Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

ML307 ENVIRONMENTAL MANAGEMENT AND SUSTAINABILITY

SUBJECT CODE	CATEGORY	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
ML-307	Compulsory	Environmental Management and Sustainability	60	20	20	0	0	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher's Assessment** shall be based upon following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objective

1. To create awareness towards various environmental problems.
2. To create awareness among students towards issues of sustainable development.
3. To expose students towards environment friendly practices of organizations.
4. To sensitize students to act responsibly towards environment.

Examination Scheme

The internal assessment of the students' performance will be done out of 40 Marks. The semester Examination will be worth 60 Marks. The question paper and semester exam will consist of two sections A and B. Section A will carry 36 Marks and consist of five questions, out of which student will be required to attempt any three questions. Section B will comprise of one or more cases / problems worth 24 marks.

Course Outcomes

1. The course will give students an overview of various environmental concerns and practical challenges in environmental management and sustainability.
2. Emphasis is given to make students practice environment friendly behavior in day-to-day activities.

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COURSE CONTENT

Unit I: Introduction to Environment Pollution and Control

1. Pollution and its types (Air, Water, and Soil): Causes, Effects and Control measures
2. Municipal Solid Waste: Definition, Composition, Effects
3. Electronic Waste: Definition, Composition, Effects
4. Plastic Pollution: Causes, Effects and Control Measures

Unit II: Climate Change and Environmental Challenges

1. Global Warming and Green House Effect
2. Depletion of the Ozone Layer
3. Acid Rain
4. Nuclear Hazards

Unit III: Environmental Management and Sustainable Development

1. Environmental Management and Sustainable Development: An overview
2. Sustainable Development Goals (17 SDGs)
3. Significance of Sustainable Development
4. Environment Friendly Practices At Workplace and Home (Three Rs' of Waste Management, Water Conservation, Energy Conservation)

Unit 1V: Environmental Acts

1. The Water (Prevention and Control of Pollution) Act, 1974: Objectives, Definition of Pollution under this act, Powers and Functions of Boards
2. The Air (Prevention and Control of Pollution) Act, 1981:Objectives, Definition of Pollution under this act, Powers and Functions of Boards
3. The Environment (Protection) Act, 1986: Objectives, Definition of important terms used in this Act, Details about the act.
4. Environmental Impact Assessment: Concept and Benefits

Unit V:Role of Individuals, Corporate and Society

1. Environmental Values
2. Positive and Adverse Impact of Technological Developments on Society and Environment
3. Role of an individual/ Corporate/ Society in environmental conservation
4. Case Studies: The Bhopal Gas Tragedy, New Delhi's Air Pollution, Arsenic Pollution in Ground Water (West Bengal), Narmada Valley Project, Cauvery Water Dispute,Fukushima Daiichi Disaster (Japan), Ozone Hole over Antarctica, Ganga Pollution, Deterioration of Taj Mahal, Uttarakhand flash floods

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Suggested Readings:

1. Rogers, P.P., Jalal, K.F. , Boyd, J.A.(Latest Edition) . **An Introduction to Sustainable Development.** Earthscan
2. Kalam, A.P.J. (Latest Edition) .***Target 3 Billon: Innovative Solutions Towards Sustainable Development.*** Penguin Books
3. Kaushik , A. and Kaushik (Latest Edition).***Perspectives in Environmental Studies***. New Delhi: New Age International Publishers.
4. Dhameja, S.K. (Latest Edition). ***Environmental Studies***. S.K. Kataria and Sons.New Delhi
5. Bharucha,E. (Latest Edition). ***Environmental Studies for Undergraduate Courses.*** New Delhi: University Grants Commission.
6. Wright, R. T. (Latest Edition). ***Environmental Science: towards a sustainable future*** .New Delhi: PHL Learning Private Ltd.
7. Rajagopalan, R. (Latest Edition). ***Environmental Studies***. New York: Oxford University Press.

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Vishwavidyalaya, Indore	Vishwavidyalaya, Indore			

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

ML-301 ENVIRONMENT AND ENERGY STUDIES

SUBJECT CODE	CATEGORY	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
ML-301	Compulsory	Environment and Energy Studies	60	20	20	0	0	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher's Assessment** shall be based upon following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives :

1. Understand sources of information required for addressing environmental challenges.
2. Identify a suite of contemporary tools and techniques in environmental informatics.
3. Apply literacy, numeracy and critical thinking skills to environmental problem-solving.

Course Outcomes

1. Apply the principles of ecology and environmental issues that apply to air, land and water issues on a global scale.
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community.

Unit I: Environmental Pollution and Control Technologies - Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and industrial pollution, Ambient air quality standards. Water pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid Waste management composition and characteristics of e - Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, Secondary and Tertiary.

Unit II: Natural Resources - Classification of Resources: Living and Non - Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problem, Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources:

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Growing energy needs, renewable energy source, case studies.

Unit III: Ecosystems: Definition, Scope and Importance ecosystem. Classification, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Energy flow in the ecosystem, Biogeochemical cycles, Bioaccumulation, Ecosystem Value, Devices and Carrying Capacity, Field visits.

Unit IV: Biodiversity and its Conservation - Introduction - Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a megadiversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man wild life conflicts; Conservation of biodiversity: In-situ and Ex-situ conservation. National Biodiversity Act.

Unit V: Environmental Policy, Legislation & EIA - Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP)

Recommended Readings:

1. Agarwal, K.C. (2001). ***Environmental Biology***. Bikaner: Nidi Pub. Ltd.
2. Brunner, R.C. (1993). ***Hazardous Waste Incineration***. New Delhi: McGraw Hill Inc.
3. Clank, R.S. (2001). ***Marine Pollution***. New York: Oxford University Press.
4. De, A.K. (2001).***Environmental Chemistry.*** New Delhi: Wiley Western Ltd.
5. Bharucha , Erach (2005). ***Environmental Studies for Undergraduate Courses.*** New Delhi: University Grants Commission.
6. Rajagopalan, R. (2006). ***Environmental Studies***. New York: Oxford University Press.
7. AnjiReddy, M. (2006).***Textbook of Environmental Sciences and Technology***. BS Publication.
8. Wright, Richard T. (2008). ***Environmental Science: towards a sustainable future*** .New Delhi: PHL Learning Private Ltd.
9. Gilbert M. Masters and Wendell P. Ela .(2008).***Environmental Engineering and science***. University Kindom:PHI Learning Pvt Ltd.
10. Botkin ,Daniel B. & Edwards A. Keller(2008).***Environmental Science.*** New Delhi: Wiley INDIA edition.
11. Kaushik ,Anubha (2009).***Environmental Studies***. New Delhi: New age international publishers.

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B. Sc. Physics Hons

III Sem

Subject Code	Category	Subject Name	Teaching and Evaluation Scheme								
			Theory			Practical		Th	T	P	CREDITS
			End Sem University Exam	Two Term Exam	Teachers Assessment*	End Sem University Exam	Teachers Assessment*				
BSPHPH 302	DC	Solid State and Electronics Principles	60	20	20	30	20	4	1	0	5

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Solid State and Electronics Principles and ability to apply them for laying the foundation for research and development. 2. To work ethically as member as well as leader in a diverse team.
Course Ourcomes	1. Student will be able to understand and solve the problems related to Solid State and Electronics Principles. 2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Abbreviation		**Teacher Assessment (Theory) shall be based on following components: Quiz / Assignment/ Project / Participation in class (Given that no component shall be exceed 10 Marks).**
Th	Theory	
T	Tutorial	**Teacher Assessment (Practical) shall be based on following components: Viva / File / Participation in Lab work (Given that no component shall be exceed 50% of Marks).**
P	Practical	

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Dr. UTTAM SHARMA
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BSPHPH 302: Solid State and Electronics Principles

UNIT I Crystal Structure and bonding: Crystalline and amorphous solids. Translational symmetry. Lattice and basis. Unit cell. Reciprocal lattice. Fundamental types of lattices (Bravias Lattice). Miller indices Lattice planes. Simple cubic. Face centered cubic. Body centered cubic lattices. Laue and Bragg's equations. Determination of crystal structure with X-rays, X- ray spectrometer. lonic, covalent, metallic, van der Waals and hydrogen bonding. Band theory of solids. Periodic potential and Bloch theorem. Kronig-Penny model (Qualitative).

UNIT II Semiconductors; Intrinsic and extrinsic semiconductors, mobility and charge density of charge carriers, Fermi Level, Temperature dependence of electron and hole concentrations, Doping: impurity states, n and p type semiconductors, conductivity, Hall Effect, Hall Coefficient. Semiconductor devices: Metal-semiconductor junction, p-n junction, majority and minority carriers,

UNIT III Zener and tunnel diodes, light emitting diode, schottkey diod, solar cell Diode, load line concept, rectification, Half wave and full wave rectifier, ripple factor, voltage stabilization, IC voltage regulation, Transistors, Characteristics of a transistor in CB, CE and CC mode, h-parameters.

UNIT IV FETs: Field effect transistors, n-channel FET, p-channel FET, JFET, MOSFET, Amplifiers,Small signal amplifiers; General Principle of operation, classification, distortion, RC coupled amplifier, gain frequency response, input and output impedance, multistage amplifiers, Transformer coupled amplifiers, Equivalent circuits at low, medium and high frequencies, emitter follower, low frequency common source and common drain amplifier, Noise in electronic circuits.

UNIT V Oscillators, Feedback in amplifiers, principle, its effects on amplifiers, characteristicsPrinciple of feedback amplifier, Barkhausen criteria, Hartley, Colpitt and Wein bridge oscillators. Condition for oscillations and frequency derivation Crystal oscillator, Monostable, Bi-stable and Astable multivibrators, propogation of radio waves in the absence of magnetic field, role of ionosphere, elementry idea of microwave, optical and satelite communication, basic theory of amplitude modulation.

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Dr. UTTAM SHARMA
Professor & Head
Department of Physics
Shri Vaishnav Institute of Science

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References:

1. Introduction to Solid State Physics, C. Kittel, VIII Edition, John Wiley and Sons, New York, 2005.
2. Intermediate Quantum theory of Crystalline Solids. A. O. E. Animalu, Prentice-Hall
3. of India private Limited, New Delhi 1977.
4. Solid State Electronic devices. B. G. Streetman, I Edition Prentice Hall. India.
5. Microelectronics, J. Millman and A. Grabel McGraw Hill New York.
6. The Physics and Chemistry of Nanosolids: Frank J. Owens, and Charles P. Poole Jr., Wiley Inter Science, 2008.
7. Physics of Low Dimensional Semiconductors: An introduction; J.H. Davies. Cambridge University Press, U.K., 1998.
8. Electronic fundamentals and applications. J. D. Ryder, Prentice Hall. India.

List of Experiments

1. To find V-I characteristics of P-N junction diode.
2. To find V-I characteristics of Zener diode.
3. To find V-I characteristics of Tunnel diode.
4. To find V-I characteristics of photo diode.
5. To find input/output characteristics of common base PNP/NPN transistor.
6. To find input/output characteristics of common emitter PNP/NPN transistor.
7. To determine energy band gap using PN junction diod.
8. To study frequency of Hartley oscillator.
9. To study frequency of Wein bridge oscillator.
10. To Study RC coupled amplifiers.
11. To find the characteristics of different types of LED.
12. To study of Regulated power supply using FET.
13. To study of Regulated power supply using Zener.
14. To study of Regulated power supply using transister.
15. To study of Half and full rectifier.

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Department of Physics
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B. Sc. Physics Hons

III Sem

Subject Code	Category	Subject Name	Teaching and Evaluation Scheme								
			Theory			Practical		Th	T	P	CREDITS
			End Sem University Exam	Two Term Exam	Teachers Assessment	End Sem University Exam	Teachers Assessment				
BSPHPH 303	DC	Classical Physics	60	20	20	0	0	4	1	0	5

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Classical Physics and ability to apply them for laying the foundation for research and development. 2. To work ethically as member as well as leader in a diverse team.
Course Ourcomes	1. Student will be able to understand and solve the problems related to Classical Physics. 2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Abbreviation		**Teacher Assessment (Theory) shall be based on following components: Quiz / Assignment/ Project / Participation in class (Given that no component shall be exceed 10 Marks).**
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T	Tutorial	**Teacher Assessment (Practical) shall be based on following components: Viva / File / Participation in Lab work (Given that no component shall be exceed 50% of Marks).**
P	Practical	

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BSPHPH 303: CLASSICAL PHYSICS

UNIT I Classical Mechanics of Point Particles: Review of Newtonian Mechanics; Application to the motion of a charge particle in external electric and magnetic fields- motion in uniform electric field, magnetic field- gyroradius and gyrofrequency, motion in crossed electric and magnetic fields. Generalized coordinates and velocities, Hamilton's principle, Lagrangian and the Euler-Lagrange equations, one-dimensional examples of the Euler-Lagrange equations-

UNIT II One-dimensional Simple Harmonic Oscillations and falling body in uniform gravity; applications to simple systems such as coupled oscillators Canonical momenta & Hamiltonian. Hamilton's equations of motion. Applications: Hamiltonian for a harmonic oscillator, solution of Hamilton's equation for Simple Harmonic Oscillations; particle in a central force field-conservation of angular momentum and energy.

UNIT III Small Amplitude Oscillations: Minima of potential energy and points of stable equilibrium, expansion of the potential energy around a minimum, small amplitude oscillations about the minimum, normal modes of oscillations example of N identical masses connected in a linear fashion to (N -1) identical springs.

UNIT IV Special Theory of Relativity: Postulates of Special Theory of Relativity. Lorentz Transformations. Minkowski space. The invariant interval, light cone and world lines. Space-time diagrams. Time-dilation, length contraction and twin paradox. Four-vectors: space-like, time-like and light-like. Four-velocity and acceleration. Metric and alternating tensors. Four-momentum and energy-momentum relation. Doppler effect from a four-vector perspective.

UNIT V Concept of four-force. Conservation of four-momentum. Relativistic kinematics. Application to two-body decay of an unstable particle. Fluid Dynamics: Density ρ and pressure P in a fluid, an element of fluid and its velocity, continuity equation and mass conservation, stream-lined motion, laminar flow, Poiseuille's equation for flow of a liquid through a pipe, Navier-Stokes equation, qualitative description of turbulence, Reynolds number.

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Indore

Dr. UTTAM SHARMA
Professor & Head
Department of Physics
Shri Vaishnav Institute of Science

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References

1. Classical Mechanics, H.Goldstein, C.P. Poole, J.L. Safko, 3rd Edn. 2002, Pearson Education.
2. Mechanics, L. D. Landau and E. M. Lifshitz, 1976, Pergamon.
3. Classical Electrodynamics, J.D. Jackson, 3rd Edn., 1998, Wiley.
4. The Classical Theory of Fields, L.D Landau, E.M Lifshitz, 4th Edn., 2003, Elsevier.
5. Classical Mechanics, P.S. Joag, N.C. Rana, 1st Edn., McGraw Hall.
6. Classical Mechanics, R. Douglas Gregory, 2015, Cambridge University Press.
7. Solved Problems in classical Mechanics, O.L. Delange and J. Pierrus, 2010, Oxford Press

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Professor & Head
Department of Physics
Shri Vaishnav Institute of Science

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Name of the Program:B. Sc. (Honours)

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
BSHMA 304	HONS	Integral Calculus and Differential Equations	60	20	20	-	-	4	0	-	4

Course Objective

To introduce the students with the Fundamentals of the Integral Calculus and OrdinaryDifferential Equations.

Course Outcomes

After the successful completion of this course students will be able to

1. *understand and apply the basics of the Integral Calculus .*
2. *evaluate Integrals of various types.*
3. *apply the techniques to find length, surface area and volume by integration.*
4. *know the reason behind formation and solution of Differential Equations.*
5. *understand and apply the basics of theDifferential Equations.*

Course Content:

UNIT – I

Integral Calculus: Integration of the form : $\int \frac{dx}{a\cos x + b\sin x + c}$, $\int \frac{a\cos x + b\sin x + c}{p\cos x + q\sin x + r} dx$ and Integration of Rational functions. Evaluation of definite integrals. Integration as the limit of a sum (with equally spaced as well as unequal intervals).Reduction formulae of $\int \sin^m x dx$ $\cos^n x dx$, $\int (\sin^m x/\cos^n x) dx$, $\int \tan^n x\, dx$ and associated problems (*m* and *n* are non-negative integers).

UNIT – II

Definition of Improper Integrals: Statements of (i) μ -test, (ii) Comparison test (Limit form excluded) – Simple problems only. Use of Beta and Gamma functions (convergence and important relations being assumed).Working knowledge of Double integral.

UNIT – III

Applications: Rectification, Quadrature, Volume and Surface areas of solidsformed by revolution of plane curve and areas – Problems only.

UNIT – IV

Differential Equations: Order, degree and solution of an ordinary differential equation (ODE) inpresenceof arbitrary constants. Formation of ODE.First order equations**:**(i) Variables separable.(ii) Homogeneous equations and equations reducible to homogeneous forms.(iii) Exact equations and those reducible to such equation.

UNIT – V

Euler's and Bernoulli's equations (Linear).Clairaut's Equations: General and Singular solutions.Simple applications : Orthogonal Trajectories.**Second order linear equations:** Second order linear differential equationswith constant. Coefficients. Euler's Homogeneous equations.

BOOKS:

1. Integral Calculus – Shanti Narayan & P. K. Mittal (S. Chand & Co. Ltd.)
2.Integral Calculus – H. S. Dhami (New Age International)
3Integral Calculus – B. C. Das & B. N. Mukherjee (U. N. Dhur)
4. Differential & Integral Calculus (Vols. I & II) – Courant & John.
5. Differential & Integral Calculus (Vol. I) – N. Piskunov
6. Differential Equations – Lester R. Ford (McGraw Hill).
7. Differential Equations – S. L. Ross (John Wiley).
8. Differential Equations – H. T. H. Piaggio.
9. A Text Book of Ordinary Differential Equations – Kiseleyev, Makarenko&Krasnov (Mir).
10. Differential Equations – H. B. Phillips (John Wiley & Sons).
11. Differential Equations with Application & Programs – S. BalachandaRao, H.R. Anuradha (University Press).
12. Text Book of Ordinary Differential Equations (2nd Ed.) – S. G. Deo, VLakshmikantham& V. Raghavendra (Tata McGraw Hill).
13. An Elementary Course in Partial Differential Equation – T. Amarnath(Narosa).
14. An Introductory Course on Ordinary Differential Equation – D. A. Murray.

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A – Quiz/Assignment/Attendance, MST Mid Sem Test.

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSHCH 305	HONS	ANALYTICAL CHEMISTRY & ADVANCED CONCEPTS OF GENERAL CHEMISTRY - I	60	20	20	0	0	4	0	0	4

***Teacher Assessment** shall be based on following components: Quiz/Assignment/Project/ Participation in class, given that no component shall exceed more than 10 marks.

Course Objective:

(i) To develop the understanding of fundamentals of Analytical Chemistry and General Chemistry.
(ii) To give basic knowledge of Analytical Chemistry.

Course Outcomes:

After completion of the course the students will be able to understand:

(i) Fundamentals of Chemistry.
(ii) Fundamentals of Analytical Chemistry.

Analytical Chemistry & Advanced Concepts of General Chemistry - I

Unit I: Periodicity of Elements:
s, p, d, f block elements, the long form of periodic table. Detailed discussion of the following properties of the elements, with reference to *s* & *p*- block.
(a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.
(b) Atomic radii (van der Waals)
(c) Ionic and crystal radii.
(d) Covalent radii (octahedral and tetrahedral)
(e) Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy.
(f) Electron gain enthalpy, trends of electron gain enthalpy.
(g) Electro negativity, Pauling's/ Mulliken's/ Allred Rachow's/ and Mulliken-Jaffe's Electro negativity scales. Variation of electro negativity with bond order, partial charge,

hybridization, group electro negativity. Sanderson's electron density ratio.

Unit II : Chemistry of Aliphatic Hydrocarbons

A. Carbon-Carbon sigma bonds

Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz- Fittig Reactions, Free radical substitutions: Halogenation - relative reactivity and selectivity.

B. Carbon-Carbon pi bonds

Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ Anti Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti hydroxylation (oxidation). 1, 2- and 1, 4- addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene.

Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

Unit III :Solid State:

Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analysis of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals.

Unit IV: Chemical Kinetics

Order and molecularity of a reaction, rate laws in terms of the advancement of a reaction, differential and integrated form of rate expressions up to second order reactions, experimental methods of the determination of rate laws, kinetics of complex reactions (integrated rate expressions up to first order only): (i) Opposing reactions (ii) parallel reactions and (iii) consecutive reactions and their differential rate equations (steady-state approximation in reaction mechanisms) (iv) chain reactions. Temperature dependence of reaction rates; Arrhenius equation; activation energy. Collision theory of reaction rates, Lindemann mechanism, qualitative treatment of the theory of absolute reaction rates.

Surface chemistry: Physical adsorption, chemisorption, adsorption isotherms. nature of adsorbed state. Catalysis: Types of catalyst, specificity and selectivity.

Unit V : Optical methods of analysis:

Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.

UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument; Basic principle of

quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers. Determination of composition of metal complexes using Job's method of continuous variation and mole ratio method.
Infrared Spectrometry: Basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instrument; sampling techniques. Structural illustration through interpretation of data, Effect and importance of isotope substitution.

Books:

1. Lee, J.D. *Concise Inorganic Chemistry*, ELBS.
2. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford.
3. Atkins, P. W. & Paula, J. de *Atkin's Physical Chemistry* 8th Ed., Oxford University Press.
4. Ball, D. W. *Physical Chemistry* Thomson Press, India.
5. Vogel, Arthur I: *A Test book of Quantitative Inorganic Analysis* (Rev. by GH Jeffery and others). The English Language Book Society of Longman.
6. Willard, Hobert H. *et. al*: *Instrumental Methods of Analysis*, Wardsworth Publishing Company, Belmont, California, USA.

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ShriVaishnav Institute of Computer Applications

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			End Sem University Exam	Two Term Exam	Teachers Assessment*	End Sem University Exam	Teachers Assessment*				
BSCS304	COMPULSORY	Fundamentals of Data Structure	60	20	20			3	1	0	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A – Quiz/Assignment/Attendance, MST - Mid Sem Test.

***Teacher Assessment** shall be based on following components:
Quiz/Assignment/project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Educational Objectives(CEOs):

- To understand the students with the applications of Standard data structure in real world problems.
- To provide knowledge of creation of new data structures.
- To familiarize the students with the analysis and design a particular problem.

Course Outcomes (Cos):students will be able to

- Demonstrate familiarity with major algorithms and data structures.
- Analyze performance of algorithms.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs
- Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick sort.
- Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.
- Demonstrate understanding of various searching algorithms.
- Program multiple file programs in a manner that allows for reusability of code.
- Compare different implementations of data structures and to recognize the advantages and disadvantages of the different implementations.

UNIT 1

Introduction and Overview: Introduction, Basic Terminology, Elementary Data Organization, Overview of Data Structures Types, Data Structure Operations, Algorithms: Complexity, Time-Space Tradeoff, Frequency count: Simple algorithms. Abstract data type (ADT), Fundamental and derived data types, Primitive data structures.

UNIT 2

Arrays: Definition, Terminology, One dimensional array: Memory allocation, Operations, Application, Multidimensional Arrays: Two dimensional Arrays, Sparse matrices, Three dimensional and n-dimensional Arrays, Pointer Arrays.

UNIT 3

Stacks: Introduction , Definition, Representation of stacks, Operations on stacks, Applications of stacks.
Linked List: Definition, Singly Linked List: Representation, Operations; Circular Linked List, Header Linked Lists, Doubly Linked List: Operations, Circular Doubly Linked List: Operations, Application of Linked Lists: Sparse Matrix Manipulation, Polynomial Representation; Dynamic Storage Management; Memory Representation: Fixed, Variable block storage, Deallocation Strategy.

UNIT 4

Queues: Introduction, Definition, Representation of Queues: Arrays Representation, Linked list Representation; Various Queue structures: Circular Queue, Deques, Priority Queue; Applications of Queues.
Trees: Concepts, Representation of Binary Trees in Memory, Operations on Binary Tree, Types of Binary Trees.
Graphs: Introduction, Graph terminologies, Sequential Representation of Graphs: Adjacency Matrix, Path Matrix; Adjacency List Representation, Shortest Path Algorithms: Dijkstra's Technique, Bellman-Ford Algorithm, Floyd-Warshall Algorithm; Minimum Spanning Tree Algorithms: Kruskal's Algorithm, Prim's Algorithm; Operations on Graphs, Traversing and Searching a Graph, Application of Graph Structures.

UNIT 5

Searching: Sequential and Binary Search, Indexed Search, Hashing Schemes, Hashing functions: Division/Remainder methods, Mid Square method, Folding method; Hash Collision: linear probing, Chaining, Bucketing.
Sorting: Selection sort, Bubble sort, Insertion sort, Quick sort, Merge sort, Radix sort, Shell sort, Heap sort, Comparison of time complexities.

TEXT BOOKS:

[T1] Seymour Lipschutz, Data Structures, *The**McGraw Hill** Companies*
[T2] Horowitz, Sahni, Anderson-Freed; Fundamentals of Data Structures in C; *Universities Press*

REFERENCE BOOKS:

[R1] NarasimhaKarumanchi, Data Structures and Algorithms Made Easy,*CareerMonk Publications*
[R2] Thomas H. Cormen , Charles E. Leiserson, Ronald L. Rivest, Clifford Stein; Introduction to Algorithms, *The MIT Press*
[R3] Debasis Samanta, Classic Data Structures, *Prentice Hall India*