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Recent Contraction of

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

DEGREE PROGRAM

B. Sc. V Sem

Subject Code	Category	Subject Name	Teaching and Evaluation Scheme										
				Prac		Γ							
			End Sem Universit y Exam	Two Term Exam	Teach ers Asses sment	End Sem Univer sity Exam	Teach ers Asses sment	Th	Т	Р	CREDITS		
BSPH 502	DC	Thermodynamics	60	20	20	0	0	3	1	0	4		

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

Abb	reviation	Teacher Assessment (Theory) shall be based on following components: Ouiz / Assignment/Decimation
Th	Theory	Participation in class (Given that no component shall be exceed 10 Marks).
Т	Tutorial	Teacher Assessment (Practical) shall be based on following components: Vivo (Dile (D) - chains and chains)
Р	Practical	Lab work (Given that no component shall be exceed 50% of Marks).

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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

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BSPH 502: Thermodynamics

UNIT I: Introduction to Thermodynamics Zeroth and First Law of Thermodynamics: Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium, Concept of Temperature, Concept of Work & Heat, State Functions, Internal Energy, and Applications of First Law: General Relation between C_P and C_V , Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient.

UNIT II: Second Law of Thermodynamics: Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work.Heat Engines.Carnot's Cycle, Carnot engine & efficiency, Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale.

UNIT III: Etropy: Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy.Entropy of a perfect gas.Principle of Increase of Entropy, Entropy Changes in Reversible and Irreversible processes with examples, Entropy of the Universe.Entropy Changes in Reversible and Irreversible Processes.Principle of Increase of Entropy, Temperature–Entropy diagrams for Carnot's Cycle. Third Law of Thermodynamics, Unattainability of Absolute Zero

UNIT IV: Thermodynamic Potentials: relation between thermodynamical potential, Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy, Cooling due to adiabatic demagnetization, First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations.

UNIT V: Maxwell's Thermodynamic Relations: Derivations and applications of Maxwell's Relations, Maxwell's Relations:(1) ClausiusClapeyron equation, (2) Values of Cp-Cv, (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.

References:

- 1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
- 2. A Treatise on Heat, MeghnadSaha, and B.N.Srivastava, 1958, Indian Press
- Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill
 Modern Thermal

Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springer.

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COURSE CODE	CATEGORY	COURSE NAME					TEAC THE	HING & I ORY	EVALUATION SCHEME PRACTICAL			
			L	Т	Р	CREDITS	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	
BSCH 503	DC	Organic Chemistry I	3	1	4	6	60	20	20	30	20	

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:

The course aims is not only the continuation study of basic principles of organic chemistry, but it will also provide the important topics in Organic chemistry functional groups including (aromatic compounds, phenols, carboxylic acids and its derivatives, aldehydes and ketones, amines, and malonic ester synthesis). This helps students to gain experience to predict the functional group transformations, simple reaction mechanisms, and the synthesis of organic molecules by multi-step synthesis strategies. In addition of that, the course will also help students to understand the reaction mechanism subjects in later stages of their study.

The general concept of the practical part of this course is to train students the fundamental laboratory skills. This includes the practical work of extraction, purification and separation techniques with some simple organic preparations which are required for experimental chemistry.

Course Outcomes:

By the end of the course the student should be able to:

- Recognize various organic functional groups.
- Understand the types of reactions in Organic Chemistry.
- Name the organic compounds commonly and systematically.
- Outline the preparation and reactions of various organic compounds.
- Draw the structure of organic compounds and curly arrows correctly.
- Suggest the reaction mechanisms of some simple organic reactions.



Syllabus:

UNIT I

Electromagnetic Spectrum Absorption Spectra

Ultraviolet (UV) absorption spectroscopy – absorption laws (Beer-Lambert law); molar absroptivity, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome, Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. U.V. spectra of conjugated enes and enones.

Infrared (**I.R.**) **absorption spectroscopy** – molecular vibrations, Hooke's law, selection rules, intensity and position of I.R. bands, measurement of I.R. spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of I.R. spectra of simple organic compounds.

UNIT II

Mechanism of Organic Reactions:

Inclusion compounds, clatherates, charge transfer complexes, resonances, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

Curved arrow notation, drawing electron movements with allows, half-headed and double-headed arrows, homolytic and heterolytic bond fission, Types of reagents – electrophiles and nucleophiles, Types of organic reactions, Energy considerations. Reactive intermediates – Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

UNIT III

Alkanes and Cycloalkanes:

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atom in alkanes, Isomerism in alkanes, sources methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes, Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity. Cycloalkanes – Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its

limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strain less rings. The case of cyclopropane ring, banana bonds.



UNIT IV

Alkenes and Cycloalkenes:

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration, The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes – mechanism involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroborationoxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO₄, Polymerization of alkenes, Substitution at the allylic and vinylic positions of alkenes, Industrial applications of ethylene and propene. Methods of formation, conformation and chemical reactions of cycloalkenes;

UNIT V

Dienes and Alkynes:

Nomenclature and classification of dienes : isolated, conjugated and cumulated dienes, Structure of allenes and butadiene, methods of formation, polymerization, chemical reaction -1, 2 and 1, 4 additions, Diels-Alder reaction. Nomenclature, structure and bonding in alkynes, Methods of formation, Chemical reactions of alkynes, acidity of alkynes, Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reductions, oxidation and polymerization.

Reference Books:

1. Robert Thornot Morrison and Robert Neilson Boyd, "Organic Chemistry", Prentice Hall of India Pvt Ltd, New Delhi, Sixth Edition, 1992.

2. Bhupinder Mehta, Manju Mehta, "Organic Chemistry", Prentice Hall of India Pvt Ltd, New Delhi, 2005.

3. James B Hedrickson Donald J. Cram and George S. Hammond, "Organic Chemistry", Mc-Graw-Hill Kogakusha,Ltd., Third Edition.

4. Arun Bahl, B. S. Bahl, "Advance Organic Chemistry", S. Chand & Company Ltd., New Delhi, First Edition, 2003.

5. I. L. Finar, "Organic Chemistry", Pearson Education Pet Ltd, New Delhi, First Edition, 2002.

6. G. Marc Loudon, "Organic Chemistry", Oxford University Press, Forth Indian edition, 2010.

7. P.S.Kalsi, "Text book of Organic Chemistry", MacMillan of India Pvt. Ltd., 1999.

8. P.S. Kalsi, "Spectroscopy of Organic Compounds", New Age International Pvt. Ltd. Publishers,



2006.

9. C.N. Banwell, "Fundamentals of Molecular Spectroscopy", McGraw-Hill, 1994.

10. Y.R. Sharma, "Elementary Organic Spectroscopy (Principles and Chemical Applications)", S. Chand, 2007.



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

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME										
			THEORY			PRACTICAL		Th	_	n	SL		
			END SEM	MST	Q/A	END SEM	Q/A	In	1	r	CRED		
BSMA 504	DC	Numerical Methods	60	20	20		-	3	1	-	4		
		& Linear		20	20	-							
		Programming											

Course Objective

To introduce the students with the Fundamentals of the Numerical Methods & Linear Programming.

Course Outcomes

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

- 1. understand and solve problems of the straight lines in 3D.
- 2. solve the problems of the planes.
- 3. know the solution of the problems of the spheres.
- 4. understand and apply the concepts of the algebra of the Right circular cone.

Course Content:

UNIT – I

Approximate numbers, Significant figures, Rounding off numbers. Error – Absolute, Relative and Percentage. **Operators** - Δ , ∇ and E (Definitions and some relations among them).**Interpolation :** The problem of Interpolation, Equispaced arguments – Difference Tables, Deduction of Newton's Forward Interpolation Formula. Remainder term (expression only). Newton's Backward Interpolation formula (statement only) with remainder term. Unequally – spaced arguments –Lagrange's Interpolation Formula (statement only). Numerical problems on Interpolation with both equi- and unequally-spaced arguments.



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

UNIT – II

Number Integration: Trapezoidal and Simpson's ¹/₃rd formula (statement only). Problems on Numerical Integration. **Numerical Solution of Equation:** To find a real root of an algebraic or transcendental equation. Location of root (Tabular method), Bisection method. Newton-Raphson method with geometrical significance. Numerical problems.

UNIT – III

Linear Programming: Motivation of Linear Programming problem. Statement of L.P.P. formulation of L.P.P. Slack and Surplus variables. L.P.P. is matrix form. Convex set, Hyperplane, Extreme points, Convex Polyhedron, Basic solutions and Basic Feasible Solutions (B.F.S.) Degenerate and Non-degenerate B.F.S. The set of all feasible solutions of an L.P.P. is a convex set. The objective function of an L.P.P. assumes its optimal value at an extreme point of the convex set of feasible solutions. A B.F.S. to an L.P.P. corresponds to an extreme point of the convex set of feasible solutions.

UNIT – IV

Fundamental Theorem of L.P.P. (Statement only). Reduction of a feasible solution to a B.F.S. Standard form of an L.P.P. Solution by graphical method (for two variables), by simplex method and method of penalty. Concept of duality. Duality theory. The dual of the dual is the primal. Relation between the objective values of dual and the primal problems. Dual problems with at most one unrestricted variable, one constraint of equality.

UNIT – V

Transportation and Assignment problems and their optimal solutions.

Texts:

- 1. Numerical methods E. Balagurusamy (Tata McGraw Hill).
- 2. Introduction to numerical analysis F. B. Hilderbrand (TMH Edition).
- 3. Numerical Analysis J. Scarborough.
- 4. Introduction to numerical analysis Carl Erik Froberg (Addison Wesley Publishing).
- 5. Numerical methods for science and engineering R. G. Stanton (Prentice

Hall).

- 6. Linear Programming : Method and Application S. I. Gass.
- 7. Linear Programming G. Hadley.



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8. An Introduction to Linear Programming & Theory of Games – S. Vajda.



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

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTICAL					SL	
			END SEM	MST	Q/A	END SEM	Q/A	Th	1	r	CRED	
BSMA 505	DC	Any one of the following groups : Group A : Analytical Dynamics Group B : Probability & Statistics	60	20	20	_	-	3	1	_	4	

Group A: Analytical Dynamics

Course Objective

To introduce the students with the Fundamentals of the Analytical Dynamics.

Course Outcomes

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

- 1. understand and solve problems of the motion of a particle.
- 2. solve the problems of the motion under forces.
- 3. understand and apply the concepts of the motion in 2D.

Course Content:

UNIT – I

Velocity and Acceleration of a particle. Expressions for velocity and acceleration in rectangular Cartesian and polar co-ordinates for a particle moving in a plane. Tangential and normal components of velocity and acceleration of a particle moving along a plane curve.



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UNIT – II

Concept of Force: Statement and explanation of Newton's laws of motion. Work, power and energy. Principles of conservation of energy and momentum. Motion under impulsive forces. Equations of motion of a particle (i) moving in a straight line, (ii) moving in a plane.

UNIT – III

Study of motion of a particle in a straight line under (i) constant forces, (ii) variable forces (S.H.M., Inverse square law, Damped oscillation, Forced and Damped oscillation, Motion in an elastic string). Equation of Energy. Conservative forces.

UNIT – IV

Motion in two dimensions : Projectiles in vacuo and in a medium with resistance varying linearly as velocity. Motion under forces varying as distance from a fixed point.

UNIT – V

Central orbit. Kepler's laws of motion. Motion under inverse square law.

Texts:

1. An Elementary Treatise on the Dynamics of a Particle & of Rigid bodies – S.

L. Loney (Macmillan).

2. Dynamics of Particle and of Rigid Bodies – S. L. Loney.



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Group B: Probability & Statistics

Course Objective

To introduce the students with the Fundamentals of the Probability & Statistics.

Course Outcomes

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

- 1. understand and solve problems of the motion of a particle.
 - 2. solve the problems of the motion under forces.
 - 3. understand and apply the concepts of the motion in 2D.

Course Content:

UNIT – I

Elements of Probability Theory: Random experiment, Outcome, Event, Mutually Exclusive Events, Equality like and Exhaustive, Classical definition of Probability, theorems of Total Probability, Conditional Probability and Statistical Independence. Bayes' theorem. Problems. Shortcomings of the classical definition. Axiomatic approach –Problems. Random Variable and its Expectation. Theorems on mathematical expectation. Joint distribution of two random variables. Theoretical Probability Distribution – Discrete and Continuous (p.m.f. pd.d.f.) Binomial, Poisson and Normal distributions and their properties.

UNIT – II

Elements of Statistical Methods. Variables, Attributes, Primary data and secondary data. Population and sample. Census and Sample Survey. Tabulation – Chart and Diagram, graph, Bar diagram, Pie diagram etc. Frequency Distribution – Un-grouped and grouped cumulative frequency distribution. Histogram, Frequency curve, Measure of Central Tendencies – Average : AM, GM, HM, Mean, Median and Mode (their advantages and disadvantages). Measures of Dispersions – Range, Quartile Deviation, Mean Deviation, Variance/S.D., Moments, Skewness and Kurtosis.



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

UNIT – III

Sampling Theory: Meaning and objects of sampling. Some ideas about the methods of selecting samples. Statistic and Parameter, Sampling Distribution – standard error of a statistic (e.g. sample mean, sample proportion). Four fundamental distributions derived from the normal : (i) Standard Normal Distribution, (ii) Chi-square distribution, (iii) Student's distribution, (iv) Snedecor's F-distribution.

UNIT – IV

Estimation and Test of Significance. Statistical Inference. Theory of estimation – Point estimation and Interval estimation. Confidence Inter/Confidence Limit. Statistical Hypothesis – Bull Hypothesis and Alternative Hypothesis. Level of significance. Critical Region. Type I and Type II error. Problems. Bivariate Frequency Distribution. Scatter Diagram, Correlation co-efficient –Definition and properties. Regression lines.

UNIT – V

Time Series : Definition. Why to analyze Time series data? Components. Measurement of Trend – (i) Moving Average Method, (ii) Curve Fittings (linear and quadratic curve). (Ideas of other curves, e.g. exponential curve etc.). Ideas about the measurement of other components. **Index Number :** Meaning of Index Number. Construction of Price Index Number. Consumer Price Index Number. Calculation of Purchasing Power of Rupee.

Texts:

- 1. The elements of probability theory and some of its applications H. Cramer.
- 2. An introduction to probability theory and its applications (Vol. 1) W. Feller.
- 3. Mathematical methods of statistics H. Cramer.
- 4 Theory of probability B. V. Gnedenko.
- 5. Mathematical probability J. V. Uspensky.