



Integral University, Lucknow

Effective from Session:2024-25							
Course Code	EE103	Title of the Course	Basic Electrical Engg	L	T	P	C
Year	I	Semester	I / II	3	0	2	4
Pre-Requisite	None	Co-requisite	None				
Course Objectives	<ul style="list-style-type: none"> Knowledge and concept of D.C Circuit Analysis and Network Theorems Circuit. Use of Steady State Analysis of Single-Phase AC Circuits AC fundamentals. Knowledge and concept of Three Phase AC Circuits Three phase system and measuring devices. Basic concepts of Power System and Transformer Study of Electromechanical energy conversion devices: AC/ DC Machines. 						

Course Outcomes	
CO1	Know about the concept of D.C Circuit Analysis and Network Theorems Circuit.
CO2	Steady State Analysis of Single Phase AC Circuits AC fundamentals.
CO3	Know about concept of Three Phase AC Circuits Three phase system and measuring devices
CO4	Layout of Power System and transformer
CO5	Know about Electromechanical energy conversion devices: AC/ DC Machines

THEORY				
Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	D.C. Circuit Concept and its Analysis	Circuit concepts: Active and passive elements, linear and nonlinear network, unilateral and bilateral elements, Series and Parallel connections, Ohms law, Kirchoff's Law: loop and nodal methods of analysis. Network theorems: Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem	8	CO1
2	Domestic/ Single Phase A.C. Circuits and its Analysis	AC fundamentals: Average and effective value of Sinusoidal waveform , form factor and peak factor, Concept of phasor, Analysis of R, L and C Circuits, power factor, Apparent, active and reactive powers, causes and problems of low power factor, resonance in series RLC circuit.	8	CO2
3	Commercial/ Industrial Three Phase A.C. Circuits and its measurement	Three phase system: Its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply, line and phase voltage/current relationship. Measuring Instruments: Types of instruments: construction and working principle of PMMC, MI type instruments, Electrodynamicometer type wattmeter.	8	CO3
4	Transformer and its concept in Household/ Commercial application	Magnetic circuit: Concepts, analogy between electric and magnetic circuit. Single Phase Transformer: Principle of operation, construction, emf equation, losses and efficiency.	8	CO4
5	House Hold/ Industry oriented Electrical Machines	UNIT-5: House Hold / Industry oriented Electrical Machines DC Machines: Construction, Types, Principle of operation and application. Single Phase Induction Motor: Principle of operation and application. Three Phase Induction Motor: Principle of operation and application. Three Phase Synchronous Machines: Principle of operation and application.	8	CO5

PRACTICAL				
S. No.	List of Experiments	Contact Hrs.	Mapped CO	
1	Verification of Thevenin's Theorem.	2	1	
2	Verification of Superposition Theorem.	2	1	
3	Verification of Maximum Power Transfer Theorem.	2	1	
4	To study V-I characteristics of diode.	2	2	
5	To study the input & output characteristics of BJT in CE configuration.	2	2	
6	To study the full wave rectifier circuit with & without filter and determine the ripple factor.	2	2	
7	To study the phenomenon of resonance in series RLC circuit.	2	3	
8	Determination of losses in single phase transformer by OCT and SCT.	2	3	
9	To calibrate a single-phase induction type energy meter.	2	4	
10	To study the running and reversing of a three phase SCIM.	2	4	

11	Study of OP Amp based inverting and non-inverting amplifier	2	2
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Reference Books:

1. V.Deltoro, "Principle of Electrical Engg." PHI, 2009..
2. M.A Mallick, Dr. I. Ashraf, "Fundamental of Electrical Engg," CBS Publishers, 2010.
3. A. Hussain, "Basic Electrical Engg" Dhanpat Rai & sons, 2007
4. I J Nagrath, "Basic Electrical Engg" ,TMH, 2010.

