SEMESTER III

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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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

B.Sc. (Life Science / Biotechnology / Chemistry)

SEMESTER III

COURSE CODE	Category	COURSE 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*				
BSLS302	**DC**	**Morphology, Physiology and Developmental Biology of Angiosperms**	60	20	20	30	20	4	0	2	6

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Objectives:

1. To study the morphology and physiology of higher plants.
2. To study the stages of development in higher plants.

Course Outcomes:

1. Student will be able to understand the structural and functional aspects of higher plants
2. Student will be able to understand the various stages of development in higher plants

UNIT-I

The Root system: Root apex and Anatomy of root in monocotyledons and dicotyledons.
The Shoot system: Shoot apex and Anatomy of shoot in monocotyledons and dicotyledons.
Phyllotaxy and Anatomy of leaf in monocotyledons and dicotyledons.

UNIT-II

Morphology of flower. Microsporogenesis and Megasporogenesis, Pollination and Fertilization.
Development of embryo and endosperm in dicotyledons and monocotyledons.

UNIT-III

Properties of water, water potential, absorption and transport. Transpiration and mechanism of stomata. Soil-plant-atmosphere continuum. Drought, heat stress, salinity stress and chilling.

UNIT-IV

Photosynthesis: pigments, antenna and reaction centers. Primary light reactions, electron transport chain and phosphorylation.Calvin cycle and carbon fixation in C3, C4 and CAM plants.
Respiration: Glycolysis, TCA cycleand oxidative phosphorylation in Mitochondria.

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BSLS302: Morphology, Physiology and Developmental Biology of Angiosperms

UNIT-V

Plant growth and photomorphogenesis. Phytochrome structure and function. Photoperiodism, Physiology of flowering and vernalization.

Plant movements, autonomic and Paratonic movements.

BSLSL305 Practical:

1) Histological study of roots of Monocots and Dicots
2) Histological study of Monocot and dicot stem
3) Morphology of monocot and dicot leaves
4) Floral organs, floral formula and floral diagram
5) Morphology of pollen grains
6) Morphology of ovary and placenta
7) Parts of Seed, embryo and endosperm
8) Plasmolysis and de-plasmolysis
9) Differential permeability
10) Isolation and absorption spectra of chlorophyll and carotenoids
11) Separation of chlorophyll and carotenoids by paper chromatography
12) Isolation of chloroplasts and demonstration of Hill activity
13) Scotomorphogenesis and photomorphogenesis
14) Gravitropic and phototropic movement

Books:

1. Embyology of Angiosperms- Bhojwani, S.S. and Bhatnagar, S.P.
2. An Introdyction to Embyology of Angiosperms- Maheshwari, P. , McGraw Hill Inc., N.Y.
3. Anatomy- Singh V., Pandey P.C. and Jain, D.K.
4. Modern Plant Physiology- Sinha, R.K. Narosa Publishing House.
5. Textbook of Plant Physiology - Verma V., Ane books Publishers.
6. An Introduction to Plant Anatomy-B.P. Pandey, S.Chand Publications.

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BSBT303	**DC**	**Metabolism and Genetic Engineering**	60	20	20	30	20	4	0	2	6

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/ Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives:

1. To understand the biochemistry of primary and secondary metabolism
2. To understand the principles of genetic engineering

Course Outcomes:

1. Student will have the knowledge of synthesis and degradation of biomolecules
2. Students will be able to understand the application part of molecular biology

UNIT –I:

Carbohydrate metabolism – aerobic and anaerobic glycolysis.Gluconeogenesis.Pentose phosphate pathway.
Lipid metabolism – synthesis and degradation of fatty acids.

UNIT – II:

Nitrogen metabolism: Biological nitrogen fixation. Nitrate reduction and its regulation, Ammonia assimilation.
Biosynthesis of amino acids. Oxidation of amino acids and production of urea.

UNIT III:

Protein synthesis. Protein targeting and degradation.
Biosynthesis and degradation of nucleotides.

UNIT-IV

Principles and applications: Maxam Gilbert's and Sanger's DideoxyDNA Sequencing techniques, Next Generation Sequencing, Gene Therapy, DNA microarray.

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BSBT303: Metabolism and Genetic Engineering

UNIT – V

Production and applications of transgenic plants, animals and microbes.
Genetic engineering and human diseases.
Biosafety guidelines and ethical issues of genetic engineering

BSBTL306 Practical:

1. Extraction and estimation of carbohydrates
2. Extraction and estimation of lipids
3. Extraction and estimation of proteins
4. Gel electrophoresis of proteins
5. Extraction of DNA from plant cells
6. Extraction of DNA from animal cells
7. Genomic DNA isolation from microorganisms
8. Spectrophotometric analysis of DNA
9. Analysis of DNA by Agarose gel electrophoresis
10. Extraction of RNA from plant cells
11. Extraction of RNA from animal cells
12. Extraction of RNA from microorganisms

Books:

1. Gene IX – Lewin B, Jones and Barlett Publishers.
2. Molecular Biology of the gene, Watson et al, Benjamin Cummings Publishing Company Inc.
3. Molecular Biology of the cell, Garland.
4. Molecular Biotechnology, Glick BR and Pasternak JJ, ASM Press.
5. Molecular Cell Biology, Lodish et al.
6. Gene Cloning, Brown TA.

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BSCH304	**DC**	**Inorganic Chemistry I**	60	20	20	30	20	3	0	2	5

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

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

UNIT – I

I. Atomic Structure:

Idea of de-Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, significance of ψ and ψ^2 , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d, orbitals, Aufbau and Pauli exclusion principles, Hund's multiplicity rule, Electronic configurations of the elements, effective nuclear charge.

II. Periodic Properties:

Detailed discussion of the following properties with examples

(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) Electronegativity.

UNIT- II

Chemical Bonding:

(A) Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, valence shall electron pair repulsion (VSEPR) theory to NH3, SF4, ICl^{-2} and H2O, MO theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electro-negativity difference.

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BSCH304 Inorganic Chemistry I

(B) Ionic Solids – Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, lattice energy and polarizing power and polarisability of ions, Fajan's rule.
(C) Weak Interactions – Hydrogen bonding, Vander Waals forces.

UNIT- III
Chemistry of *s* and *p* block elements:
Inert pair effect, Relative stability of different oxidation states, diagonal relationship and anomalous behaviour of first member of each group. Allotropy and catenation.
Hydrides and their classification ionic, covalent and interstitial.
Study of the following compounds with emphasis on structure, bonding, preparation,properties and uses.
Boric acid and borates, boron nitrides, borohydrides (diborane) carboranes, silanes, Oxides and oxoacids of nitrogen, Phosphorus and chlorine. Peroxo acids of sulphur, interhalogencompoundspseudohalogens and basic properties of halogens.

UNIT-IV
Coordination Compounds
Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.

UNIT-V
Hard and Soft Acids and Bases (HSAB)
Classification of acids and bases as hard and soft, Pearson's HSAB concept,acid-base strength and hardness and softness, Symbiosis, theoretical basis of hardness and softness, electro negativity and hardness and softness.

Guidelines for Practical:
A two credit lab is to be conducted by covering the most relevant and useful topics from afore mentioned syllabus.

Recommended Texts:
1. Huheey, J.E. *Inorganic Chemistry*, Prentice Hall
2. Douglas, B.E. and Mc Daniel, D.H., *Concepts & Models of Inorganic Chemistry*, Oxford
3. Lee, J.D. *Concise Inorganic Chemistry*, ELBS
4. Shriver & Atkins, *Inorganic Chemistry*, Third Edition, Oxford Press
5. H.W. Porterfield, *Inorganic Chemistry,* Second Edition, Academic Press,
6. Canham, G.R. and Overton, T., *Descriptive Inorganic Chemistry*, Freeman & Co.
7. Cotton, F.A. and Wilkinson, G, *Advanced Inorganic Chemistry*, Wiley, VCH.
8. Lippard, S.J. & Berg, J.M. *Principles of Bioinorganic Chemistry* Panima Publishing Company.

BSCH304 Inorganic Chemistry I

Practicals:

1. Calibration and use of apparatus.
2. Preparation of solutions of different Molarity /Normality.
3. Identification of cations and simple anionsin a mixture of salts containing not more than six ions (Three cations and three anions).
4. Estimation of Fe (II) and oxalic acid using standardized $KMnO_4$ solution.
5. Estimation of available chlorine in bleaching powder iodometrically.
6. Inorganic Preparations
   (i) Tetraammine copper (II) sulphate, $[Cu(NH_3)_4]SO_4.H_2O$,
   (ii) Potassium trisoxalatochromate (III), $K_3[Cr(C_2O_4)_3]$,
   (iii) Cis and trans $K[Cr(C_2O_4)_2 H_2O_2]$ Potassium dioxalatodiaquachromate(III),
   (iv) Pentaamminecarbonato Cobalt (III) ion.