Shri Vaishnav VidyapeethVishwavidyalaya, Indore

DEGREE PROGRAM

B. Sc VI Sem.

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*				
BSPH602	DC	Atomic, Molecular and Nuclear Physics	60	20	20	30	20	3	1	4	6

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 Objectives:-

1. To develop the comprehensive understanding of laws of physics related toAtomic, Molecular and Nuclear Physicsand 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 Outcomes:-

1. Student will be able to understand and solve the problems related toAtomic, Molecular and Nuclear Physics,
2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Joint Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

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

Atomic, Molecular and Nuclear Physics

UNIT-I

Atoms in Electric and Magnetic Fields: - Electron Angular Momentum, Electron Spin and Spin Angular Momentum, Stern-Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyro magnetic Ratio and Bohr Magneto Pauli's Exclusion Principle. Symmetric and Anti symmetric Wave Functions. Periodic table, Fine structure, Spin orbit coupling. Total Angular Momentum, Vector Model L-S and J-J couplings

UNIT-II

Molecular Spectra: - Rotational Energy levels, Selection Rules and Pure Rotational Spectra of a Molecule, Vibrational Energy Levels, Selection Rules and Vibration Spectra. Rotation Vibration Energy Levels, Selection Rules and Rotation-Vibration Spectra, Determination of Inter-nuclear Distance, Raman Effect and Quantum Theory of Raman Effect, Complimentary Character of Raman and infrared Spectra

UNIT-III

Structure of nuclei: - basic properties of nuclei, binding energy. Quadra pole moment, Nuclear forces α -decay: - range of α-particles, Geiger-Nuttal law and α-particle spectra. Gamow theory of alpha decay, β-decay: - energy spectra and neutrino hypothesis. B-decay: - energy spectra and neutrino hypothesis, Nuclear reactions: - types of reactions and conservation laws. Concept of compound and direct reactions, Compound Reaction rate, Q-value of nuclear reaction, Nuclear Fission and Fusion.

UNIT-IV

Nuclear models: - Liquid drop model and Semi empirical mass formula, Shell model, Linear accelerator, Cyclotron, Betatron, Synchro-cyclotron. Detectors and Counters: Ionization chamber, Proportional Counter, GM Counter., Wilson cloud chamber, Scintillation detectors. Semiconductor detectors, Bain bridge mass spectrograph.

UNIT-V

Elementary particles - fundamental interactions, Classification of elementary particles, Particles and antiparticles, baryons, hyperons, leptons, and mesons., Elementary particle quantum numbers: baryon number, lepton number, strangeness, electric charge, hypercharge and isospin.

Suggested books:

1. Concepts of modern physics by Arthur beiser (McGraw -hill book company, 1987)

2. Concepts of nuclear physics by Bernard l.cohen.(new Delhi: Tata McGraw hill, 1998).

3. Introduction to the physics of nuclei and particles by r.a. Dunlap.(Singapore: Thomson Asia, 2004).

4. Nuclear physics by Irving Kaplan. (Oxford & ibh, 1962).

5. Introductory nuclear physics by Kenneth s. Krane. (John Wiley & sons, 19

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 604	DC	Computer Science and Programming	60	20	20	-	-	3	1	-	4

Course Objective

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

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Course Outcomes

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

1. *understand and solve problems of the Boolean algebra.*
2. *write and execute program written in computer languages.*
3. *design Algorithms and Flow Charts.*
4. *identify and solve problems encountered to run a program.*

Course Content:

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. 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 – II

Computer Science and Programming: Historical Development, Computer Generation, Computer Anatomy – Different Components of a Computer System. Operating System,

Hardware and Software. Positional Number System. Binary to Decimal and Decimal to Binary. Other systems. Binary Arithmetic. Octal, Hexadecimal, etc. Storing of data in

a Computer – BIT, BYTE, WORD, etc. Coding of a data – ASCII , etc.

UNIT – III

Programming Language : Machine Language, Assembly language and High level language. Compiler and Interpreter. Object Programme and Source Programme. Ideas about some HLL – e.g. BASIC, FORTRAN, C, C++, COBOL, PASCAL, etc.

Algorithms and Flow Charts – their utilities and important features, Ideas about the complexities of an algorithm. Application in simple problems. FORTRAN 77/99**:** Introduction, Data Type **–** Keywords, Constants and Variables – Integer, Real, Complex, Logical, Character, Subscripted Variables, Fortran Expressions.

UNIT – IV

I/O Statements – formatted and unformatted. Programme execution control – Logical if, if-then-else, etc. Arrays, dimension statement. Repetitive Computation – Do, Bested Do etc. **Sub Programs –** (i) Function Sub Programme (ii) Subroutine Sub Programme

UNIT – V

Elements of BASIC Programming Language: Reading, Printing, Branch & Loop, Array, Functions. Application to Simple Problems. An exposure to M.S. Office, e-mail, Internet (Through Demonstration only).

Text:

1. Programming with FORTRAN 77 – A Structured approach – R. S. Dhaliwal, S. K. Agarwal, S. K. Gupta (Wiley Eastern Limited/New Age International Ltd.).
2. Structured FORTRAN 77 for engineers and scientists – D. M. Etter (The Benjamin/Cummings Publishing Co. Inc.).
3. Programming and Computing with FORTRAN 77/90 – P. S. Grover (Allied Publishers).
4. Programming with FORTRAN including structured FORTRAN – Seymour Lipschutz and Arthur Poe (Schaum's Outline Series).
5. FORTRAN 77 and numerical methods – C. Xavier (Wiley Eastern limited).
6. Let us C – Y. Kanetkar (BPB Publications).

7. Programming in C – V. Krishnamoorthy and K. R. Radhakrishnan (Tata Mcgraw Hill).

8. C by example : Noel Kalicharan (Cambridge University Press).

9. Programming in ANSI C – E. Balagurusamy (Tata McGraw Hill).

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

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			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

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Name of Program: Bachelor of Science in Electronics

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*				
BSEL603		Electronics VI	60	20	20	30	20	3	1	0	4

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. Build an understanding of the fundamental concepts of Data Communication.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to networking concepts, networking.

Course Outcomes:

Student will be able to:

1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network.

Syllabus:

UNIT I **08 Hrs.**

Network structure Point to Point, Broadcast, Multicast. Horizontal and vertical distribution, Star, Mesh, tree, bus structures. OSI 7-layer model: Architecture, Functions of layers, Packet switches, circuit switching and message switching.

UNIT II **10 Hrs.**

Physical layer: Transmission media, Channel allocation methods: ALOHA, CSMA/CD, LAN Protocols IEEE802.3, 802.4, 802.5, 802.6 and 802.11.

UNIT III **10 Hrs.**

Data link layer: Framing, Error detection, Error correction, CRC, Stop and wait, Go-back-N, Sliding window Protocol, Selective repeat.

UNIT IV **10 Hrs.**

Network layer: Routing algorithms and congestion control algorithms, Repeaters, Bridges, Routers and Gateways, Inter networking. Introduction to transport layer and session layer.

UNIT V **07 Hrs.**

Presentation layer: coding, compression and cryptography. Introduction to Application layer: High performance networks: ATM, Fast Ethernet, FDDI.

Textbooks:

1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw–Hill, Fourth Edition, 2011.
2. Andrew S. Tanenbaum, "Computer Networks", Pearson education, Fourth Edition, 2009.

References:

1. Prakash C. Gupta, "Data Communications and Computer Networks", PHI, Second Edition, 2014.
2. Ajit Pal, "Data Communications and Computer Networks", PHI, First Edition, 2014.
3. Wayne Tomasi, "Introduction to Data communications and Networking", Pearson Education, First Edition, 2009.