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	1	3						3	3	3	2	3
CO2	3	3	3	2	1	1						2	3	2	2	3
CO3	3	2	1	1	2	2	3					3	2	2	2	3
CO4	3	2	2	2	3	3						2	3	2	2	3
CO5	3	1	1	1	1	2	1					2	3	2	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation



Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	EC101	Title of the Course	Basic Electronics	L	T	P	C
Year	I	Semester	I	3	0	0	3
Pre-Requisite		Co-requisite					
Course Objectives	<ul style="list-style-type: none"> Understand the basics of semiconductors, including how current flows and how various types of diodes work. Analyze the characteristics and biasing techniques of Bipolar Junction Transistors (BJTs) and Field Effect Transistors (FETs). Design and implement basic circuits using operational amplifiers (op-amps) for various functionalities like inverting, integrating, and differentiating signals. Grasp the concepts of number systems, logic gates, and Boolean algebra, and learn how to simplify logic functions using Karnaugh maps. Explore different types of sensors and transducers, understand the working principles of basic motors, and learn about common consumer electronics and their applications. 						

Course Outcomes	
CO1	Understand and analyze the behavior of semiconductor materials and basic electronic devices like diodes and transistors.
CO2	Design and build circuits using operational amplifiers for various applications.
CO3	Apply Boolean algebra and logic gates to simplify digital circuits.
CO4	Comprehend the working principles of various sensors, transducers, and basic motors for robotics.
CO5	Demonstrate a basic understanding of common consumer electronics and their functionalities.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Semiconductor & Devices	Current Conduction in Semiconductors, Electrons and holes, PN junction diode, working and its characteristic, Halfwave and full wave rectifiers, LED. BJT characteristics and circuits: Transistor, configuration and characteristics, transistor biasing.	8	CO1
2	Field Effect Transistors	JFET: Working and its characteristics, MOSFET: Working of Enhancement and depletion type, Biasing of FET. Implementation of Basic functions through circuits (Using Operational Amplifier) Op-Amp & its application: Inverting, Non-inverting, integrator, differentiator. Summer.	8	CO2
3	Number System & Logic gates	Number system, Conversion, 2's and 10's, 1's Compliments, 9's Compliments Addition and Subtraction, Boolean algebra, Logic gates, Minimization of logical function using Karnaugh map.	8	CO3
4	Sensors & Transducers	Types and Application of Sensors & Transducers, Pressure sensor, IR sensors, PiezoElectric transducers. Basics of Motors: Working principle of Servo Motors, Stepper Motors.	8	CO4
5	Consumer Electronics	Working of TV, Remote, Microwave Oven, Washing Machine, Electronic Security systems. Application of Digital Multimeter	8	CO5

Books recommended:

Text Books:

1. Bolyested & Nashekey: Electronic Devices and Circuit Theory, PHI.
2. J. S. Katre, Electronics Engineering, Tech-Max Publication.
3. B.R. Gupta, V. Singhal, Consumer Electronics, S.K. Kataria & Sons.
4. S. H. Saeed, Automatic Control System, S.K. Kataria & Sons.

Reference Book:

Milliman & Halkias: Integrated Electronics, McGraw- Hill

e-Learning Source:

- https://www.youtube.com/watch?v=4_nGFY7zgDM
- https://www.youtube.com/results?search_query=diode+characteristics
- <https://nptel.ac.in/courses/117108140>
- <https://nptel.ac.in/courses/108102156>

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3			2							3	2		
CO2	3	2	3										3		3	3
CO3	3	3	3	2	2			1					3	2		
CO4	3	3	2			2						1	3		3	3
CO5	3	2	2	1	1			1				1	3	2		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Effective from Session:2024-25							
Course Code	HM101	Title of the Course	RASHTRA GAURAV	L	T	P	C
Year	I	Semester	I	2	0	0	0
Pre-Requisite	Intermediate (Any Stream)	Co-requisite	None				
Course Objectives	The objective of the course on "Rashtra Gaurav" is to explore and critically analyze the multifaceted dimensions of national pride and glory, as depicted in the paper. Participants will delve into the historical, cultural, social, and political aspects that contribute to the concept of "Rashtra Gaurav" (National Pride) in the context of the specific themes and perspectives presented in the paper. Through in-depth discussions, readings, and interactive sessions, participants will gain a comprehensive understanding of the factors that shape and define a nation's sense of pride, and how these factors influence individual and collective identities. The course aims to foster a nuanced appreciation for the significance of "Rashtra Gaurav" in contemporary society, encouraging participants to critically evaluate its implications and applications within diverse global contexts.						

Course Outcomes	
CO1	To understand the basics of Indian Society and culture.
CO2	To understand the literature, science and astrology.
CO3	To understand Indian heritage.
CO4	To examine the philosophical and spiritual developments in India.
CO5	To evaluate the contributions of Major National Characters and Personalities.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Indian Society & Culture	<ul style="list-style-type: none"> Unity in Diversity: Cultural & Religious Harmony Indian Diaspora Ancient Indian Civilization. National and International Awards & Awardees 	05	01
2	Literature, Science, Astrology	<ul style="list-style-type: none"> Indian Epics: Ramayan & Mahabharata Prominent litterateur: Shudrak, Kalidas, Amir Khusru, Kautilya's Arthashastra Panini's Ashtadhyayi 	05	02
3	Indian Heritage	<ul style="list-style-type: none"> Cultural Heritage in India: Buddhist Monuments at Sanchi, Ajanta & Ellora Caves, Khajuraho, Taj Mahal Tourist Places in India: Red Fort, Ambar Palace, Kaziranga National Park 	04	03
4	Philosophical and Spiritual Developments	<ul style="list-style-type: none"> Sufism & Bhakti Movement: Bulleh Shah, Data Ganj Baksh, Khwaja Moinuddin Chishti, and Nizamuddin Auliya. Tulsidas, Surdas, Meera, Nanak & Kabir Jainism: Mahavir's Biography and Education Buddhism: The life of Buddha, Contributions of Buddhism to India's Culture 	05	04
5	Major National Characters And Personalities	<ul style="list-style-type: none"> Ashoka the Great and His Dhamma Raja Ram Mohan Roy & Brahma Samaj Swami Vivekanand and his philosophies Mahatma Gandhi: Role of Gandhi in Indian National Movement Dr. Bhimrao Ambedkar: A Chief architect of the Indian Constitution 	06	05

Reference Books:
Jawaharlal Nehru - "The Discovery of India" B.R. Ambedkar - "Annihilation of Caste" Ramachandra Guha - "India After Gandhi: The History of the World's Largest Democracy" Mahatma Gandhi - "My Experiment with Truth" S C Dubey- "Indian Society" Nadeem Hasnain - "Indian Society and Culture" G Shah- "Social Movements in India"

Course Articulation Matrix: (Mapping of COs with POs and PSOs)										
PO-PSO	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	3	3	2	2	3	2	1	2
CO2	3	2	2	3	1	2	3	1	2	1
CO3	1	2	2	2	2	3	2	3	3	2
CO4	1	3	2	3	2	3	2	3	1	3
CO5	2	3	1	2	2	3	1	3	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign and seal of HoD
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Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	ME101	Title of the Course	Basic Mechanical Engineering & Workshop	L	T	P	C
Year	I	Semester	I / II	3	0	2	4
Course Objectives	To impart knowledge to the students of basic thermodynamics process and laws along with mechanics of materials, their properties and fabrication techniques						

Course Outcomes	
CO1	Understand the basic concepts of thermal sciences and temperature measurement on the basis of zeroth law of thermodynamics
CO2	Understand and apply first and second law of thermodynamics in various processes and systems
CO3	Will be able to model the problem using free-body diagrams and reach to solution by using equilibrium equations
CO4	Will be able to perform structural analysis for safe design and fabrication techniques
CO5	Will be able to understand mechanical properties of engineering materials, their testing and different operations performed in workshop to make components
CO6	Learn to perform operations on lathe machine shop, fitting shop, carpentry shop
CO7	Learn to perform operations on sheet metal shop, smithy shop, welding shop

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Fundamental Concepts for modelling of thermal systems	Role of thermodynamics in different fields of engineering, thermodynamics system, surrounding and universe, macroscopic & microscopic point of view, concept of continuum, thermodynamic equilibrium, property, state, path, process, Energy and its form, temperature and it's measurement, Zeroth law of thermodynamics.	08	CO1
2	First law & Second law of thermodynamics as a tool for analysing thermal systems	First law of thermodynamics and its application for non flow processes, Flow processes and control volume, Flow work, Steady flow energy equation, Mechanical work in a steady flow process. Essence of second law of thermodynamics, Thermal reservoir, heat engines, COP of heat pump and refrigerator and its introduction to industrial applications. Statements of second law, Carnot cycle, Clausius inequality and its applications.	08	CO2
3	Introduction to engineering mechanics and its application	Role of engineering mechanics in different fields of engineering, Laws of motion, Transfer of force to parallel position, Resultant of planer force system. Free Body diagrams, equilibrium and its equation, Coulomb's law of friction, Equilibrium of bodies involving dry friction.	08	CO3
4	Structure analysis for safe design	Beams: Introduction, its types and uses in engineering application, concept of shear force and bending moment, Shear and bending moment diagram for statically determinate beams. Simple Stress and strain: Introduction, Normal & shear stress-strain for unidirectional loading, pure bending of beam and its applications.	08	CO4
5	Mechanical properties and testing of engineering materials	Introduction to engineering materials & their applications, Mechanical properties of engineering materials. Mechanical Testing: Tensile and compressive test, stress-strain diagrams for ductile and brittle materials, bending test, hardness test and impact test.	08	CO5

Practical				
S. No.	Name of shop	List of experiments	Contact Hrs.	Mapped CO
1	Machine shop	To study and sketch a lathe machine To perform facing, plain turning, step turning, taper turning & chamfering operations	4	CO6
2	Fitting shop	To perform step cutting, filing, drilling & tapping To make a 90° v-groove fitting on mild steel flat	4	CO6
3	Carpentry shop	To make a mortise and tenon joint To make a corner lap joint	4	CO6
4	Smithy shop	To make a square punch from mild steel round rod To make a pipe hook from a mild steel round rod	4	CO7
5	Welding shop	To weld the two given plates & make a lap joint (by arc welding) To weld the two given plates & make a butt joint (by arc welding)	4	CO7
6	Sheet metal	To perform different fabrication operations in sheet metal shop	4	CO7

Reference Books:

- ◆ Van Wylen G.J. & Sonntag R.E. Fundamentals of Classical Thermodynamics, John Wiley & Sons, Inc. NY
- ◆ Wark Wenneth: Thermodynamics (2nd edition) Mc Graw Hill Book Co. NY
- ◆ Holman, J.P.: Thermodynamics, Mc Graw Hill Book Co. NY
- ◆ Shames I.H., Engineering Mechanics, P.H.I

- ◆ Callister W. D., 2006, "Materials Science and Engineering-An Introduction", 6th Edition, Wiley India
- ◆ Khurmi R.S, Workshop Technology, S.Chand Publication

e-Learning Source:

https://www.youtube.com/watch?v=Dy2UeVCSRYs&list=PL2_EyjPqHc10CTN7cHiM5xB2qD7BHUr7

<https://www.youtube.com/watch?v=DzyIEz3dKXQ&t=1s>

https://www.youtube.com/watch?v=A-3W1EbQ13k&list=PLyqSpQzTE6M_MEUdn1izTMB2yZgP1NLfs

<https://www.vlab.co.in/>

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO- PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1		2						3	3	2	2
CO2	3	3	3	2		3						3	3	3	2
CO3	3	3	3	2		3						3	3	2	1
CO4	3	2	2	2		3						3	3	2	1
CO5	3	3	2	1		3						3	3	2	2
CO6	3	1		2		2			2			3	3	3	3
CO7	3	1		2		2			2			3	3	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation



Effective from Session: 2024-25							
Course Code	EC105	Title of the Course	Introduction to Artificial Intelligence & Applications	L	T	P	C
Year	I	Semester	I	2	1	0	3
Pre-Requisite		Co-requisite					
Course Objectives	<ul style="list-style-type: none"> Understand the history and evolution of AI. Learn about the basic techniques for problem-solving and search. Explore knowledge representation and reasoning. Gain an introductory understanding of machine learning and its applications. Discuss and understand the ethical considerations in AI. Explore practical applications of AI in various domains. 						

Course Outcomes	
CO1	Identify key milestones in AI history and applications using Bloom's Knowledge dimension.
CO2	Apply search algorithms such as BFS, DFS, A*, and evaluate their efficiency in problem-solving (Comprehension).
CO3	Analyze logical agents' decisions using propositional and first-order logic (Application).
CO4	Evaluate machine learning models' performance through supervised and unsupervised learning techniques (Analysis).
CO5	Create ethical frameworks for AI applications in various domains like healthcare and finance (Synthesis).

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to AI and Intelligent Agents	Overview of AI, History and evolution of AI, Applications of AI, Intelligent agents and environments, Rationality and types of agents	8	CO1
2	Problem-Solving and Search	Problem-solving agents, Uninformed search strategies: BFS, DFS, UCS, Informed search strategies: A*, Greedy, Local search algorithms, Constraint Satisfaction Problems (CSP)	8	CO2
3	Knowledge Representation and Reasoning	Logical agents, Propositional logic, First-order logic, Planning and acting in the real world	8	CO3
4	Machine Learning	Introduction to machine learning, Supervised vs. unsupervised learning, Decision tree learning, Neural networks and deep learning, Model evaluation and validation	8	CO4
5	Applications of AI	Reinforcement learning: Q-learning and policy gradients, Natural Language Processing (NLP), AI applications in healthcare, AI applications in finance, AI applications in robotics, AI in autonomous systems, Ethical considerations in AI	8	CO5

Books recommended:

Text Books:

1. Poole, D. L., & Mackworth, A. K. (2017). Artificial Intelligence: Foundations of Computational Agents (2nd ed.). Cambridge University Press.

2.	Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill
3.	Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Prentice Hall of India
Reference Book:	
1.	Russell, S., & Norvig, P. (2021). Artificial Intelligence: A Modern Approach (4th ed.). Pearson.
e-Learning Source:	
1.	https://nptel.ac.in/courses/106105077
2.	https://www.techtarget.com/searchenterpriseai/definition/AI-Artificial-Intelligence
3.	https://nptel.ac.in/courses/106106140

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	1	2	1	1	2	2	1	2	1	2	2	1
CO2	3	3		2	3	1	1	1	3	3	1	2	3	3	2	1
CO3	2	1	3	3	2	2	1	1	3	1	3	2	3	1	3	1
CO4	1	1	3	3	3	1	1	1	3	3	1	3	2	2	2	2
CO5	1	1	2	1	1	3	2	3	1	2	2	1	1	2	1	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	MT101	Title of the Course	Mathematics I	L	T	P	C
Year	1st	Semester	1st	3	1	0	4
Pre-Requisite	None	Co-requisite	None				
Course Objectives	<ul style="list-style-type: none"> The course is aimed to develop the skills in mathematics which is necessary for grooming them into successful engineering graduate. The topics introduced will serve as basic tools for specialized studies in science field. 						

Course Outcomes	
CO1	Able to calculate rank of matrix, characteristic equation & characteristic roots & use the applicability of Cay lay Hamilton Theorem to find inverse of matrix which is very important in many engineering application.
CO2	To develop ability to solve higher derivative, expansion of functions in ascending power of variable & partial derivatives.
CO3	Develops ability to solve Jacobian, error and approximation and Extrema of the function.
CO4	Learn the evaluation policy of some special function like gamma & Beta function. & their relation which is helpful to evaluate some definite integral arising in various branch of Engineering.
CO5	Able to determine vector differentiation and integration.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Differential Equations	Linear differential equations of first order, Linear differential equations of higher order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).	8	CO1
2	Laplace Transform	Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Unit step function, Dirac-delta function, Laplace transform of periodic functions, Inverse Laplace transform, Convolution theorem, Applications to solve simple linear and simultaneous differential equations.	8	CO2
3	Fourier Series and Partial Differential Equations	Periodic functions, trigonometric series, Fourier series of period 2π , Euler's formulae, functions having arbitrary period, change of interval, Even and odd functions, Half range sine and cosine series. Introduction of partial differential equations, linear partial differential equations with constant coefficients of second order and their classifications to parabolic, elliptic and hyperbolic forms with illustrative examples.	9	CO3
4	Applications of Partial Differential Equations	Method of separation of variables for solving partial differential equations, Wave equation up to two-dimensions, Laplace equation in two-dimensions, Heat conduction equations up to two dimensions, Equations of transmission Lines.	8	CO4
5	Basic Statistics and curve fitting	Mean, Median, Mode, Standard deviation and Variance, Method of least squares, Curve fitting of straight line and parabola.	7	CO5

Reference Books:

1. E. Kreyszig Advanced Engineering Mathematics, Wiley Eastern Ltd.
2. Jaggi and Mathur Advanced Engineering Mathematics, Khanna Publication.
3. B. S. Grewal Higher Engineering Mathematics, Khanna Publication.
4. Dennis G. Zill Advanced Engineering Mathematics, CBS Publication.

e-Learning Source:

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																		
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	3	3	2	1	1	3						3	3	3	2	3	
CO2	3	3	3	2	1	1						2	3	2	2	3		
CO3	3	2	1	1	2	2	3					3	2	2	2	3		
CO4	3	2	2	2	3	3						2	3	2	2	3		
CO5	3	1	1	1	1	2	1					2	3	2	2	3		

3- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation



Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CH101	Title of the Course	Chemistry	L	T	P	C
Year	1 st	Semester	2 nd	3	1	0	4
Pre-Requisite	None	Co-requisite	None				
Course Objectives	<ul style="list-style-type: none"> The core is aimed to develop the skills in Chemistry which is necessary for grooming shes in casual engineering graduate. The topics introduced will serve as basic tools for specialized studies in science field. 						

Course Outcomes	
CO1	Analyze and compare magnetic behavior and stability of heteronuclear diatomic molecules, Significance of hydrogen bonding band theory, radius ratio, density of unit cell, fullerenes and graphite
CO2	Comprehension of types of polymers to make an appropriate choice of use of polymers (Natural, synthetic and biodegradable)
CO3	Compare reaction intermediates and mechanism of chemical reactions and isomerism.
CO4	Interpret phase rule, phase diagram, corrosion and its prevention, calculation of activation energy, rate constant, half-life period, emf of electrochemical cells, construction and operation of galvanic cell and concentration cells.
CO5	Determination of calorific value, analyzing water softening methods, principles, instrumentations of UV, IR and NMR spectroscopy and their applications.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Chemical bonding and state of matter:	Molecular theory of hetero diatomic molecules, Band theory of bonding in metals, Hydrogen bonding. Solid state chemistry: Radius ratio rule, Space lattice (only cubes), Types of Unit cells, Bragg's law, calculation of density of unit cell. One and Two Dimensional solids, Graphite as two dimensional solid and its conducting and lubricating properties. Fullerene and its applications.	8	CO1
2	Polymers:	Polymerization and its classification, Thermoplastic and thermosetting resins. Elastomers (Buna-S, Buna-N, thiokols, polyurethanes, silicones), Polyamides (Nylon-6, Nylon-6,6, Nylon-6,10, Nylon-11, Kevlar), Polyesters (Terelene), Polyacrylates (PMMA, PAN, PVC). Organic conducting and biodegradable polymers.	8	CO2
3	Structural and mechanistic concepts in organics:	Stability of reaction intermediates, e.g. Carbanions, Carbocations and free radicals. Types of organic reactions, mechanism of nucleophilic substitution reactions. Mechanism of the following name reactions. i. Aldolcondensation ii. Cannizzaro reactioniii. Beckmann rearrangement iv. Hofmann rearrangement and v. Diels-Alderreaction E-Z Nomenclature. R.S configuration, Optical isomerism of organic compounds containing one chiral center. Examples of optically active compounds without chirality. Conformations of n-butane.	8	CO3
4	Reaction kinetics, Phase rule, Electrochemistry and Corrosion:	Order and molecularity of reactions. First and second order reactions. Energy ofactivation. Phase Rule, its application to one component system(water). Equilibrium potential, electrochemical cells (galvanic and concentrationcells) Electrochemical theory of corrosion and protection ofcorrosion.	8	CO4
5	Analytical methods, Fuel and Water treatment:	Basic principles of spectroscopic methods. The use of UV, Visible, IR, 1HNMR, for the determination of structure of simple organic compounds. Classification of fuels, determination of gross and net calorific values using Bomb Calorimeter. Hardness of water, softening of water by Lime-Soda process, Zeolites and ion exchange resins process and Reverse Osmosis. Treatment of boiler feed water by Calgon process.	8	CO5

Reference Books:

1. Jain P. C. and Jain M. 1994. Engineering Chemistry. Danpat Rai publishing company Pvt. Ltd., Delhi.
2. Bahl B.S, Arun Bahl and Tuli B.D. 2007. Essentials of Physical Chemistry. S. Chand and Co. Ltd., Delhi.
3. Industrial Chemistry B.K Sharma, Goel publishing house.

e-Learning Source:

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																		
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1	3	3	2	1	1	3						3	3	3	2	3	
CO2	3	3	3	2	1	1						2	3	2	2	3		
CO3	3	2	1	1	2	2	3					3	2	2	2	3		
CO4	3	2	2	2	3	3						2	3	2	2	3		
CO5	3	1	1	1	1	2	1					2	3	2	2	3		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation