute and Conditional Convergence.

[9 L]

Module 2: Matrices

Rank of a Matrix, elementary transformations, Row - reduced Echelon form. Vectors, Linear Independence and Dependence of Vectors. Consistency of system of linear equations. Eigenvalues, Eigenvectors, Cayley - Hamilton theorem.

[9 L]

Module 3 : Advance Differential Calculus

Function of several variables, Limit, Continuity, Partial derivatives, Eulerôs theorem for homogeneous functions, Total derivatives, Chain rules, Jacobians and its properties, Taylor series for function of two variables, Maxima ï Minima, Lagrangeôs method of multipliers.

[9 L]

Module 4: Advance Integral Calculus

Beta and Gamma functions: definition and properties.
Double integrals, double integrals in polar coordinates, Change of order of integration, Triple Integrals, cylindrical and spherical coordinate systems, transformation of coordinates, Applications of double and triple integrals in areas and volumes.

[9 L]

Module 5 : Vector Calculus

Scalar and vector point functions, gradient, directional derivative, divergence, curl, vector equations and identities. Line Integral, Work done, Conservative field, Greenôs theorem in a plane, Surface and volume integrals, Gauss ï divergence theorem, Stoke ôs theorem.

[9 L]

Text Books:

1. M. D. Weir, J. Hass and F. R. Giordano: ThomasôCalculus, 11th Edition, Pearson Educations, 2008E.
2. H. Anton, I. Brivens and S. Davis, Calculus, 10th Edition, John Wiley and sons, Singapore Pte. Ltd., 2013.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Reference Books:

1. M. J. Strauss, G. L. Bradley And K. J. Smith, Calculus, 3rd Ed, Dorling.Kindersley (India) Pvt. Ltd. (P Ed), Delhi, 2007.
2. David C. Lay, Linear Algebra and its Applications, 3rd Edition, Pearson Ed. Asia, Indian Reprint, 2007.
3. D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, 4th Edition, 2011.

COURSE INFORMATION SHEET

Course code: MA 107
Course title: Mathematics II
Pre-requisite(s):
Co- requisite(s): Mathematics - I
Credits: L: 3 T: 1 P: 0 C: 4
Class schedule per week: 3 Lectures, 1 Tutorial**.**
Class: BE
Semester / Level: II / First
Branch: All
Name of Teacher:

Course Objectives: This course enables the students to understand

1.	Various methods to solve linear differential equations of second and higher order.
2.	special functions viz. Legendre's and Bessel's and different properties associated with them.
3.	Diverse mathematical techniques for solving partial differential equations of first order and higher order, along with their applications in wave and heat equations using Fourier series.
4.	The theory of functions of a complex variable, complex differentiation and integration.
5	About random variables and elementary probability distribution.

Course Outcomes: After the completion of this course, students will be able to

CO1	Investigate the occurrence of differential equations in science and engineering and use methods available for their solutions.
CO2	Gain an understanding on complex variable functions and using their properties in real life problems.
CO3	Construct appropriate probability models in solving real world problems.
CO4	Demonstrate a depth of understanding in advanced mathematical topics.
CO5	Enhance and develop the ability of using the language of mathematics in engineering.

(MA 107) Mathematics- II

Syllabus

Module 1: Ordinary Differential Equations – I

Linear differential equations, Wronskian, Linear independence and dependence of solutions, Linear differential equations of second and higher order, Operator method, Legendreôs and Euler ï Cauchyôs form of linear differential equation, Method of variation of parameters.

[9 L]

Module 2: Ordinary Differential Equations – II

Ordinary and singular points of differential equation, Power and Frobenius series solutions. Besselôs differential equation, Bessel function of first kind and its properties. Legendreôs differential equation, Legendreôs polynomial and its properties.

[9 L]

Module 3: Fourier series and Partial Differential Equations

Fourier series: Euler formulae for Fourier series, Dirichlet conditions, Half range Fourier series.

Partial Differential Equations: Linear partial differential equations, Lagrangeôs method. Method of separation of variables and its application in solving one dimensional wave and heat equations.

[9L]

Module 4: Complex Variable-Differentiation & Integration

Function of a complex variable, Limit, Continuity, Differentiability, Analyticity, Analytic functions, Cauchy ï Riemann equations. Harmonic functions, Harmonic Conjugate.
Cauchyôs theorem, Cauchyôs Integral formula, Taylor and Laurent series expansions. Singularities and its types, Residues, Residue theorem.

[9L]

Module 5: Applied Probability

Discrete and continuous random variables, cumulative distribution function, probability mass and density functions, expectation, variance, moment generating function. Introduction to Binomial, Poisson and Normal Distribution.

[9L]

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, 4th Edition, 2011.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, McGraw Hill, 2004.
4. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, 3rd Edition, Narosa Publishing, 2009.
5. R. A . Johnson, I. Miller and J. Freund: Probability and Statistics for Engineers, PHI.

6. S. C. Gupta and V.K . Kapoor.: Fundamental of Mathematical Statistics, Sultan Chand and Sons.

Reference Books:

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition ., Wiley India, 2009.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
4. G. F. Simmons, Differential Equations with Applications and Historical Notes, TMH, 2nd Edition, 2003.
5. P. L. Meyer: Introductory Probability and Statistical Applications, Oxford & IBH.

Course Delivery methods
Lecture by use of boards/LCD projectors/OHP projectors
Tutorials/Assignments
Seminars
Mini projects/Projects
Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of NPTEL materials and internets
Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Mid Semester Examination	25
End Semester Examination	50
Quiz (s)	10+10
Assignment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Mid Semester Examination	√				√
End Semester Examination	√	√	√		√
Quiz (s)	√	√	√		
Assignment	√	√	√	√	√

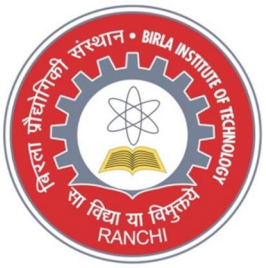
Indirect Assessment –

1. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	1	1	1	1	3	3	2	2
CO2	3	3	3	2	1	1	1	1	3	3	2	2
CO3	3	3	3	2	1	1	1	1	3	3	2	2
CO4	2	2	3	3	1	1	1	1	3	3	2	2
CO5	2	2	3	3	1	1	1	1	3	3	2	2

If satisfying< 34%=1, 34-66% =2, > 66% = 3



BIRLA INSTITUTE OF TECHNOLOGY MESRA

RANCHI, INDIA

CHOICE BASED CURRICULUM

Under Graduate Programme

Department of Chemistry

Program Outcomes

1. Demonstrate knowledge on fundamental principles including concepts and their applications related to chemistry.
2. Have ability for in depth structural and analytical thinking towards chemical science to conceptualize and analyze to improve the knowledge of chemical systems and its connections with natural and engineering sciences.
3. Have ability to design system components and chemical processes meeting all applicable consideration for public health, safety, cultural, societal and environmental considerations.
4. Have ability to investigate and analyze critical physicochemical and structural problem towards the development of appropriate solution.
5. Have ability to use modern lab equipmentôs and relevant theoretical understand to perform measurements, experiments, design and analysis.
6. Be able to apply the awareness to assess chemical impact on societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional practices.
7. Exhibit understanding of theoretical & experimental perspective to solve societal and environmental issues (health, legal, safety, cultural etc.) relevant to professional practice.
8. Informed to professional ethics, responsibilities, economic, environmental, societal, and political norms.
9. Have ability to work as an individual, in a team or as a team leader, for project execution and to achieve the objectives.
10. Have ability in written and oral communications to effectively present the chemical system for product design and analysis.
11. Develop know-how in managerial capacity including cost design to acquire leadership position in chemical industry.
12. To develop interest, encouragement and aptitude for life-long learning and continuous professional growth.

COURSE INFORMATION SHEET

Course code: CH 101
Course title: Chemistry
Pre-requisite(s): Intermediate level chemistry
Co- requisite(s):
Credits: 4 L: 3 T: 1 P: 0
Class schedule per week: 04
Class: B.Tech.
Semester /Level: I/First
Branch: ALL
Name of Teacher:

Course Objectives

This course enables the students:

1.	To create concept of Chemical bonding & Coordination Chemistry.
2.	To understand the basic 3D structure in organic chemistry including stereochemistry, aromaticity and reaction mechanism.
3.	To understand the reaction dynamics and to know different types of catalysis.
4.	To understand the modern techniques related to spectroscopy and structural characterization.
5.	To develop knowledge on the physical state and electrochemistry of molecules.

Course Outcomes

After the completion of this course, students will be:

CO1	Able to explain the bonding in a molecular structure.
CO2	Able to explain the 3D structure, aromaticity and stereochemistry of organic molecules.
CO3	Able to explain the spectroscopic data for structural characterization of the molecules.
CO4	Able to predict the rate, molecularity and mechanism of a simple as well as catalytic reaction.
CO5	Able to interpret the phases of solid and the electrochemical behavior of the molecules.

(CH 101) Chemistry

Syllabus

Module I: Chemical Bonding

Ionic bond: Radius ratio rule, Born-Landé equation, Born-Haber cycle. *Metallic Bond:* valence bond and band theories, defects in solids, Werner's Theory, Bonding in Transition metal complexes, Ligands, coordination complexes, Ligand Field, Crystal Field Theory, Octahedral, Tetrahedral and square planar complexes, CFSE, Jahn Teller theorem, electronic spectra, magnetism, and isomerization in coordination compounds. **[9L]**

Module II: Organic Structure and Stereochemistry

Covalent bond: Lewis structure, Valence Bond theory, Molecular orbital theory, Molecular orbital of diatomic and polyatomic system, hybridization, conjugated molecules, Huckel molecular orbital theory of conjugated systems. Isomerism, Geometrical isomerism: *cis*ï *trans* and syn-anti isomerism; Optical isomerism & Chirality; Wedge, Fischer, Newmann and Sawhorse Projection formulae and interconversions; E/Z, D/L, R/S nomenclature system; Conformational studies of ethane, n-butane, Cyclohexane. **[9L]**

Module III: Kinetics and Catalysis:

Order & molecularity of reactions: chain, parallel, Competing, Side, Consecutive reactions; Kinetics of Fast reactions, Characteristics of catalyst, types of catalysis, catalytic poison; Theories of catalysis; Acid base catalysis: including kinetics, Enzyme catalysis, Mechanism and kinetics of enzyme catalyzed reaction, Michaelis-Menten equation, Important catalysts in industrial processes; Hydrogenation using Wilkinsons catalyst, Hydroformylation by using Cobalt-catalyst, Phase transfer catalyst. **[9L]**

Module-IV: Spectroscopic Techniques

Absorption and emission Spectroscopy, Lambert-Beers Law, Principles and applications of UV-Visible, Factors influencing for UV-VIS spectrum; Rotational and Vibrational spectroscopy, Principle of FT-IR, and NMR spectroscopy; Modern techniques in structural elucidation of compounds by UV-VIS, IR, & NMR Spectroscopy. **[9L]**

Module V: Phase and Chemical equilibrium

Phase Rule: Terms Involved, Phase diagram of one component (Water) & two component (Pb/Ag) system & their applications. Law of chemical equilibrium, equilibrium constants and their significance, Weak and strong electrolytes, Standard electrode potential and its application to different kinds of half cells, EMF and its measurement and application, Batteries and Fuel Cells, Chemical and Electrochemical corrosion, Factors affecting the rate of corrosion. **[9L]**

Text books:

1. Huheey, J. E., Inorganic Chemistry: Principles of Structure and Reactivity, 4th edition, Pearson.
2. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Seventh Edition, Pearson
3. Atkins, P. W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014.

Reference books:

1. Lee, J. D. Concise Inorganic Chemistry ELBS, 1991.
2. Mortimer, R. G. Physical Chemistry 3rd Ed., Elsevier (2009).
3. William Kemp, Organic Spectroscopy, 3rd Ed., 2008 Macmillan.

Gaps in the syllabus (to meet Industry/Profession requirements) : NA

POs met through Gaps in the Syllabus : NA

Topics beyond syllabus/Advanced topics/Design : NA

POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods	
Lecture by use of boards/LCD projectors/OHP projectors	Y
Tutorials/Assignments	Y
Seminars	N
Mini projects/Projects	N
Laboratory experiments/teaching aids	Y
Industrial/guest lectures	Y
Industrial visits/in-plant training	N
Self- learning such as use of NPTEL materials and internets	Y
Simulation	N

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	**% Contribution during CO Assessment**
Mid Sem Examination Marks	25
End Sem Examination Marks	50
Quiz	10+10
Teacherôs assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Mid Sem Examination Marks	√	√	√		
End Sem Examination Marks	√	√	√	√	√
Quiz I	√	√			
Quiz II			√	√	

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Graduate Attributes

Course Outcome #	Graduate Attributes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2		3	3	3		3	2	2		3
2	3	3		3	3	3		3	2	2		3
3	3	1		2	1	2		3	2	2		3
4	3			3	2	2		2	2	2		3
5	2	3		3	3	3	3	2	2	2		3

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1 and CD2
CD2	Tutorials/Assignments		CO2	CD1 and CD2
CD3	Seminars		CO3	CD1 and CD2
CD4	Mini projects/Projects		CO4	CD1 and CD2
CD5	Laboratory experiments/teaching aids		CO5	CD1 and CD2
CD6	Industrial/guest lectures		-	-
CD7	Industrial visits/in-plant training		-	-
CD8	Self- learning such as use of NPTEL materials and internets		-	-
CD9	Simulation		-	-

Course code: CH 102
Course title: Chemistry Lab
Pre-requisite(s): Intermediate level Chemistry
Co- requisite(s):
Credits: 1.5 L: 0 T: 0 P: 3
Class schedule per week: 03
Class: B. Tech.
Semester / Level: I/First
Branch: ALL
Name of Teacher:

Syllabus

1. Gravimetric estimation of Nickel by Dimethylglyoxime.
2. Quantitative estimation of Ca^{2+} and Mg^{2+} ions by complexometric titration using Na_2-EDTA.
3. To verify Bears Law using Fe^{3+} solution by spectrophotometer/colorimeter and to determine the concentration of a given unknown Fe^{3+} solution.
4. Separation of binary organic mixture by acid-base extraction and analysis using given FTIR and NMR spectrum.
5. Preparation of Diazoamino Benzene and report the melting point and yield of product.
6. Draw melting point-mass percent composition diagram for two component mixture and determine the Eutectic Temperature.
7. To study the kinetics of acid-catalyzed hydrolysis of ethyl acetate and to evaluate the value of the rate constant.
8. To determine the rate law for the reaction between iodide and hydrogen peroxide in an acidic environment and to determine the effect of a catalyst on the rate of reaction.
9. To determine the strength of the given strong acid by strong base Potentiometrically.
10. To determine the transition temperature of the given salt hydrate.
11. Qualitative detection of special elements in organic compounds.
12. To draw the pH-titration curve of strong acid vs strong base.

Reference book:

1. Experimental Physical Chemistry, By B. Viswanathan, P. S. Raghavan, Narosa Publishing House (1997).
2. Vogels Textbook of Practical Organic Chemistry
3. Experiments in General chemistry, C. N. R. Rao and U. C. Agarwal
4. Experimental Organic Chemistry Vol 1 and 2, P R Singh, D S gupta, K S Bajpai, Tata McGraw Hill

BIRLA INSTITUTE OF TECHNOLOGY
MESRA
RANCHI, INDIA

CHOICE BASED CURRICULUM

Under Graduate Programme

Department of Electronics and Communication Engineering

Program Outcomes

1. Demonstrate knowledge on fundamental principles and concepts, apart from the knowledge on various systems, standards and their applications related to Electronics and Communication Engineering.
2. Have ability for in depth analytical and critical thinking in order to conceptualize, analyze, design and improve different kinds of electronic systems and communication applications reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. Have ability to design system components and processes meeting all applicable consideration for public health and safety, cultural, societal and environmental considerations.
4. Have ability to investigate and analyze complex problems and development of appropriate solution.
5. Have ability to use lab equipment using modern tools and relevant simulation software to perform measurements, experiments, design and analysis.
6. Be able to apply reasoning informed contextual knowledge to assess societal, health, safety legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. Exhibit understanding of societal and environmental issues (health, legal, safety, cultural etc.) relevant to professional engineering practice and demonstrate knowledge of and the need for sustainable development.
8. Be committed to professional ethics, responsibilities and economic, environmental, societal, and political norms.
9. Have ability to work as an individual, in a team or team leader, in a multidisciplinary team.
10. Have ability in written and oral communications to effectively communicate product design and analysis.
11. Develop know-how in project management and finance to acquire leadership position in industry.
12. Have and interest and aptitude for life-long learning and continuous professional development.

COURSE INFORMATION SHEET

Course code: EC 101
Course title: Basics of Electronics & Communication Engineering
Pre-requisite(s): N/A
Co- requisite(s): N/A
Credits: L: 3 T: 1 P: 0 C: 4
Class schedule per week: 04
Class: B. Tech.
Semester / Level: I/First
Branch: ALL
Name of Teacher:

Course Objectives:

This course enables the students:

1.	To understand PN Junction, diodes and their applications.
2.	To comprehend BJT, FET and their bias configurations.
3.	To grasp importance of feedback in amplifier circuits, op amp and its applications.
4.	To understand number system, Logic Gates and Boolean algebra.
5.	To apprehend fundamentals of communication technology.

Course Outcomes:

After the completion of this course, students will be able to:

CO1	Explain PN Junction, diodes and their applications.
CO2	Appraise the BJT, FET and their biasing techniques.
CO3	Comprehend feedback in amplifier circuits, op amp and its applications.
CO4	Translate one number system into another, build circuits with Logic Gates, electronic components and OPAMP IC 741 and analyze the measurement results using CRO.
CO5	Appraise the fundamentals of communication technology.

(EC 101) Basics of Electronics & Communication Engineering

Syllabus

Module-1

Diodes and Applications: Introduction to PN junction diodes; Characteristics of semiconductor diodes: V-I characteristics, diode-resistance, temperature-dependence, diode-capacitance; DC & AC load lines; Breakdown Mechanisms; Zener Diode ï Operation and Applications; Diode as a Rectifier: Half Wave and Full Wave Rectifiers with and without C-Filters.

[9L]

Module-2

Bipolar Junction Transistors (BJT): PNP and NPN Transistors, Basic Transistor Action, Input and Output Characteristics of CB, CE and CC Configurations, dc and ac load line analysis, operating point, Transistor biasing: Fixed bias, emitter bias/self-bias, Low-frequency response of CE amplifier.

Field Effect Transistors: JFET, Idea of Channel Formation, Pinch-Off and saturation Voltage, Current-Voltage Output Characteristics; MOSFET: Basic structure, operation and characteristics.

[9L]

Module-3

Sinusoidal Oscillators: Concept of positive and negative feedback, Barkhausen criterion for sustained oscillations, Determination of Frequency and Condition of oscillation, Hartley and Colpittôs oscillator.

Operational Amplifiers: Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Inverting and non-inverting amplifiers, Offset error voltages and currents; Power supply rejection ratio, Slew Rate and concept of Virtual Ground, Summing and Difference Amplifiers, Differentiator and Integrator, RC phase shift oscillator.

[9L]

Module-4

Logic Gates and Boolean algebra: Introduction to Boolean Algebra and Boolean operators, Symbolic representation, Boolean algebraic function and Truth table of different Digital logic Gates (AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR); Realization of Basic logic gates using universal gates, Adder, Subtractor, adder/subtractor.

[9L]

Module-5

Electronic communication: Introduction to electronic communication system, Electromagnetic Communication spectrum band and applications, Elements of Electronic Communication System; Merits and demerits of analog and digital communication, Modes of communication; Signal radiation and propagation; Need for modulation; Introduction to Amplitude modulation and Angle modulation.

[9L]

Text Books:

1. Millman J., Halkias C.C., Parikh Chetan, Integrated Electronics: Analog and Digital Circuits and Systems, 2nd Edition, Tata McGraw-Hill.
2. Mano M.M., Digital Logic and Computer Design, Pearson Education, Inc, Thirteenth Impression, 2011.
3. Singal T. L., Analog and Digital Communications, 2nd Edition, Tata McGraw-Hill.
4. Haykin S., Moher M., Introduction to Analog & Digital Communications, 2nd Edition, Wiley India Pvt. Ltd.

Reference Book:

1. Boylstead R.L., Nashelsky L., Electronic Devices and Circuit Theory, 10th Edition Pearson Education, Inc.

Gaps in the syllabus (to meet Industry/Profession requirements): Teaching through paper

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	**Course Delivery methods**
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Quizzes
CD3	Assignments/Seminars
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Mid SEM Examination Marks	25
End SEM Examination Marks	50
Quizzes	10+10
Assessment by teacher	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Mid SEM Examination Marks					
End SEM Examination Marks					
Quizzes					
Assessment by teacher					

If satisfying < 34% = 1, 34-66% = 2, > 66% = 3

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	3	1	2	3	1	1				3	
CO2	3	3	1	2	3	1	1				3	
CO3	3	3	1	2	3	1	2		1	1	3	2
CO4	3	3	1	2	3	1	2		1	1	3	2
CO5	3	3	1	2	3	1	1				3	

If satisfying < 34% = 1, 34-66% = 2, > 66% = 3

Mapping Between COs and Course Delivery (CD) methods			
CD	**Course Delivery methods**	**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4	CD1
CD2	Quizzes	CO1, CO2, CO3	CD2
CD3	Assignments/Seminars	CO3	CD3
CD4	Mini projects/Projects		
CD5	Laboratory experiments/teaching aids		
CD6	Industrial/guest lectures		
CD7	Industrial visits/in-plant training		
CD8	Self- learning such as use of NPTEL materials and internets		
CD9	Simulation		

COURSE INFORMATION SHEET

Course code: EC 102
Course title: Electronics & Communication Lab
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3 C: 1.5
Class schedule per week: 03
Class: B. Tech.
Semester / Level: I/First
Branch: ALL
Name of Teacher:

Course Objectives:
This course enables the students:

1.	To demonstrate the measurement of voltage, frequency using CRO.
2.	To explain PN junction characteristics and its applications.
3.	To understand the frequency response of BJT amplifier and OPAMP.
4.	To Realize logic gates and implement simple Boolean expression.
5.	To explain the Amplitude Modulation and Frequency Modulation

Course Outcomes:
After the completion of this course, students will be able to:

CO1	Make use of CRO for measuring different parameters.
CO2	Appraise PN junction characteristics and its applications.
CO3	Experiment with Diodes, BJT and OPAMP.
CO4	Design specified circuit using given electronic components/ICs/logic gates.
CO5	Demonstrate the working of Amplitude Modulation and Frequency Modulation

Syllabus
List of Compulsory experiments:
1. Measurement of voltage, time period and frequency of different signals on CRO.
2. Measurement of frequency and phase of two different signals using Lissajous pattern.
3. To determine the forward and reverse bias characteristics of PN junction diode.
4. To determine the reverse bias characteristics of Zener diode and application as a voltage regulator.
5. Measurement of rectification efficiency and ripple factor of Half-wave and Full-wave rectifier Circuits with and without C-Filter.
6. To determine the frequency response of CE transistor amplifier and finding its gain bandwidth product.
7. To determine the transfer characteristics of JFET and measurement of its voltage gain.
8. Design of RC phase shift oscillator using IC-741 Op-Amp and finding its frequency of oscillation.

9. Design of Inverting and Non-inverting amplifier using IC 741 OP-AMP and finding its frequency response.
10. Realization of Basic logic gates (AND, OR, NOT) using NAND Gate (IC-7400).
11. Implementation of Boolean expression F = (A.B.C + D.E) using AND Gate(IC 7408) and OR Gate (IC 7432).
12. Generation of Amplitude modulated wave and calculation of percentage of modulation using standard setup.
13. Generation of FM-wave and its detection using standard setup.

Text Books:

1. Millman J., Halkias C.C., Parikh Chetan, Integrated Electronics: Analog and Digital Circuits and Systems, 2nd Edition, Tata McGraw-Hill.
2. Mano M.M., Digital Logic and Computer Design, Pearson Education, Inc, Thirteenth Impression, 2011.
3. Singal T. L., Analog and Digital Communications, 2nd Edition, Tata McGraw-Hill.
4. Haykin S., Moher M., Introduction to Analog & Digital Communications, 2nd Edition, Wiley India Pvt. Ltd..

Reference Book:

1. Boylstead R.L., Nashelsky L., Electronic Devices and Circuit Theory, 10th Edition Pearson Education, Inc.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Progressive Evaluation	**(60)**
Attendance Marks	**12**
Lab Viva marks	**24**
Lab file Marks	**12**
Day-to-day performance Marks	**12**
End SEM Evaluation	**(40)**
Lab quiz Marks	**20**
Lab performance Marks	**20**

Assessment Components	CO1	CO2	CO3	CO4	CO5
Progressive Evaluation					
End SEM Evaluation					

If satisfying < 34% = 1, 34-66% = 2, > 66% = 3

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

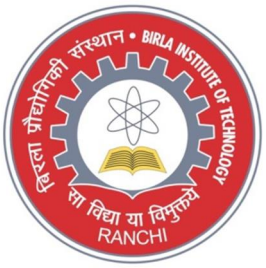
Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	1	2	1	1	1				3	
CO2	3	2	1	2	2	1	1				1	
CO3	3	2	1	2	2	1	2		1	1	1	1
CO4	3	3	1	2	3	1	2		1	1	3	1
CO5	3	2	1	2	1	1	1				3	

If satisfying < 34% = 1, 34-66% = 2, > 66% = 3

Mapping Between COs and Course Delivery (CD) methods			
CD	**Course Delivery methods**	**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		
CD2	Tutorials/Assignments/Quiz (s)		
CD3	Seminars		
CD4	Mini projects/Projects		
CD5	Laboratory experiments/teaching aids	CO1, CO2, CO3, CO4	CD5
CD6	Industrial/guest lectures		
CD7	Industrial visits/in-plant training		
CD8	Self- learning such as use of NPTEL materials and internets		
CD9	Simulation	CO1, CO2, CO3, CO4	CD9



BIRLA INSTITUTE OF TECHNOLOGY MESRA

RANCHI, INDIA

CHOICE BASED CURRICULUM

Under Graduate Programme

Department of Mechanical Engineering

Program Outcomes

A graduate shall

1. Be competent in applying basic knowledge of science and engineering for the purpose of obtaining solution to a multi-disciplinary problem.
2. Gain skilful knowledge of complex engineering problem analysis.
3. Be able to design system components and processes meeting all applicable rules and regulations.
4. Be proficient in arriving at innovative solution to a problem with due considerations to society and environment.
5. Be capable of undertaking suitable experiments/research methods while solving an engineering problem and would arrive at valid conclusions based on appropriate interpretations of data and experimental results.
6. Continually upgrade his/her understanding and become masterly at modern engineering and soft tools and apply them along with other appropriate techniques and resources.
7. Exhibit understanding of societal and environmental issues (health, legal, safety, cultural etc) relevant to professional engineering practice and demonstrate through actions, the need for sustainable development.
8. Be committed to professional ethics, responsibilities and economic, environmental, societal, and political norms.
9. Demonstrate appropriate inter-personal skills to function effectively as an individual, as a member or as a leader of a team and in a multi-disciplinary setting.
10. Be able to comprehend and write effective reports and design documentations; give and receive clear instructions; make effective presentations and communicate effectively and convincingly on complex engineering issues with engineering community and with society at large.
11. Be conscious of financial aspects of all professional activities and shall be able to undertake projects with appropriate management control and control on cost and time.
12. Recognize the need for continuous learning and will prepare himself/ herself appropriately for his/her all-round development throughout the professional career.

Course code: ME 101
Course title: Basics of Mechanical Engineering
Pre-requisite(s):
Co- requisite(s):
Credits: 4 L: 3, T: 1, P: 0
Class schedule per week: 04
Class: B. Tech
Semester / Level: I/First
Branch: All
Name of Teacher:

Course Objectives

This course enables the students:

1.	To introduce system of forces, and write equation of equilibrium.
2.	To analyse motion of particle and rigid body subjected to force.
3.	To grasp the importance of internal, external combustion engines and heat transfer.
4.	To apprehend the fundamentals of friction and vibration.
5.	To understand the different sources of energy.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Write and solve the equations of equilibrium for particles and structures members subjected to forces.
CO2	Write and solve the equations of motion for particles and rigid bodies subjected to forces.
CO3	Discuss the basics of Boilers, IC Engines and heat transfer.
CO4	Aware of different types of vibrations and friction.
CO5	Outline the non-conventional energy resources.

(ME 101) Basics of Mechanical Engineering

Syllabus

Module 1: System of Forces and Structure Mechanics

Addition of Forces, Moment of a Force, Couple, Varignonôs theorem, Free Body Diagram, Equilibrium in Two and Three Dimensions, Equivalent Forces and Moment. Types of Trusses, Plane and Space Trusses. Analysis of Plane Trusses by: Method of Joints and Method of Sections, Analysis of Frames with Hinged Joints. Hookeôs Law of elasticity, Stress and Strain, Relation between elastic constants, Thermal Stresses, Properties of surfaces such as centroid and area moment of inertia. (9 L)

Module 2: Kinematics & Kinetics of rigid bodies

Types of rigid body motionï translation, rotation about fixed axis, equations defining the rotation of a rigid body about a fixed axis, plane motion, absolute and relative velocity in plane motion, instantaneous center of rotation. Equation of translational and rotational motion, Newtonôs law and DôAlembertôs principle ï inertia force and inertia couple. (9 L)

Module 3: Friction and Vibration
Interfacial Friction (a) Laws of dry friction, static & kinetic co-efficient of friction, Analysis of static, kinetic and rolling friction.(b) Analysis of frictional forces in inclined planes, wedges, screw jacks and belt drives.
Vibrations: Types of vibration, free un-damped longitudinal vibrations, free damped longitudinal vibrations. (9 L)

Module 4: Boilers and Internal Combustion Engine:
Boiler Mountings and Accessories, Fire Tube and Water Tube Boilers, Cochran Boiler, Babcock and Wilcox Boiler.
Basic components and terminology of IC engines, working of four stroke/two stroke - petrol/diesel engine, classification and application of IC engines.
Heat transfer: various modes of heat transfer, one dimensional steady state conduction, Application to composite walls and cylinder. (9 L)

Module 5: Non-Conventional Energy and their resources:

Renewable and Non-renewable Energy Resources, Advantages and Disadvantages of Renewable Resources, Renewable Energy Forms and Conversion, Solar Energy, Wind Energy, Tidal Energy, Ocean Thermal Energy; Geothermal Energy, Nuclear Energy, Hydro Energy. (9 L)

Text Books

1. Engineering Mechanics, Irving H. Shames, P H I. ltd, 2011.

2. Engineering Mechanics, S. Timoshenko, D. H. Young, J. V. Rao, Sukumar Pati, McGraw Hill education, 2017.

3. Theory of vibrations with applications, Thomson and Dahleh, Pearson Education, 5th Edition, 2008.

4. Boiler operator, Wayne Smith, LSA Publishers, 2013.

5. Internal Combustion Engines, M. L. Sharma and R. P. Mathur, Dhanpat Rai Publications, 2014.

6. Heat Transfer, J. P. Holman, Souvik Bhattacharya, Mcgraw Higher Ed Publishers, 2011.

7. Fundamentals of Renewable Energy Processes, Aldo Vieira Da Rosa, Elsevier publication, 2012.

Reference Books

1. Engineering Mechanics : statics, James L. Meriam, L. G. Kraige, Wiley, 7th Edition, 2011.

2. Engineering Mechanics, S. Rajasekaran & G. Sankarasubramaniam, Vikash publishing house, 2018.

3. Engineering Vibration, Daniel J. Inman, Pearson, 2013.

4. An Introduction to Steam Boilers, David Allan Low, Copper Press Publisher, 2012.

5. Internal Combustion Engines ï V Ganesan, McGraw hill, 2017.

6. Heat and Mass Transfer: Fundamentals and Applications, Yunus A. Cengel, Afshin J. Ghajar, McGraw Hill Education Publisher, 2017.

7. Non Conventional Energy Resources, B. H. Khan, McGraw Hill Education Publisher, 2017.

8. Principles of Mechanical Engineering, R. P. Sharma & Chilkesh Ranjan, Global Academic Publishers, 2016.

Course Delivery methods
Lecture by use of boards/LCD projectors/OHP projectors
Tutorials/Assignments
Seminars
Mini projects/Projects
Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of NPTEL materials and internets
Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Mid Sem Examination Marks	25
End Sem Examination Marks	50
Quizzes (1 and 2)	10+10
Assignment	05

Assessment Components	CO1	CO2	CO3	CO4	CO5
Mid Sem Examination Marks	√	√	√		
End Sem Examination Marks	√	√	√	√	√
Quizzes	√	√	√	√	√
Assignment	√	√	√	√	√

If satisfying< 34%=1, 34-66% =2, > 66% = 3

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	1	1	1	1	1		2
CO2	3	2	2	2	2	1	1	1	1	1		2
CO3	3	2	2	2	2	1	1	1	1	1		2
CO4	3	1	1	2	2	1	1	1	1	1		2
CO5	3	1	1	2	1	1	1	1	1	1		2

COURSE INFORMATION SHEET

Course code: ME 102
Course title: Engineering Graphics Lab
Credits: 2.0 L: 0, T:0, P:4
Class schedule per week: 04
Class: B. Tech
Semester / Level: I / First
Branch: All
Name of Teacher:

Course Objectives

This course enables the students:

1.	To understand the basic principles of Engineering Graphics, which include projections of 1D, 2D and 3D objects.
2.	To visualize a solid object (including sectioned) and convert it into drawing.
3.	To visualize different views of any object.
4.	To develop skill to draw objects using software.
5.	To inculcate the imagination and mental visualization capabilities for interpreting the geometrical details of common engineering objects.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Understand the fundamentals of Engineering Graphics and sketch the orthographic projections of points, lines and planes.
CO2	Sketch the orthographic projections of solids and section of solids.
CO3	Sketch three dimensional isometric views and development of the surfaces.
CO4	Create and modify orthographic projections using AutoCAD software.
CO5	Create three dimensional solid models using AutoCAD software.

(ME 102) Engineering Graphics Lab

Syllabus

Module 1: Introduction to orthographic projections, Conventions, Fundamentals of First and Third Angle projection, Orthographic projections of points, lines and planes.

(9L)

Module 2: Projections of simple solids - axis perpendicular to HP, VP and inclined to one or both planes, Sectioning of solids, section plane perpendicular to one plane and parallel or inclined to other plane.

(9L)

Module 3: Development of surfaces- Development of prisms, pyramids and cylindrical & conical surfaces, Isometric projection and isometric views of different planes and simple solids, introduction to perspective projection.

(9L)

Module 4: Working with AutoCAD Commands, Cartesian Workspace, Basic Drawing & Editing Commands, Drawing: Lines, Rectangles, Circles, Arcs, Polylines, Polygons, Ellipses, Creating Fillets and Chamfers, Creating Arrays of Objects, Working with Annotations, Adding Text to a Drawing, Hatching, Adding Dimensions, Dimensioning Concepts, Adding Linear Dimensions, Adding Radial & Angular Dimensions, Editing Dimensions.

(9L)

Module 5: Create views of engineering parts in AutoCAD, case studies with examples of Mechanical/ Electrical/Civil engineering drawings.

(9L)

Text Books

1. Engineering Drawing by N. D. Bhatt, Charotar Publishing House Pvt.Ltd., 53rd, Edition, 2014.

2. Engineering Drawing and Graphics + AutoCAD by K. Venugopal, New Age International (P) Limited, 4th Reprint: June, 2017.

Reference Books

1. Engineering Graphics with Autocad by J. D. Bethune, Prentice Hall, 2007.

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Progressive evaluation	60
End Semester Lab Examination Marks	40

Assessment Components	CO1	CO2	CO3	CO4	CO5
Progressive evaluation Marks	√	√	√	√	√
End Semester Lab Examination Marks	√	√	√	√	√

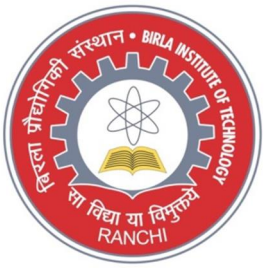
Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	2	3	1			3	3	3		
CO2	3	3	2	3	1			3	3	3		
CO3	3	3	2	3	1			3	3	3		
CO4	3	3	2	3	3			3	3	3		
CO5	3	3	2	3	3			3	3	3		



BIRLA INSTITUTE OF TECHNOLOGY MESRA

RANCHI, INDIA

CHOICE BASED CURRICULUM

Under Graduate Programme

Department of Physics

Program Outcomes

1. Demonstrate knowledge on fundamental principles and concepts, apart from the knowledge on various systems, standards and their applications related to physics.
2. Have ability for in depth analytical and critical thinking in order to conceptualize, analyse, design and improve different kinds of electronic systems and communication applications reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. Have ability to design system components and processes meeting all applicable consideration for public health and safety, cultural, societal and environmental considerations.
4. Have ability to investigate and analyse complex problems and development of appropriate solution.
5. Have ability to use lab equipment using modern tools and relevant simulation software to perform measurements, experiments, design and analysis.
6. Be able to apply reasoning informed contextual knowledge to assess societal, health, safety legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. Exhibit understanding of societal and environmental issues (health, legal, safety, cultural etc.) relevant to professional engineering practice and demonstrate knowledge of and the need for sustainable development.
8. Be committed to professional ethics, responsibilities and economic, environmental, societal, and political norms.
9. Have ability to work as an individual, in a team or team leader, in a multidisciplinary team.
10. Have ability in written and oral communications to effectively communicate product design and analysis.
11. Develop know-how in project management and finance to acquire leadership position in industry.
12. Have and interest and aptitude for life-long learning and continuous professional development.

COURSE INFORMATION SHEET

Course code: PH 113
Course title: PHYSICS
Pre-requisite(s): Intermediate Physics and Intermediate Mathematics
Co- requisite(s):
Credits: 4 L:3 T:1 P:0
Class schedule per week: 3+1
Class: B. Tech
Semester / Level: I/First
Branch: ALL
Name of Teacher:

Course Objectives

This course enables the students:

1	To explain principles of physical optics.
2	To construct Maxwellôs equations from basic principles and use it to solve electromagnetic plane wave equations.
3	To distinguish between Newtonian Mechanics and special theory of relativity and develop the relationship of length contraction, time dilation and Einstein energy mass relation and to apply the concepts of special theory of relativity in various field of physics and engineering.
4	To illustrate the phenomena of old quantum theory and derive Heisenberg uncertainty principle and Schrödingerôs equations.
5	To understand basic lasing action, study various types of lasers and to have basic idea of fiber optics.

Course Outcomes

After the completion of this course, students will be able:

CO1	To interpret the intensity variation of light due to Polarization, interference and diffraction.
CO2	To formulate and solve the engineering problems on electromagnetism.
CO3	To explain special theory of relativity and apply its concepts in various fields of physics and engineering.
CO4	To explain fundamentals of quantum mechanics and apply it to problems on bound states.
CO5	To analyze working principle of lasers and to summarize its applications.

(PH 113) PHYSICS

Module-1	Physical Optics: Polarization, Malusô Law, Brewsterôs Law, Double Refraction, Interference in thin films (Parallel films), Interference in wedge-shaped layers, Newtonôs rings, Fraunhofer diffraction by single slit, Double slit.	**[9L]**
Module-2	Electromagnetic Theory: Curl, Gradient, Divergence, Gauss theorem, Stokes theorem, Gaussôs law, Applications, Concept of electric potential, Relationship between E and V, Polarization of dielectrics, dielectric constant, Boundary conditions for E & D, Gaussôs law in magnetostatics, Ampereôs circuital law, Boundary conditions for B & H, Equation of continuity of charge, Displacement current, Maxwellôs equations.	**[9L]**
Module-3	Special Theory of Relativity: Introduction, Inertial frame of reference, Galilean transformations, Postulates, Lorentz transformations and its conclusions, Length contraction, time dilation, velocity addition, Mass change, Einstein's mass energy relation.	**[9L]**
Module-4	Quantum Mechanics: Planck's theory of black-body radiation, Compton effect, Wave particle duality, De Broglie waves, Davisson and Germer's experiment, Uncertainty principle, physical interpretation of wave function, Schrodinger equation in one dimension, free particle, particle in an infinite square well.	**[9L]**
Module-5	Lasers: Spontaneous and stimulated emission, Einstein's A and B coefficients, Population-inversion, Light amplification, Basic laser action, Ruby and He-Ne lasers, Properties and applications of laser radiation, Elementary ideas of fiber optics and application of fiber optic cables.	**[9L]**

Text books:

T1: A. Ghatak, Optics, 4th Edition, Tata Mcgraw Hill, 2009
T2: Mathew N.O. Sadiku, Elements of Electromagnetics, Oxford University Press, 2001
T3: Arthur Beiser, Concept of Modern Physics, 6th edition, Tata McGraw- Hill, 2009

Reference books:

R1: Fundamentals of Physics, Halliday, Walker and Resnick

Gaps in the syllabus (to meet Industry/Profession requirements) : NA

POs met through Gaps in the Syllabus : NA

Topics beyond syllabus/Advanced topics/Design : NA

POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods	
Lecture by use of boards/LCD projectors/OHP projectors	Y
Tutorials/Assignments	Y
Seminars	N
Mini projects/Projects	N
Laboratory experiments/teaching aids	N
Industrial/guest lectures	N
Industrial visits/in-plant training	N
Self- learning such as use of NPTEL materials and internets	Y
Simulation	N

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	**% Contribution during CO Assessment**
Mid Sem Examination Marks	25
End Sem Examination Marks	50
Quiz	10+10
Teacherôs assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Mid Sem Examination Marks	√	√	√		
End Sem Examination Marks	√	√	√	√	√
Quiz I	√	√			
Quiz II			√	√	

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Graduate Attributes

Course Outcome #	Graduate Attributes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2		3	3	3		3	2	2		3
2	3	3		3	3	3		3	2	2		3
3	3	1		2	1	2		3	2	2		3
4	3			3	2	2		2	2	2		3
5	2	3		3	3	3	3	2	2	2		3

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1 and CD2
CD2	Tutorials/Assignments		CO2	CD1 and CD2
CD3	Seminars		CO3	CD1 and CD2
CD4	Mini projects/Projects		CO4	CD1 and CD2
CD5	Laboratory experiments/teaching aids		CO5	CD1 and CD2
CD6	Industrial/guest lectures		-	-
CD7	Industrial visits/in-plant training		-	-
CD8	Self- learning such as use of NPTEL materials and internets		-	-
CD9	Simulation		-	-

COURSE INFORMATION SHEET

Course code: PH 114
Course title: PHYSICS LAB
Pre-requisite(s): Intermediate Physics (Theory and Lab)
Co- requisite(s):
Credits: 1.5 L:0 T:0 P:3
Class schedule per week: 3
Class: B. Tech
Semester / Level: I/ First
Branch: ALL
Name of Teacher:

List of Experiments

1. Error analysis in Physics Laboratory
2. To determine the frequency of AC mains with the help of sonometer
3. To determine the wavelength of sodium light by Newtonôs rings Method
4. To determine the resistance per unit length of a Carey Fosterôs bridge wire and then to find the resistivity of the material of a given wire.
5. Measurement of mechanical equivalent of heat by electrical method
6. Determination of refractive index of the material of a prism using spectrometer and sodium light
7. To determine the frequency of electrically maintained tuning fork by Meldeôs experiment
8. Measurement of voltage and frequency of a given signal using cathode ray oscilloscope
9. To determine the wavelength of prominent spectral lines of mercury light by a plane transmission grating using normal incidence
10. To determine the electromotive force (emf) of an unknown cell using a stretched wire potentiometer
11. To study the frequency response and quality factor of series LCR circuit.
12. To find the specific rotation of sugar solution by using a polarimeter.
13. To determine the Hall voltage and calculate the Hall coefficient and carrier concentration of a semiconductor sample

BIRLA INSTITUTE OF TECHNOLOGY
MESRA
RANCHI, INDIA

CHOICE BASED CURRICULUM

Under Graduate Programme

Department of Computer Science & Engineering

Program Outcomes (PO)

1. A graduate will demonstrate a fundamental understanding of the basic sciences, mathematics and engineering concepts by applying them to engineering problems of varying degrees of complexity.
2. A graduate will be competent in applying systematic rigor to understanding a engineering problem, exploring its background, investigating possible solution methodologies and comparing their merits and demerits.
3. A graduate shall be equipped in designing efficient solutions for complex engineering problems, while complying with all established social, medical, environmental norms.
4. A graduate shall perform high quality simulations and experiments for problems of varying degrees of complexity, interpret the outputs and infer correct results and trends from the experiments.
5. A graduate shall be adept at the use of the appropriate IT tools to rapidly prototype and deploy efficient solutions to real life problems. In doing so he should demonstrate sufficient knowledge of competing tools and their relative merits and demerits.
6. A graduate shall be sensitive to social, legal and ethical concerns and tune his knowledge to be a responsible engineer adhering to all established practices of his profession. She/he will display special concern for devising environment friendly solutions that shall make a positive impact on society.
7. A graduate will be trained as a team player, well versed in understanding the dynamics of working in a team, in leading when necessary and comfortable working across the globe.
8. A graduate will be articulate in his presentation, oral, written and graphical. He will convey his designs in unambiguous and clear terminology, use accepted documentation tools and provide instructions which are easily interpretable.
9. A graduate shall determine the financial aspects of a project with sufficient reliability, make effective cost estimates and convey achievable timelines for his/ her projects.
10. A graduate will demonstrate the traits of learning and unlearning throughout his professional career, and be willing to learn new techniques, methods and processes.
11. Will constantly endeavour to know about and keep pace with the advancement in software industry, so as to be able to contribute affectively to the organization.
12. Graduates shall strive to adept a research attitude towards all his/her assignment whether in academics, higher studies or industries.

COURSE INFORMATION SHEET

Course code: CS 101
Course title: Programming for Problem Solving
Pre-requisite(s):
Co- requisite(s): Programming for Problem Solving Lab
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B.Tech
Semester / Level: I / First
Branch: All

Course Objectives
This course enables the students:

1.	To learn computer language.
2.	To learn coding for solving scientific and engineering problems.
3.	To learn the problem-solving process through computer.
4.	To know the limitations of system during program execution.
5.	To know the practical application of various programming techniques.

Course Outcomes
After the completion of this course, students will be able:

CO1	To formulate simple algorithms for arithmetic and logical problems.
CO2	To translate the computer algorithms to computer programs.
CO3	To test and execute the programs and correct syntax and logical errors.
CO4	To apply programming to solve simple numerical method problems, differentiation of function and simple integration.
CO5	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

(CS 101) Programming for Problem Solving

Syllabus

Module I **[9L]**

Introduction to Programming:
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
Problem Solving: Steps to solve logical and numerical problems.
Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Module II **[9L]**

Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals, Iterations, Loops.

Module III **[9L]**

Array, Character array, strings. Case studies to discuss the various Problems related to Basic science (Matrix addition, Matrix-matrix multiplication, Roots of an equation etc.), Sorting, Searching.

Module IV **[9L]**

Functions (including using built in libraries), Parameter passing in functions, call by value, call by reference. Passing arrays to functions, Recursion (Finding Factorial, Fibonacci series, Ackerman function etc.).

Module V **[9L]**

Structures, Defining structures and Array of Structures
Pointers: Defining pointers, Use of Pointers in self-referential structures, File Handling

Text Books:

1. Jery R Hanly, Problem solving and Program design in C, 7th Edition, Pearson Education.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
3. ReemaThareja, Introduction to C Programming, 2nd Edition, Oxford University Press, 2015.
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice.
5. Byron Gottfried, Schaum's Outline of Programming with C, Tata McGraw-Hill.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	1	3	1	2	1	1
CO2	3	3	3	3	3	1	1	2	1	2	1	1
CO3	3	3	2	3	3	1	1	1	1	2	2	2
CO4	3	3	3	3	2	1	1	2	1	2	3	2
CO5	3	3	2	2	3	1	1	2	1	2	2	2

COURSE INFORMATION SHEET

Course code: CS 102
Course title: Programming for Problem Solving Lab
Pre-requisite(s):
Co- requisite(s): Programming for Problem Solving
Credits: L: 0 T: 0 P: 3
Class schedule per week: 1
Class: B. Tech
Semester / Level: I / First
Branch: All

Course Objectives

This course enables the students:

1.	To learn computer language.
2.	To learn coding for solving scientific and engineering problems.
3.	To learn the problem-solving process through computer.
4.	To know the limitations of system during program execution.
5.	To know the practical application of various programming techniques.

Course Outcomes

After the completion of this course, students will be able:

CO1	To formulate simple algorithms for arithmetic and logical problems.
CO2	To translate the computer algorithms to computer programs.
CO3	To test and execute the programs and correct syntax and logical errors.
CO4	To apply programming to solve simple numerical method problems, differentiation of function and simple integration.
CO5	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

Sample Program List

Module 1 & Module 2: Introduction and Control Flow

1. Write an interactive program that will read in a +ve integer value and determine the following
   i) If the integer is a prime number
   ii) If the integer is a Fibonacci number
2. WAP in C to compute sinx = x ï x^3/3! + x^5/3! ï x^7/7! é .. to five place of accuracy. Test the program for x = 1, x = 2, and x = 3. In each case display the number of terms used to obtain the final answer.
3. WAP to generate every 3rd integer beginning with I = 2 and continue for all integers that are less than 150. Calculate the sum of those integers that are evenly divisible by 5.
4. WAP to find whether a given year is a leap year or not. Modify it to generate a list of leap years between two year limits given by user.
5. WAP to display the following pattern :

```
                    11
               11   10   11
          11   10   9    10   11
     11   10   9    8    9    10   11
```

6. Using Ternary / Conditional operator find the greatest among 3 numbers.
7. WAP to convert a decimal number into an equivalent number of the input base. Test your program for base 2, 8 & 16.
8. WAP to read a number n, and print it out digit-by-digit, as a series of words. For e.g. 123 would be printed as ñone two threeò.
9. WAP to check whether any input +ve integer is palindrome or not.
10. WAP to simulate a simple calculator (+ - / * %) that takes two operands and an operator as input and displays the result.
11. WAP to find the GCD of two input +ve integer numbers. Using this find GCD of 9 numbers.
12. WAP to swap the values of two variables without using a third variable.

Module 3: Array

13. Read a line of mixed text, and then write it out with all lower case and uppercase letters reversed, all digits replaced by 0s and all other characters (non-letters and non-digits) replaced by ó*ô
14. WAP to find the product of two matrices A and B. Display the source matrices and product matrix C in matrix format.
15. WAP to find whether a given matrix is a triangular matrix or not.
16. WAP to find the transpose of a matrix. Display the source and the transposed matrix in matrix format.
17. Implement Prob. No. ï 14 to 16 using functions for reading, manipulating and displaying the corresponding matrices in matrix form.
18. WAP to sort a list of strings alphabetically using a 2-dim. Character array.
19. WAP to display the row sum and the column ï sum of an input 2- dim. Matrix. Display the source matrix with row and column sum.

Module 4: Functions, Pointer & String

20. Write a recursive function to calculate S = 2 + 4 + 6 + 8 + é é +2N. Implement the function in a complete C program.
21. Write a function that accepts two arguments an array and its size n. It performs Bubble up sort on the array elements. Using indirection operator ó*ôimplement this in a complete C program. Display the source and the sorted array.
22. Using pointer, write a function that receives a character string and a character as argument. Delete all occurrences of this character in the string. The function should return corrected string with no holes.
23. Write a function for reading character string using pointer. Calculate the length of the string (without using strlen ()). Finally print the string in reverse order, using pointer.
24. Implement prob. No. 14 using pointers representation of 2 ï dim. array.
25. Implement prob. No. 15 using pointer representation of 2 dim. array.
26. Implement prob. No. 16 using pointer representation of 2 dim. array.
27. WAP to sort a list of strings into alphabetical order using array of pointers.

Module 5: Structure and File

28. Create records of 60 students, where each record has fields-name, roll, GPA and fees. Write a function update () to reduce the fees of those students who have obtained GPA greater than 8.5 by 25% of the original fees. Write a complete program to exercise this function in the main program and display all the records before and after updation.
29. Define a structure that describes a hotel. It should have members that include the name, address, grade, average room charge and number of rooms. Write a function to perform the following operations:
    a) To print out hotels of a given grade in order of charges.
    b) To print out hotels with room charges less than a given value.
30. WAP to concatenate the contents of two files into a third file.
31. WAP to copy the content of one file into another file. Names of both the files are to be input as command line arguments

<u>Mapping of Course Outcome with Program Outcomes</u>

Course Outcome	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	1	3	1	2	1	1
CO2	3	3	3	3	3	1	1	2	1	2	1	1
CO3	3	3	2	3	3	1	1	1	1	2	2	2
CO4	3	3	3	3	2	1	1	2	1	2	3	2
CO5	3	3	2	2	3	1	1	2	1	2	2	2

BIRLA INSTITUTE OF TECHNOLOGY MESRA

RANCHI, INDIA

CHOICE BASED CURRICULUM

Under Graduate Programme

Department of Electrical and Electronics Engineering

Program Outcomes (PO)

A graduate shall

1. Be competent in applying basic knowledge of science and engineering for the purpose of obtaining solution to a multi-disciplinary problem.
2. Gain skilful knowledge of complex engineering problem analysis.
3. Be able to design system components and processes meeting all applicable rules and regulations.
4. Be proficient in arriving at innovative solution to a problem with due considerations to society and environment.
5. Be capable of undertaking suitable experiments/research methods while solving an engineering problem and would arrive at valid conclusions based on appropriate interpretations of data and experimental results.
6. Continually upgrade his/her understanding and become masterly at modern engineering and soft tools and apply them along with other appropriate techniques and resources.
7. Exhibit understanding of societal and environmental issues (health, legal, safety, cultural etc) relevant to professional engineering practice and demonstrate through actions, the need for sustainable development.
8. Be committed to professional ethics, responsibilities and economic, environmental, societal, and political norms.
9. Demonstrate appropriate inter-personal skills to function effectively as an individual, as a member or as a leader of a team and in a multi-disciplinary setting.
10. Be able to comprehend and write effective reports and design documentations; give and receive clear instructions; make effective presentations and communicate effectively and convincingly on complex engineering issues with engineering community and with society at large.
11. Be conscious of financial aspects of all professional activities and shall be able to undertake projects with appropriate management control and control on cost and time.
12. Recognize the need for continuous learning and will prepare himself/ herself appropriately for his/her all-round development throughout the professional career.

COURSE INFORMATION SHEET

Course code: EE 101
Course title: BASICS OF ELECTRICAL ENGINEERING
Pre-requisite(s): Basic Sciences
Co- requisite(s):
Credits: L: 3 T: 1 P: 0
Class schedule per week: 04
Class: B. Tech.
Semester / Level: I / FIRST
Branch: ALL
Name of Teacher:

Course Objectives

This course envisions to impart to students to:

1.	Classify different electrical circuit elements and apply suitable laws and theorems for the analysis of electrical systems.
2.	Represent series / parallel electric / magnetic circuits.
3.	Employ three phase circuits for transfer of electrical power both under balanced and unbalanced condition.
4.	Interpret the system responses under different operating conditions such as resonance, mutual coupling and star-delta conversion.
5.	Assess the working of different A.C. electrical machines.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Solve electrical circuits using Kirchhoffôs laws and apply concepts of magnetic circuits in electrical systems.
CO2	Analyze A.C. electrical circuits having dependent and independent sources for computation of responses such as voltage, current, power.
CO3	Evaluate the advantages of 3 phase system in electrical industrial applications and differentiate between balanced and unbalanced operation.
CO4	Assess the applicability of circuit theorems for practical applications.
CO5	Integrate the sources of energy for transferring power to the consumers (load).

(EE 101) Basics of Electrical Engineering

Syllabus

Module 1

Introduction: Importance of Electrical Engineering in day-to-day life, Electrical elements, properties and their classification, Ideal and Real Sources, Source Conversion.

D.C. Circuits: KCL and KVL, Loop current and Nodal voltage method Steady state analysis with independent and dependent sources, Star-Delta conversion.

Magnetic Circuits: Introduction, Series-parallel magnetic circuits, Analysis of Linear and Non-linear magnetic circuits, Energy storage, A.C. excitation, Eddy currents and Hysteresis losses.

(9L)

Module 2

Single-phase AC Circuits: Series Circuits: Common signals and their waveforms, RMS and Average value, Form factor & Peak factor of sinusoidal waveform, Impedance of Series circuits. Phasor diagram, Active Power, Power factor. Power triangle.

Parallel Circuits: Admittance method, Phasor diagram. Power, Power factor. Power triangle, Series- parallel Circuit, Power factor improvement,

Series and Parallel Resonance: Resonance curve, Qï factor, Dynamic Impedance and Bandwidth.

(9L)

Module 3

Three-Phase Circuits: Line and Phase relation for Star and Delta connection, Power relations, Analysis of balanced and unbalanced 3 phase circuits, Measurement of Power. (9L)

Module 4

Circuit Theorems: Superposition theorem, Thevenin's & Norton's Theorem, Maximum Power Transfer theorem for Independent and Dependent Sources for DC and AC circuits.

Coupled Circuits (Dot rule), Self and mutual inductances, Coefficient of coupling. (9L)

Module 5

Working principles of AC Generators, motors and transformers, working principles of measuring equipments such as digital voltmeter, ammeter, power factor meter and wattmeter.

(9L)

Text books:

1. Hughes, Electrical Technology, Pearson, 10th Edition, 2011.
2. Fitzgerald and Higginbotham, Basic Electrical Engineering, McGraw Hill Inc, 1981.
3. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering, 3rd Edition, TMH, 2009.

Reference books:

1. W. H. Hayt, Jr J. E. Kemmerly and S. M. Durbin, Engineering Circuit Analysis, 7th Edn TMH, 2010.
2. Electrical Engineering Fundamental, Vincent Del Toro, Prentice Hall, New Delhi.

Gaps in the syllabus (to meet Industry/Profession requirements)

1. Application of principles of magnetic circuits to electrical machines like transformers, generators and motors.
2. Field applications of three phase equipment and circuits in power system.
3. Applications of circuit theorems in electrical and electronics engineering.

POs met through Gaps in the Syllabus

3, 4, 12

Topics beyond syllabus/Advanced topics/Design

1. Concepts of electric, magnetic and electromagnetic fields
2. 3 - ∧ power generation and transmission
3. Power factor improvement for three phase systems
4. Utility of reactive power for creation of electric and magnetic fields

POs met through Topics beyond syllabus/Advanced topics/Design

2, 3, 4, 12

Course Delivery methods
Lecture by use of boards/LCD projectors/OHP projectors
Tutorials/Assignments
Seminars
Mini projects/Projects
Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of NPTEL materials and internets
Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Mid Semester Examination	25
End Semester Examination	50
Quiz (s)	10+10
Assignment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Mid Semester Examination	√	√	√		
End Semester Examination	√	√	√	√	√
Quiz (s)	√	√	√	√	√
Assignment	√	√	√	√	√

Indirect Assessment –

1. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	3	1	3	1	1	1				2
CO2	3	3	3	1	3	1	1	1				2
CO3	3	3	3	3	3	1	2	2		1	1	2
CO4	3	3	3	1	3		1	1		1	1	2
CO5	3	3	3	3	3	1	1	1	1	1	1	2

3= High, 2=Medium, 1=Low

COURSE INFORMATION SHEET

Course code: EE102
Course title: Electrical Engineering Laboratory
Pre-requisite(s): Physics, Fundamentals of Mathematics and Electrical Engineering.
Credits: L:0 T:0 P:3
Class schedule per week: 3

Course Overview: Concepts of measuring instruments, AC RLC series parallel circuit operation, resonance, KVL and KCL, circuit theorems, 3-phase star and delta connections, measurement of low and high resistance of D.C. machine, measurement of power by three voltmeter, three-ammeter methods, measurement of power of 3-phase induction motor by two-wattmeter method.

Course Objectives
This course enables the students:

1	To describe students practical knowledge of active and passive elements and operation of measuring instruments
2	To demonstrate electrical circuit fundamentals and their equivalent circuit models for both 1-ű and 3- ű circuits and use circuit theorems
3	To establish voltage & current relationships with the help of phasors and correlate them to experimental results
4	1. To conclude performance of 1 ï ʌ AC series circuits by resonance phenomena 2. To evaluate different power measurement for both 1-ű and 3- ű circuits

Course Outcomes
After the completion of this course, students will be able to:

CO1	classify active and passive elements, explain working and use of electrical components, different types of measuring instruments;
CO2	illustrate fundamentals of operation of DC circuits, 1-ű and 3- ű circuits and also correlate the principles of DC, AC 1-ű and 3- ű circuits to rotating machines like Induction motor and D.C machine.;
CO3	measure voltage, current, power, for DC and AC circuits and also represent them in phasor notations;
CO4	analyse response of a circuit and calculate unknown circuit parameters;
CO5	recommend and justify power factor improvement method in order to save electrical energy.

List of Experiments:

1. **Name: Measurement of low & high resistance of DC shunt motor**

Aim:
(i) To measure low resistance of armature winding of DC shunt motor
(ii) To measure high resistance of shunt field winding of DC shunt motor

2. **Name: AC series circuit**

Aim:
(i) To obtain current & voltage distribution in AC RLC series circuit and to draw phasor diagram
(ii) To obtain power & power factor of single phase load using 3- Voltmeter method and to draw phasor diagram

3. **Name: AC parallel circuit**

Aim:
(i) To obtain current & voltage distribution in AC RLC parallel circuit and to draw phasor diagram
(ii) To obtain power & power factor of single phase load using 3- Ammeter method and to draw phasor diagram

4. **Name: Resonance in AC RLC series circuit**

Aim :
(i) To obtain the condition of resonance in AC RLC series circuit
(ii) To draw phasor diagram

5. **Name: 3 phase Star connection**

Aim :
(i) To establish the relation between line & phase quantity in 3 phase star connection
(ii) To draw the phasor diagram

6. **Name: 3 phase Delta connection**

Aim :
(i) To establish the relation between line & phase quantity in 3 phase delta connection
(ii) To draw phasor diagram

7. **Name: 3 phase power measurement**

Aim :
(i) To measure the power input to a 3 phase induction motor using 2 wattmeter method
(ii) To draw phasor diagram

8. **Name: Self & mutual inductance**

Aim :
To determine self & mutual inductance of coils

9. **Name: Verification of Superposition, Thevenin's and Reciprocity theorem**

Aim :
(i) To verify Superposition theorem for a given circuit
(ii) To verify Thevenin's theorem for a given circuit

10. Name: Verification of Norton's, Tellegen's and Maximum Power transfer theorem
Aim :
(i) To verify Norton's theorem for a given circuit
(ii) To verify Maximum Power transfer theorem for a given circuit

Gaps in the syllabus (to meet Industry/Profession requirements)
1. Application of principles of magnetic circuits to electrical machines like transformers, generators and motors
2. Visualize Phase sequence

POs met through Gaps in the Syllabus: 1, 2, 3, 7.

Topics beyond syllabus/Advanced topics/Design
1. Assignment : Simulation of electrical circuits with dependent/independent sources by various techniques (Mesh current/Node Voltage/Thevenin's theorem/Norton's theorem/Maximum power transfer theorem etc.) using MATLAB/PSIM/C++ softwares
2. Active/reactive power calculation for 3 ï ∧ circuits

POs met through Topics beyond syllabus/Advanced topics/Design: 5, 6, 7, 8, 9.

Mapping of lab experiment with Course Outcomes

Experiment	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
1	3	3	3	2	
2	3	3	3	3	2
3	3	3	3	3	2
4	3	3	3	3	2
5	3	3	3	1	
6	3	3	3	1	
7	3	3	3	2	2
8	3	3	3	3	
9	3	3	3	2	
10	3	3	3	2	

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors
CD2	Tutorials/Assignments
CD3	Mini projects/Projects
CD4	Laboratory experiments/teaching aids
CD5	Self- learning such as use of NPTEL materials and internets
CD6	Simulation

Course Evaluation:

Daily individual assessment through viva:	20	
Regular evaluation of fair and rough copy:	15+5=20	Progressive evaluation (60)
Regularity/Punctuality:	10	
Assignment:	10	
Practical examinations:	20	
End sem Viva-voce :	20	end evaluation (40)
TOTAL:	**100**	

Mapping of Course Outcomes onto Course Objectives

Course Outcome #	Course Objectives			
	CO1	CO2	CO3	CO4
1	3	3	3	3
2	3	3	3	3
3	3	3	3	3
4	3	3	3	3
5	2	3	3	3

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	3	3	3	L	3	3	3	3	3	3
2	3	3	3	2	2	2	2	3	3	3	3	3
3	3	3	3	2	2	2	2	2	3	3	2	3
4	3	3	3	3	3	1	2	2	3	3	2	2
5	3	3	3	3	3	2	3	3	3	3	3	3

Mapping of Course Outcomes onto Program Educational Objectives

Course Outcome #	Program Educational Objectives			
	1	2	3	4
1	3	3	2	2
2	3	3	3	
3	3	3	3	2
4	3	3	3	
5	H	H	M	M

Mapping Between COs and Course Delivery (CD) methods

Course Outcome	Course Delivery Method
CO1	CD1,CD2,CD4, CD5
CO2	CD1,CD4,CD5
CO3	CD1,CD3,CD4,CD5,CD6
CO4	CD1,CD2,CD4, CD5
CO5	CD4, CD5

Course Delivery (CD) methods		Program Outcomes (PO)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CD1	Lecture by use of boards/LCD projectors	2	1	1	2	3	1						
CD2	Tutorials/ Assignments	2	2	2	2	3	3			3	3	1	2
CD3	Seminars												
CD4	Mini projects/Projects												
CD5	Laboratory experiments/teaching aids	3	3	3	3	3	1		2	3	2	2	3
CD6	Industrial/guest lectures												
CD7	Industrial visits/in-plant training												
CD8	Self- learning such as use of NPTEL materials and internets	3	3	3	3	3	3	2	3	2	3	2	2
CD9	Simulation	3	3	3		3	3			2	2		