FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER SCIENCE
COURSE CURRICULUM

PART- A: Introduction

Program: Bachelor in Science (CS) *(Certificate / Diploma / Degree/Honors)*	Semester - V	Session: 2024-2025

1	Course Code	**CSSC-05T**	
2	Course Title	**Programming in Java**	
3	Course Type	**DSC (Discipline Specific Course)**	
4	Prerequisite (if, any)	***As per program***	
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand fundamentals of java programming environment • Understand the importance of features of Java programming. • Create user defined Classes/interfaces and Packages which help them to develop new Application Software and Utility Software. • Develop new Online Software and Internet Games with the help of Applet and AWT Packages. • Familiar about Applet, Thread and Servlet Life Cycle which helps them to develop important applications for Internet Users.	
6	Credit Value	**3 Credits**	***Credit = 15 Hours - learning & Observation***
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**

PART -B: Content of the Course

Total No. of Teaching–Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Overview of JAVA:** The genesis of java, history of java, java virtual machine (JVM), java development kit (JDK), source files, jar files, compiling and running of files, byte code, platform independency, data types, literals, variables, constants, array and its types, operators, conditional and looping statements, various packages, introduction of class, objects and methods, nested and inner class, string handling, constructor and its types.	12
II	**Inheritance:** concept of super and sub class, types of inheritance, Polymorphism: method overloading, method overriding; abstract class, constructor in multilevel inheritance, using final with inheritance. **interface:** defining and implementing interface, extending interface, nested interface, importance of interface in java. **Package:** defining package, rules for creating a new package, concept of class-path, access protection, importing package.	11
III	**Exception Handling and Multithreading:** using try and catch, multiple catch classes, nested try statements, throw, throws and finally, types of exception: built in exception, checked/unchecked exception, creating own exception class. **Java Thread Model:** main thread, creating own thread, life cycle of thread, thread priorities, synchronization, inter thread communication, suspending, resuming and stopping thread.	11
IV	**Java Packages: I/O classes:** Byte Stream and Character Stream, Predefined Stream, reading console input, writing console output. **Applet:** Applet Life Cycle, creating an applet, Using image and sound in applet. **Lang:** Various classes, Importance class Definition, **Util:** Framework, Event Model, Scanner Class **AWT:** Exploring AWT, Event handling – The delegation-event model, Event classes, Source of event, Event listener interfaces, handling mouse and keyboard event, Adapter class.	11

Keywords | *Java Virtual Machine (JVM), Java Development Kit (JDK), Interface, Package, Threads, Applet, AWT.*

Name and Signature of Convener & Members of CBoS:

Dr. H.S. Hota
Chairman

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Naughton P and Schildt H., Osborne, The complete reference, McGraw-Hill, Berkeley Publication.
- James R. Laverick, An Introduction to JAVA programming, Firewall Media publication.

Reference Books Recommended:

- E. Balgurusamy, Java Programming, McGraw-Hill Publication.
- Rashmi Kanta Das ,Core JAVA for beginners, Vikas Publication.

Online Resources:

- SWAYAM URL Link for Java
  https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
  https://onlinecourses.nptel.ac.in/noc19_cs84/preview
  https://www.dqindia.com/iit-bombay-offers-free-online-course-java-swayam-platform/
  https://www.classcentral.com/course/swayam-programming-in-java-12930
- W3schools Java Tutorial.
  Java Tutorial (w3schools.com)
- Online Platforms to Exercise and Execute the Java Programs
  Online Java Compiler (programiz.com)
  Solve Java | HackerRank
  Online Java Compiler - Online Java Editor - Java Code Online (jdoodle.com)
- NPTEL Channel: Programming in Java
  Programming In Java - Course (nptel.ac.in)

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment (CIA):	**30 Marks**
End Semester Exam (ESE):	**70 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20** +**20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10** x**1**= **10** Mark; **Q2**. Short answer type- **5**x**4** =**20** Marks Section B: Descriptive answer type qts.,**1 out of 2** from each unit-**4**x**10**=**40** Marks	

Name and Signature of Convener & Members of CBoS:

Dr H.S. Hota
Chairman

ANJEETA KUJUR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER SCIENCE
COURSE CURRICULUM

PART- A: Introduction

Program: Bachelor in Science (CS) *(Certificate / Diploma / Degree)*	Semester – V	Session: 2026-2027

1	Course Code	**CSSC-05P**
2	Course Title	**Lab 5: Programming in Java**
3	Course Type	**DSC**
4	Prerequisite (if, any)	*As per program*
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Execute the program in java • Implement the concept of multi-threading • Develop new Packages which help them to develop new application software and Utility Software. • Develop new Online Software and Internet Games with the help of Applet and AWT Packages. • Familiar about Applet, Thread and Servlet Life Cycle which helps them to develop value added services for Internet Users.
6	Credit Value	**1 Credits** *Credit =30 Hours Laboratory or Field learning/Training*
7	Total Marks	**Max. Marks: 50** **Min Passing Marks: 20**

PART -B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
Lab./Field Training/ Experiment Contents of Course	1. Write a program to check palindrome number. 2. Write a program to check Armstrong number. 3. Write a program to check the prime number. 4. Write a program to calculate simple interest using the GUI Form. 5. Write a program to demonstrate the thread life cycle. 6. Write a program to show the use of applet. 7. Write a program to demonstrate the concept of arrays. 8. Write a program to find the second largest and second smallest number in array. 9. Write a program to perform multiplication of two matrices. 10. Write a program to demonstrate the concept of method overloading. 11. Write a program to demonstrate the concept of constructor overloading. 12. Write a program to demonstrate the concept of inner classes. 13. Write a program to demonstrate the concept of inheritance. 14. Write a program to demonstrate the concept of access specifiers in java. 15. Write a program to implement the concept of interface. 16. Write a program to show the creation of package in java. 17. Write a program to design the user registration form with basic registration details. 18. Write a program to show the exception handling process in java. 19. Write a program to show the significance of multithreading. 20. Write a program to read the data from the console device and store it in any file in secondary storage. 21. Write a program to copy the content of any file into another file. 22. Write a program to demonstrate the advantages of event delegation model. 23. Write a program in java for command line value passing. 24. Write a program to implement the concept of event delegation model.	**30**

	Note: Concerned teacher can add additional practical exercises as per requirement.
Keywords	*Class, Object, interface, Inheritance, package, exception handling, threads, applet, AWT.*

Name and Signature of Convener & Members of CBoS:

Dr. H. S. Hota
chairman

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Naughton P and Schildt H., Osborne, The complete reference, McGraw-Hill, Berkeley Publication.
- James R. Laverick, An Introduction to JAVA programming, Firewall Media publication.

Reference Books Recommended:

- E. Balgurusamy, Java Programming, McGraw-Hill Publication.
- Rashmi Kanta Das ,Core JAVA for beginners, Vikas Publication.

Online Resources:

- SWAYAM URL Link for Java
  https://onlinecourses.swayam2.ac.in/aic20_sp13/preview
  https://onlinecourses.nptel.ac.in/noc19_cs84/preview
  https://www.dqindia.com/iit-bombay-offers-free-online-course-java-swayam-platform/
  https://www.classcentral.com/course/swayam-programming-in-java-12930
- W3schools Java Tutorial.
  Java Tutorial (w3schools.com)
- Online Platforms to Exercise and Execute the Java Programs
  Online Java Compiler (programiz.com)
  Solve Java | HackerRank
  Online Java Compiler - Online Java Editor - Java Code Online (jdoodle.com)
- NPTEL Channel: Programming in Java
  Programming In Java - Course (nptel.ac.in)

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**50 Marks**
Continuous Internal Assessment (CIA):	**15 Marks**
End Semester Exam (ESE):	**35 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **15** Marks
End Semester Exam (ESE):	**Laboratory / Field Skill Performance:** **On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools & technology (written) – 10 Marks** **Viva-voce (based on principle/technology) - 05 Marks**	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:

Dr. H. S. Hota
chairman

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF COMPUTER SCIENCE
COURSE CURRICULUM

PART-A: Introduction

Program: Bachelor in Science (CS) *(Certificate / Diploma / Degree/Honors)*	Semester – V	Session: 2024-2025

1	Course Code	CSSE-03	
2	Course Title	**Cyber Security and Cyber Law**	
3	Course Type	**DSE (Discipline Specific Elective)**	
4	Prerequisite	***As per Program***	
5	Course Learning Outcomes(CLO)	At the end of this course, students will be able to: • Understand the fundamental concepts in cyber security and distinguish among the attacks, threats and vulnerabilities. • Identify, differentiate and explain different cyber crimes and frauds. • Understand the concept of Cyber security issues and challenges associated with it. • Understand the cyber crimes, their nature, legal remedies and how to report the crimes through available platforms and procedures. • Understand the basic concepts related to E-Commerce and digital payments.	
6	Credit Value	**4 Credits**	***Credit = 15 Hours -Learning & Observation***
7	Total Marks	**Max. Marks: 100**	**Min Passing Marks: 40**

PART – B: Content of the Course

Total No. of Teaching– Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No .of Period
I	**Introduction:** Defining Cyberspace, Architecture of cyberspace, Internet, World wide web, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security, Cyber Physical System Security, Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cyber crimes, Remedial and mitigation measures.	15
II	**Authentication:** Vulnerability and vulnerability assessment, Intrusion Detection and Intrusion Prevention System, Introduction of Authentication, User Authentication Methods, Biometric Authentication Methods.	15
III	**Different Securities:** Window Security, Smartphone Security, Browser Security, Web Security, Email Security, Wi-Fi Security, and Social Media Security: Challenges, opportunities and pitfalls in online social network, Best practices for the use of Social media, Introduction to digital payments, Components of digital payment and stakeholders, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorized banking transactions.	15
IV	**Cyber Law Basics:** Information Technology Act 2000-Amendments; Laws regarding posting of inappropriate content, Relevant provisions of Payment Settlement Act 2007, Cybercrimes and offenses dealt with IPC, RBI Act, IPR in India.	15
Keywords	*Cyberspace, Cybercrime, Cyber security, Physical System security, Ransomware, Modus-operandi, Authentication, Vulnerability, Intrusion Detection and Prevention, Cyber Law.*	

Signature of Convener & Members of CBoS:

Dr. T S Hota
Chairman

ANJEETA KUJUR

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Cyber criminology: Exploring Internet Crimes and Criminal Behavior by K. Jaishankar, CRC press.
- Data communication and Networking by B. Forouzan, TMH.
- An unofficial guide to ethical hacking by Ankit Fadia, trinity publisher.
- An ethical guide to hacking mobile phones by Ankit Fadia, trinity publisher.
- Computer Network Security and Cyber Ethics by Siva Ram Murthy,B.S. Manoj , McFarland and Company , INC

Reference Books Recommended:

- Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010.
- Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
- Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
- Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
- Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
- Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
- Fundamentals of Network Security by E. Maiwald, McGraw Hill.

Online Resources:

- Cyber Security from SWAYAM: https://onlinecourses.swayam2.ac.in/cec21_cs09/preview
- Introduction to Cyber Security from SWAYAM: https://onlinecourses.swayam2.ac.in/nou20_cs01/preview
- Cyber Security for Beginners: https://heimdalsecurity.com/pdf/cyber_security_for_beginners_ebook.pdf
- Cyber Criminology by K. Jaishankar: https://larose.staff.ub.ac.id/files/2011/12/Cyber-Criminology-Exploring-Internet-Crimes-and-Criminal-Behavior.pdf
- Fundamental of Cyber Security by Dr. Jitendra Pandey: http://www.uou.ac.in/sites/default/files/slm/FCS.pdf
- Information Technology Act 2000: https://www.meity.gov.in/content/information-technology-act-2000
- Information Technology Act: https://www.meity.gov.in/content/information-technology-act
- Cyber Crime Law and Practice: https://www.icsi.edu/media/webmodules/publications/Cyber_Crime_Law_and_Practice.pdf

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment(CIA):	**30 Marks**
End Semester Exam(ESE):	**70 Marks**

Continuous Internal Assessment(CIA): (By Course Teacher)	Internal Test / Quiz- (2): 20 & 20 Assignment/Seminar- 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks

End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts., **1 out of 2** from each unit-**4x10=40 Marks**

Name and Signature of Convener & Members of CBoS:

Dr. H.S Hota
chairman

ANJEETA KUJ

FOUR YEAR UNDER GRADUATE PROGRAM (2024-28)

DEPARTMENT OF MATHEMATICS

COURSE CURRICULUM

Part A: Introduction			
Program: Bachelor in Science (Degree/Honors)		**Semester - V**	**Session:2024-2025**
1	Course Code	**MASC-05**	
2	Course Title	Real Analysis	
3	Course Type	**Discipline Specific Course (DSC)**	
4	Pre-requisite(if any)	Knowledge of algebra, real numbers, set theory, functions and elementary calculus.	
5	Course Learning Outcome (CLO)	**This Course will enable the students to:** ➢ Understand basic properties of real number system such as least upper bound property and Order property. ➢ Realize importance of bounded,convergent,Cauchy and monotonic sequences of real numbers,find their limit superior and limit inferior. ➢ Learn about Riemann integrability of bounded functions and algebra of R-integrable functions. ➢ Determine various applications of the fundamental theorem of integral calculus. ➢ Relate concepts of uniform continuity,differentiation,integration and uniform convergence..	
6	Credit Value	**4 C**	1Credit = 15 hours- Learning and Observation
7	Total Marks	Maximum Marks : 100	Minimum Passing Marks:40

Part B: Content of the Course		
Total no of teaching – learning period =60 Periods (60 Hours)		
UNIT	**Topics**	**No of Periods**
I	**Contributions and Biography of Indian Mathematicians** Swami Bharati Krishna Tirth, Madhav, NeelkanthSomayaji and ShrinivaasAayangarRamanujan **Real Numbers :** The set of real numbers R as an ordered field, Least upper bound properties of R, Metric property and completeness of R, Archimedean property of R, Dense subsets of R, Nested intervals property; Neighborhood of a point in R, Open sets, limit point of a set, closed and perfect sets in R.	15
II	**Convergence of sequences in R:** Bounded and monotonic sequences, Convergent sequence and its limit, Limit theorems, Monotone convergence theorem, Subsequences, Bolzano-Weierstrass theorem, Limit superior and limit inferior, Cauchy sequence, Cauchy's convergence criterion.	15
III	**Infinite Series:** Convergence and divergence of infinite series of positive real numbers, Necessary condition for convergence, Cauchy criterion for convergence;Test for	15

Dr. S. Dashpute

(Dr. P. K. Sahu)

	convergence of positive term series; Basic comparison test, Comparison test,D'Alembert's Ratio test, Cauchy root test,Raabe's test, Logarithmic test, Cauchy Integral test, Alternating series, Leibnitz's test, Series of arbitrary terms,Absolute and conditional convergence,Rearrangement of series and Riemann's theorem.	
IV	**Riemann Integration and Improper Integrals:** Riemann integrability of bounded functions, Examples of R- integrable and non-integrable functions, Algebra of Riemann integrable functions, Integrability of continuous and monotonic functions, Darboux theorems, Fundamental theorem of integral calculus, Improper Integral.	15

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Text Books Recommended-

1. T.M.Apostol(2008).*MathematicalAnalysis:AModernApproachtoAdvancedCalculus*.Pearson Education.
2. Charalambos D.Aliprantis&)OwenBurkinshaw1998).*PrinciplesofReal Analysis*.AcademicPress

Reference Books Recommended-

3. RobertG.Bartle&DonaldR.Sherbert(2015).*IntroductiontoRealAnalysis*(4th edition).WileyIna.
4. GeraldG.Bilodeau,PaulR.Thie&G.E.Keough(2015).*AnIntroductiontoAnalysis* (2nd edition),JonesandBartlettIndiaPvt.Ltd.
5. E.Hewitt&K.Stromberg(2013).*RealandAbstractAnalysis*.Springer-Verlag.
6. K.A.Ross(2013).*ElementaryAnalysis*:*TheTheoryofCalculus*(2nd edition).Springer.
7. WalterRudin.*PrinciplesofMathematicalAnalysis*(3rd edition),TataMcGrawHill.

E-resources: https://onlinecourses.nptel.ac.in
https://epqp.inflibnet.aci.in
https://swayam.gov.in
https://www.mooc.org

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment (CIA):	**30 Marks**
End Semester Examination (ESE):	**70 Marks**

Continuous Internal Assessment (CIA) (Conducted by course teacher)	Test /Quiz – 20+20 Marks Assignment/Seminar- 10 Marks	Better marks out of two test/quiz + obtained marks in Assignment shall be considered against 30 marks
End Semester Examination (ESE)	**Two Section-A&B** Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20marks Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks	

Name and signature of convener & members of CBOS-

Dr. S. Das [signature] Dr. Omkar Lal Shrivastava [signature] (Dr. P. K. Sahu)

FOUR YEAR UNDERGRADUATE PROGRAM(2024-28)

DEPARTMENT OF MATHEMATICS

COURSE CURRICULUM

Part A: Introduction			
Program: Bachelor in Science (Degree/Honors)		**Semester - V**	**Session:2024-2025**
1	Course Code	**MASE-03**	
2	Course Title	**Numerical Methods**	
3	Course Type	**Discipline Specific Elective (DSE)**	
4	Pre-requisite (if any)	Basic idea of Numerical solutions, Differential equation and theory of eqution.	
5	Course Learning Outcome (CLO)	**This Course will enable the students to:** ➢ The aim of this course is to teach the student the application of various numerical techniques for variety of problems occurring in the daily life. ➢ The main outcome will be that student will be able to handle problems and finding approximated solution. ➢ Obtain numerical solutions of algebraic and transcendental equations. ➢ Find numerical solutions of system of linear equations and to check the accuracy of the solutions. ➢ Learn about various interpolating and extrapolating methods to find numerical solutions.	
6	Credit Value	**4 C**	1Credit =15 hours-Learning and Observation
7	Total Marks	Maximum Marks : 100	Minimum Passing Marks:40

Part B: Content of the Course		
Total no of teaching – learning period =60 Periods (60 Hours)		
UNIT	**Topics**	**No of Periods**
I	Numerical Methods for Solving Algebraic and Transcendental Equations Round-off error and computer arithmetic, Local and global truncation errors, Algorithms and convergence; Bisection method, false position method, fixed point iteration method, Newton's method and secant method for solving equations.	**15**
II	Lagrange and Newton interpolations, Piecewise linear interpolation, Cubic spline interpolation, Finite difference operators, Gregory Newton forward and backward difference interpolations.	**15**
III	First order and higher order approximation for first derivative, Approximation for second derivative; Numerical integration: Trapezoidal rule, Simpson's rule and its error analysis, BulirschStoer extrapolation methods, Richardson extrapolation.	**15**
IV	Euler's method, RungeKutta methods, Higher order one step method, Multi-step methods; Finite difference method, Shooting method, Real life examples: Google search engine, 1D and 2D simulations, Weather forecasting.	**15**

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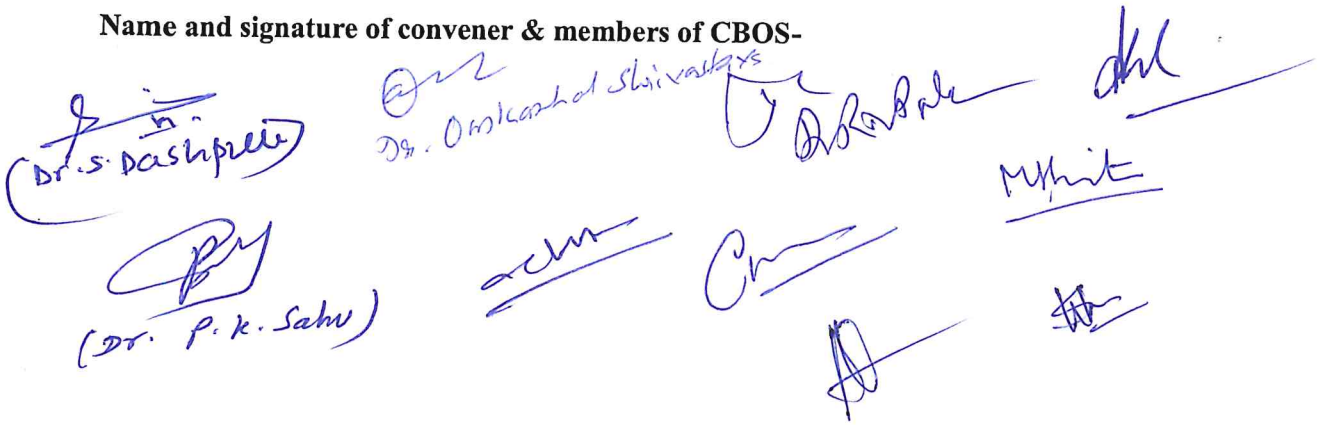
(Dr. P. K. Sahu)

Part C - Learning Resource		
Text Books, Reference Books, Other Resources		
Text Books Recommended- 1. M.K. Jain, S. R. K. Iyengar& R. K. Jain (2012). Numerical Methods for Scientific and Engineering Computation (6th edition). New Age International Publishers. 2. C. F. Gerald & P. O. Wheatley (2008). Applied Numerical Analysis (7th edition), Pearson Education, India.		
Reference Books Recommended- 3. Brian Bradie (2006), A Friendly Introduction to Numerical Analysis. Pearson. 4. Robert J. Schilling & Sandra L. Harris (1999). Applied Numerical Methods for Engineers Using MATLAB and C. Thomson-Brooks/Cole.		
E-Recourses: https://onlinecourses.nptel.ac.in https://epgp.inflibnet.aci.in https://swayam.gov.in https://www.mooc.org		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: **Maximum Marks:** **100 Marks** **Continuous Internal Assessment (CIA):** **30 Marks** **End Semester Examination (ESE):** **70 Marks**		
Continuous Internal Assessment (CIA) (Conducted by course teacher)	Test /Quiz – 20+20 Marks Assignment/Seminar- 10 Marks	Better marks out of two test/quiz + obtained marks in Assignment shall be considered against 30 marks
End Semester Examination (ESE)	**Two Section-A&B** Section-A: Q1.Objective- 10x1=10 marks Q2. Short answer type question-5x4=20marks Section-B: Descriptive answer type question, 1 out of 2 from each unit- 10x4= 40 Marks	

Name and signature of convener & members of CBOS-



FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION

Program: Bachelor in Science *(Degree/ Honors)*	Semester: V	Session: 2024-25

1	Course Code	**PHSC-05T**
2	Course Title	**Introduction to Quantum Mechanics**
3	Course Type	**Discipline Specific Course**
4	Pre-requisite (if any)	**As per Program**
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: ➢ Explain the basic postulates of quantum mechanics ➢ Explain the concept of the wave packet ➢ Describe the principle of Heisenberg's uncertainty principle and its applications ➢ Gain knowledge about physical quantities as operators ➢ Apply the Schrodinger equation to various quantum systems
6	Credit Value	**03 Credits** | **1 Credit = 15 Hours - Learning & Observation**
7	Total Marks	**Maximum Marks: 100** | **Minimum Pass Marks: 40**

PART – B: CONTENT OF THE COURSE

Total No. of Teaching-learning Periods (01 Hr. per period) – 45 Periods (45 Hours)

Unit	Topics	No. of Period
I	**Wave-particle duality:** Limits of classical mechanics, Theoretical and experimental consequences and their explanation such as black body radiation, Planck's law, Photoelectric effect, Compton's effect, Specific heat of solids at low temperatures, wave-particle duality and demonstration of matter waves, Bohr's complementary principle and correspondence principle, Concept of the wave packet and its spread with time, Gaussian wave packet, Phase and Group velocity, de-Broglie wavelength using phase velocity and group velocity.	12
II	**Uncertainty principle:** Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of variables), Experiments for the verification of uncertainty principle, mathematical derivation of uncertainty principle for the one-dimensional wave packet, Applications and consequences of the uncertainty principle.	10
III	**Schrodinger equation:** Representation of dynamic variables by operators (operators for the position, momentum, energy, angular momentum), Schrodinger's wave equation, Wave function, Probabilistic interpretation of wave function, Probability current densities in one dimension, Equation of continuity, Normalization of wave function, Orthogonality property of wave function, Expectation value of dynamical variables, Ehrenfest's theorem, Postulates of Quantum Mechanics.	11
IV	**Application of Schrodinger wave-equation** Solution for free particle, Free particle in a box and density of states, Transmission through potential step, Rectangular potential barrier and tunnelling phenomena, Linear harmonic oscillator with the concept of zero-point energy and parity, Schrodinger equation in spherical polar co-ordinates, spherical symmetric potential, energy states of hydrogen using Schrodinger equation.	12

Keywords:	Black body radiation, Planck's, Photoelectric effect, de-Broglie wavelength, Uncertainty principle, Schrodinger equation.

10/6/24

Signature of Convener & Members (CBoS):

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books *Recommended*

1. Unified Physics- III, R. P. Goyal, Shivlal Agrawal Publications
2. Unified Physics- III, Navbodh Publications

Reference Books*Recommended*

1. Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
2. Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill
3. Quantum Mechanics: Theory & Applications, A.K.Ghatak&S.Lokanathan, 2004, Macmillan

Online Resources (e-books/ learning portals/ other e-resources)

1. All e-books of physics https://www.e-booksdirectory.com/listing.php?category=2
2. Free physics textbook in PDFhttps://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE
3. Cambridge University Books for Physics https://www.cambridgeindia.org/
4. Books for solving physics problems https://bookboon.com/en/physics-ebooks
5. NPTEL Online courses: https://onlinecourses.nptel.ac.in/noc21_ph05/preview
6. Quantum Mechanics https://archive.nptel.ac.in/courses/115/101/115101107/
7. Quantum Mechanics https://nptel.ac.in/courses/115106066

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 100Marks
Continuous Internal Assessment (CIA): 30 Marks
End Semester Examination (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz (2): **20+20** Assignment/ Seminar (1): **10** Total Marks: **30**	Better marks out of the two Test / Quiz + marks obtained in Assignment shall be considered against **30** Marks
End Semester Exam(ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 =20Marks** Section B: Descriptive answer type, **1 out of 2** from each unit- **4x10 =40 Marks**	

Signature of Convener & Members (CBoS) :

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FOUR YEARS UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION				
Program : Bachelor in Science (Degree/ Honours)			**Semester: V**	**Session: 2024-25**
1	Course Code	**PHSC- 05 P**		
2	Course Title	**Introduction to Quantum Mechanics**		
3	Course Type	**Discipline Specific Course**		
4	Pre-requisite (if any)	**As per Program**		
5	Course Learning Outcomes (CLO)	After the completion of the course, get opportunity to perform the following experiments on measurement and verification basicconcepts of Quantum mechanics. The studentsare expected to: ➢ Assemble required parts/devices and arrange them to perform experiments. Record/ observe data as required by the experimental objectives. ➢ Analyze recorded data and formulate it to get desired results. ➢ Interpret results and check for attainment of proposed objectives related to laws of Quantum Mechanics and its applications ➢ Apply the learnt concepts for different problems in laser systems, nuclear physics and EMW related problems.		
6	Credit Value	**01 Credit**	**1 Credit = 30 Hours Laboratory Work**	
7	Total Marks	**Maximum Marks: 50**	**Minimum Pass Marks: 20**	

PART – B: CONTENT OF THE COURSE

Total No.of learning-Training/performance Periods - 30 Periods (30 Hours)

Sr. No.	Objects (At least 10 of the following or related Experiments)	No. of Period
1	Measurement of Planck's constant using black body radiation and photo-detector	30
2	Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light	
3	To determine work function of material of filament of directly heated vacuum diode.	
4	To determine the Planck's constant using LEDs of at least 4 different colours.	
5	To determine the wavelength of H-alpha emission line of Hydrogen atom.	
6	To determine the ionization potential of mercury.	
7	To determine the absorption lines in the rotational spectrum of Iodine vapour.	
8	To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.	
9	To setup the Millikan oil drop apparatus and determine the charge of an electron.	
10	To show the tunneling effect in tunnel diode using I-V characteristics.	

Keywords:	Planck's constant, tunneling effect, Photo-electric effect, spectrum –Rotational and vibrational, e/m

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PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended-

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash& Ramakrishna, 11th Edn, 2011,Kitab Mahal
4. Practical Physics B. Sc III : R P Goyal, Shivlal Publications

Reference Books Recommended-

1. Practical Physics by Dr. Giasuddin Ahmad and Md. Shahabuddin
2. Practical Physics by Dr. Harnam Singh
3. Practical Physics by R. K. Shukla and N. K.

Online Resources (e-books/ learning portals/ other e-resources)

1. Virtual Lab :https://vlab.amrita.edu/?sub=1&brch=195
2. https://mpv-au.vlabs.ac.in/
3. https://mpv-au.vlabs.ac.in/modern-physics/Hall_Effect_Experiment/
4. https://www.falstad.com/qmatomrad/
5. https://www.falstad.com/mathphysics.html : Quantum mechanics

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 Marks
Continuous Internal Assessment(CIA):15 Marks
End Semester Exam(ESE):35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance – **05** Total Marks - **15**	Better marks out of the two Test / Quiz **+Marks** obtained in Assignment shall be considered against **15** Marks
End Semester Exam (ESE):	**Laboratory Performance: On spot Assessment** **Performed the Task based on lab. work - 20 Marks** **Spotting based on tools & technology (written) – 10 Marks** **Viva-voce (based on principle/technology) - 05 Marks**	**Managed by Course teacher as per lab. status**

Name and Signature of Convener & Members of CBoS:

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION				
Program: Bachelor in Science *(Degree/Honors)*			**Semester - V**	Session: 2024-2025
1	**Course Code**	**PHSE-03**		
2	**Course Title**	**Nuclear Physics**		
3	**Course Type**	**Discipline Specific Elective**		
4	**Pre-requisite** (if, any)	***As per Program***		
5	**Course Learning. Outcomes (CLO)**	➢ Describe nuclear constituents and their intrinsic properties.Analyze binding energy variations with mass number and understand the N/Z plot. ➢ Explain and apply nuclear models for clear understanding of stability of nuclei and nuclear processes.Differentiate alpha, beta, and gamma decay and interpret energy spectra. ➢ Apply conservation laws to compute Q-values, and analyze reaction mechanism.Explain significance of scattering and reaction cross section. ➢ Calculate and compare nuclear fission and fusion energy.Describe nuclear detectors and particle accelerators. ➢ Gain insights into cutting-edge research, accelerator technology, and interdisciplinary applications and apprehend the role of accelerators in advancing scientific knowledge and contributing to societal well-being.		
6	**Credit Value**	**4 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: CONTENT OF THE COURSE

Total No. of Teaching–learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course Contents)	No. of Period
I	**General Properties of Nuclei:** Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments.	15
II	**Nuclear Models:** Liquid drop model approach, semi empirical mass formula and, significance of its various terms, condition of nuclear stability, two nucleon separation energies, Fermi gas model, evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field.	15

III	**Nuclear decay and Reactions:** Alpha, beta, gamma decay, energy spectrum, Geiger-Nuttel law, disintegration energy, quantum theory of alpha decay, types of beta decay and energy spectrum, Pauli's prediction of neutrino. Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct Reaction, resonance reaction, Coulomb scattering (Rutherford scattering). **Nuclear Energy Reactions:** Nuclear Fission, Calculation of energy released, Nuclear fusion, Energy released in Fusion, Comparison of Fission and fusion energy, Fusion as source of stellar Energy, Nuclear reactors in India, Contribution of nuclear energy in total energy requirement.	**15**
IV	**Nuclear Detector and Particle Accelerators:** Interaction of charge particle through matter, Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation, Detectors and construction of photo-multiplier tube (PMT), Semiconductor Detectors. Accelerator facility available in India: Van-de Graaff generator, Pelletron accelerator, Linear accelerator, Cyclotron accelerator **Nuclear Accelerators in India:** RRCAT, VECC, BARC TIFR Pelletron Facility, IUC : working, evolution and contribution.	**15**
Keywords	Properties of Nucleus, Nuclear forces, Nuclear Models, Decay reaction, detectors and accelerators	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Introduction to Nuclear and Particle Physics V.K. Mittal, R. C. Verma, S. C. Gupta, Eastern Economy Edition.
2. Basic ideas and concepts in Nuclear Physics - An Introductory Approach by K. Heyde (IOP-Institute of Physics Publishing, 2004)
3. Nuclear Physics by S.N. Ghoshal, S. Chand Publishing, 2019
4. Unified Physics-III by R P Goyal, Shivlal Agrawal & Sons Publication
5. Nuclear Physics -6Ed by D. C. Tayal, Himalaya Publishing House

Reference Books Recommended –

1. Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008).
2. Concepts of nuclear physics by Bernard L. Cohen. (Tata Mc-Graw Hill, 1998).
3. Introduction to the physics of nuclei & particles, R.A. Dunlap. (Thomson Asia, 2004).
4. Nuclear Physics An Introduction S. B. Patel New Age International Publishers.

Online Resources– e-Resources / e-books and e-learning portals

1. NPTEL :: Physics - NOC:Nuclear and Particle Physics
2. NPTEL :: Physics - Nuclear Physics: Fundamentals and Applications
3. Fundamentals of Nuclear Power Generation - Course (nptel.ac.in)
4. eGyanKosh: Unit-13 Nuclear Physics
5. eGyanKosh: Block-4 Nuclear Physics
6. NPTEL :: Physics - Nuclear Science & Engineering
7. Official Websites of Raja Ramanna Centre for Advanced Technology (RRCAT),Variable Energy Cyclotron Centre (VECC),BARC–TIFR Pelletron Facility, Inter-University Accelerator Centre (IUAC)

PART -D:vAssessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20 & 20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – 10 x1= **10** Mark; **Q2**. Short answer type- **5x4 =20Marks** Section B: Descriptive answer type qts.,**1 out of 2** from each unit-**4x10=40 Marks**	

Name and Signature of Convener & Members of CBoS:

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FOUR YEAR UNDERGRADUATE PROGRAM (2024-2028)
DEPT. OF SPORTS: VALUE ADDITION COURSE
COURSE CURRICULUM (2024-25)

PART-A: Introduction			
Program: Undergraduate *(Certificate / Diploma / Degree/Honors)*		Semester - I/III/V	Session: 2024-2025
1	Course Code	LIVAC-01	
2	Course Title	Library & Information Resources	
3	Course Type	VAC(Value Added Courses)	
4	Pre-requisite (if, any)	*As per Program*	
5	Course Learning. Outcomes (CLO)	Acquainted with library resources and their various types. Understood general and reference sources. Familiar with electronics and open resources. