Shri Vaishnav VidyapeethVishwavidyalaya, Indore

DEGREE PROGRAM

B. Sc. VI 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*				
BSPH 602	DC	Quantum Mechanics	60	20	20	30	20	3	1	0	4

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Quantum Mechanics 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 Quantum Mechanics. 2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Abbreviation		
Th	Theory	**Teacher Assessment (Theory) shall be based on following components: Quiz/Assignment/ Project/Participation in class (Given that no component shall be exceed 10 Marks).**
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
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Dr. UTTAM SHARMA
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Indore

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BSPH 602: Quantum Mechanics

UNIT I: Particles and waves inadequacies in classical physics, Blackbody radiation: quantum theory of light. Photoelectric effect, Compton Effect, Wave nature of matter: de Broglie hypothesis, Wave-particle duality, Davisson-germer experiment, Wave description of particles by wave packets.Group and phase velocities and relation between them, Two-slit experiment with electrons. Probability, Wave amplitude and wave functions.

UNIT II: Heisenberg's uncertainty principle (uncertainty relations involving canonical pair of variables): derivation from wave packets. Energy, Momentum and Hamiltonian operators, Time-independent Schrodinger wave equation for stationary states, Properties of wave Function. Interpretation of wave function, Probability density, Conditions for physical acceptability of wave functions, Linearity and superposition Principles, Eigen values and Eigen functions

UNIT III: Expectation values, Wave function of a free Particle. Applications of Schrödinger wave equation: Eigen functions and Eigen values for a particle in a one dimensional box. general features of a bound Particle system, (1) one dimensional Simple harmonic oscillator: energy levels and wave Functions. Zero point energy, (2) Quantum theory of hydrogen atom: particle in a spherically symmetric potential.

UNIT IV: Schrodinger wave equation, Separation of variable, Radial solutions and principal quantum Number, orbital and magnetic quantum numbers, Quantization of energy and Angular Momentum, Space quantization, Electron probability Density.

UNIT V: Finite Potential Step: Reflection and Transmission. Stationary solutions, Probability current, Attractive and repulsive potential Barriers, Quantum phenomenon of tunneling: tunnel effect. Tunnel diode (qualitative Description), Finite potential well (Square well).

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Board of Studi...
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References:

1. L. I. Schiff, quantum mechanics, 3rd Edition, (McGraw hill book co., New York 1968).
2. E. Merzbacher, quantum mechanics, 3rd Edition, (john Wiley & sons, inc1997)
3. J. I. Powell & b. Crasemann, quantum mechanics, (Addison-Wesley pubs.co., 1965)
4. A. Ghatak& s. Lokanathan, quantum mechanics: theory and applications, 5th Edition, (Macmillan India, 2004)
5. E. M. Lifshitz and l. D. Landau, quantum mechanics: non-relativistic theory (course of Theoretical physics, vol 3), 3rd Edition, butterworth-heinemann (1981).

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Bachelor of Science (PCM, LS,BT)

SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BSCH 604	**DC**	Organic Chemistry II	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.

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SEMESTER VI

Syllabus:

UNIT I

NMR Spectroscopy:

Principle of nuclear magnetic resonance, basic instrumentation, shielding mechanism, chemical shift, number of signals, spin-spin coupling and coupling constants, splitting of signals, deuterium labeling. Applications of NMR to simple organic compounds.

UNIT II

Stereochemistry of Organic Compounds :

Concept of isomerism, Types of isomerism; Optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centers, disasteromers, threo and erythro diastereomers, meso compounds, resolution of enantionmer, inversion, retention and recemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Geometric isomerism – determination of configuration of geometric isomers, E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism – conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives, Newman projection and Sawhorse formulae, Fischer and flying wedge formulae, Difference between configuration and conformation.

UNIT III

Arenes and Aromaticity:

Nomenclature of benzene derivatives, The aryl group, Aromatic nucleus and side chain, Structure of benzene; molecular formula and kekule structure, stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture.

Aromaticity: The Huckle rule, aromatic ions. Aromatic electrophilic substitution – general pattern of the mechanism, role of σ and π complexes, Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio, Side chain reactions of benzene derivatives, Birch reduction; Methods of formation and chemical reactions of alkylbenzenes, alkynylbenzenes and biphenyl, naphthalene and Anthracene.

UNIT IV

Heterocyclic Compounds:

Introduction, structure of Pyrrole, Furan and Thiophene, Paal Knorr synthesis and electrophilic substitution of Pyrrole, Furan and Thiophene, reactivity and orientation of electrophilic substitution reactions (ESR) in five membered heterocycles (Pyrrole, Furan and Thiophene) Structure of Pyridine, Electrophilic and Nucleophilic substitution reactions of pyridine. Basicity of pyridine.

UNIT V

[A] Carbohydrates

Introduction, classification of carbohydrates, osazone formation, epimerization, step up and step down reactions of monosaccharides, simple structures of glucose and fructose, Fischer's proof of configuration of D-glucose.

[B] Amino acid:

Introduction of amino acid, Classification and properties of amino acids, Zwitter ion , Isoelectric point, Strecker's and Gabreil pthalimide synthesis of amino acids.

Reference Books:

Reference Books

1. Organic Chemistry: I. L. Finar, Vol-II, 5th Edition, Pearson Education Ltd.
2. Organic Chemistry: Morrison & Boyd, 6th Edition, Prentice Hall of India Pvt. Ltd.
3. Stereochemistry of carbon compounds: E. L. Eliel, Wiley Eastern Ltd.
4. Stereochemistry and mechanism through solved problems: P. S. Kalsi, New Age International.
5. Stereochemistry of Organic Compounds: Principles and Applications: D. Nasipuri; New Academic Science; 4th Revised Edition.
6. Organic Chemistry: Hendrickson, Cram, Hammond, Mc Graw-Hill.
7. Organic Chemistry: 6 th Edition, John Mcmurry, Brooks Cole, International Edition.
8. Organic Chemistry: T.W. Graham Solomons and Craig B. Fryhle Wiley, 8 th Edition.
9. Organic Chemistry: Francis A. Carey, Mc Graw-Hill, 7 th Edition.
10.Organic Chemistry: Leroy G.Wade, Prentice Hall, 6 th Edition.
11. Organic Chemistry: Jonathan Clayden, Nick Greeves, Stuart Warren and Peter Wothers. Oxford University Press, USA.
12. P.S. Kalsi, "Spectroscopy of Organic Compounds", New Age International Pvt. Ltd. Publishers, 2006.

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

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

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BSMA604	DC	Computer Science & Programming	3	1	0	4	60	20	20	0	0

Course Educational Objective:

- To introduce the students with the Fundamentals of the Computer Science & Programming.

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

- Understand and solve problems of the Boolean algebra.
- Write and execute program written in C programming language
- Design Algorithms and Flow Charts.

Syllabus:

UNIT – I

Boolean algebra – Basic Postulates and Definition. Tow-element Boolean algebra. Boolean function. Truth table. Standard form of Boolean function –DNF and CNF. Minterms and maxterms. Principle of Duality. Some laws and theorem of Boolean algebra.

UNIT – II

Simplification of Boolean expressions –Algebraic method and Karnaugh Map method. Application of Boolean algebra– Switching Circuits, Circuit having some specified properties, Logical Gates– AND, NOT, OR, NAND, NOR etc.

UNIT – III

Computer Fundamentals: Historical Development, Computer Generations, Computer Anatomy – Different Components of a Computer System.

Number Systems: Binary to Decimal and Decimal to Binary. Binary Arithmetic. Octal and Hexadecimal systems. ASCII, EBCDIC and UNICODE. Concepts of bit, byte, word and nibble.

UNIT – IV

Introduction to C Programming: Algorithms, flowcharts, history, features, identifiers, input/ output functions, control structures- if, for, do-while, while and switch-case, arrays.

UNIT – V

Library and user defined functions, recursion. String handling, pointers, structures. Basics of file handling in C.

Text Books:

1. Let us C – Y. Kanetkar (BPB Publications)
2. Programming in C – V. Krishnamoorthy and K. R. Radhakrishnan (Tata Mcgraw Hill).
3. C by example: Noel Kalicharan (Cambridge University Press).
4. Programming in ANSI C – E. Balagurusamy (Tata McGraw Hill).
5. Computer System Architecture by Morris Mano
6. Digital computer organization by Malvino and Leach.

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
BSMA 605	BS	**Any one of the following groups : Group A : A Course of Calculus Group B : Discrete Mathematics**	60	20	20	-	-	3	1	-	4

Group A: A Course of Calculus

Course Objective

To introduce the students with the Fundamentals of the Advanced Calculus.

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Course Outcomes

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

1. *understand and decide convergence and divergence of a series.*
2. *know properties of the power series.*
3. *solve higher order ordinary differential equations.*
4. *apply Laplace Transform to find solution of the ODE.*
5. *solve partial differential equations.*

Course Content:

UNIT – I

Concept of Point-wise and Uniform convergence of sequence of functions and series of functions with special reference of Power Series. Statement of Weierstrass M-Test for

Uniform convergence of sequence of functions and of series of functions. Simple applications. Statement of important properties like boundedness, continuity, differentiability and integrability of the limit function of uniformly convergent sequence of functions and of the sum function of uniformly convergent series of functions. Determination of Radius of convergence of Power Series.

UNIT – II

Statement of properties of continuity of sum function power series. Term by term integration and Term by term differentiation of Power Series. Statements of Abel's Theorems on Power Series. Convergence of Power Series. Expansions of elementary functions such as ex, sin x, log(1+x), $(1+x)^n$. Simple problems.

UNIT – III

Fourier series on $(-\pi, \pi)$: Periodic function. Determination of Fourier coefficients. Statement of Dirichlet's conditions of convergence and statement of the theorem on convergence of Fourier Sine and Cosine series.

UNIT – IV

Third and Fourth order ordinary differential equation with constant coefficients. Euler's Homogeneous Equation. Second order differential equation : (a) Method of variation of parameters. (b) Method of undetermined coefficients. (c) Simple eigenvalue problem. Simultaneous linear differential equation with constant coefficients.

UNIT – V

Laplace Transform and its application to ordinary differential equation. Laplace Transform and Inverse Laplace Transform. Statement of Existence theorem. Elementary properties of Laplace Transform and its Inverse. Application to the solution of ordinary differential equation of second order with constant coefficients. Partial Differential Equation (PDE) : Introduction, Formation of PDE, Solutions of PDE, Lagrange's method of solution.

Text:

1. Basic Real & Abstract Analysis – Randolph J. P. (Academic Press).
2. A First Course in Real Analysis – M. H. Protter & G. B. Morrey (Springer Verlag, NBHM).
3. A Course of Analysis – Phillips.
4. Problems in Mathematical Analysis – B. P. Demidovich (Mir).
5. Problems in Mathematical Analysis – Berman (Mir).

6. Calculus of One Variable – Maron (CBS Publication).

7. Introduction to Real Analysis – Bartle & Sherbert (John Wiley & Sons.)

9. Mathematical Analysis – Parzynski.

10. Introduction to Real Variable Theory – Saxena & Shah (Prentice Hall Publication).

11. Real Analysis – Ravi Prakash & Siri Wasan (Tata McGraw Hill).

12. Mathematical Analysis – Shantinarayan (S. Chand & Co.).

13. Theory & Applications of Infinite Series – Dr. K. Knopp.

14. Advanced Calculus – David Widder (Prentice Hall).

15 Charles Chapman Pugh: Real mathematical analysis; Springer; New York; 2002

16 Sterling K. Berberian: A First Course in Real Analysis; Springer; New York; 1994

17 Steven G. Krantz: Real Analysis and Foundations; Chapman and Hall/CRC;. 2004

18 Stephen Abbott: Understanding Analysis; Springer; New York, 2002

19 T. M. Apostol: Mathematical Analysis, Addison-Wesley Publishing Co. 1957

20 W. Ruddin: Principles of Mathematical Analysis, McGraw-Hill, New York, 1976

21 J. F. Randolhp: Basic Real and Abstract Analysis, Academic Press; New York, 1968

22 Robert G Bartle, Donald R Sherbert: Introduction to real analysis; John Wiley Singapore; 1994

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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

Group B : Discrete Mathematics

Course Objective

To introduce the students with the Fundamentals of the Discrete Mathematics.

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Course Outcomes

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

1. *understand and represent integers.*
2. *know the concept of the congruences and apply them.*
3. *use the Recurrence Relations and Generating functions.*
4. *apply the principles of the Boolean Algebra.*

Course Content:

UNIT – I

Integers: Principle of Mathematical Induction. Division algorithm. Representation of integer in an arbitrary base. Prime integers. Some properties of prime integers. Fundamental theorem of Arithmetic. Euclid's Theorem. Linear Diophantine Equations. (Statement of Principle of Mathematical Induction, Strong form of Mathematical induction. Applications in different problems. Proofs of division algorithm. Representation of an integer uniquely in an arbitrary base, change of an integer from one base to another base. Computer operations with integers – Divisor of an integer, g.c.d. of two positive integers, prime integer, Proof of Fundamental theorem, Proof of Euclid's Theorem. To show how to find all prime numbers less than or equal to a given positive integer. Problems related to prime number. Linear Diophantine equation – when such an equation has solution, some applications).

UNIT – II

Congruences : Congruence relation on integers, Basic properties of this relation. Linear Congruences, Chinese Remainder Theorem. System of Linear Congruences. (Definition of Congruence – to show it is an equivalence relation, to prove the following **:** $a \equiv b \pmod m$ implies (i) $(a+c) \equiv (b+c) \pmod m$ (ii) $ac \equiv bc \pmod m$ (iii) $an \equiv bn \pmod m$, for any polynomial $f(x)$ with integral coefficients $f(a) \equiv f(b) \pmod m$ etc. Linear

Congruence, to show how to solve these congruences, Chinese remainder theorem – Statement and proof and some applications. System of linear congruences, when solution exists – some applications).

UNIT – III

Application of Congruences : Divisibility tests. Computer file, Storage and Hashing functions. Round-Robin Tournaments. Check-digit in an ISBN, in Universal Product Code, in major Credit Cards. Error detecting capability. (Using Congruence, develop divisibility tests for integers base on their expansions with respect to different bases, if d divides (b-1) then n = (akak- 1a1b) is divisible by d if and only if the sum of the digits is divisible by d etc. Show that congruence can be used to schedule Round-Robin tournaments. A university wishes to store a file for each of its students in its computer. Systematic methods of arranging files have been developed based on Hashing functions $h(k) \equiv k \pmod{m}$. Discuss different properties of this congruence and also problems based on this congruence. Check digits for different identification numbers – International standard book number, universal product code etc. Theorem regarding error detecting capability).

UNIT – IV

Congruence Classes : Congruence classes, addition and multiplication of congruence classes. Fermat's little theorem. Euler's Theorem. Wilson's theorem. Some simple applications. (Definition of Congruence Classes, properties of Congruence classes, addition and multiplication, existence of inverse. Fermat's little theorem. Euler's theorem. Wilson's theorem – Statement, proof and some applications).

UNIT – V

Recurrence Relations and Generating functions : Recurrence Relations. The method of Iteration. Linear difference equations with constant coefficients. Counting with generating functions. **Boolean Algebra :** Boolean Algebra, Boolean functions, Logic gates, Minimization of circuits.

Text:

1. C. L. Liu: Discrete Mathematics

2. Schaum's outline series: Discrete Mathematics