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:

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

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.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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	

Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

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

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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.

Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

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

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya

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.

Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

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

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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).**
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	

Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

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

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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.

Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

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

Chairperson
Board of Studies
Shri Valshnav Vidyapeeth Vishwavidyalaya
Indore

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

Registrar
Vaishnav Vidyapeeth Vishwavidyalaya
Indore

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

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

ShriVaishnavVidyapeethVishwavidyalaya, Indore

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.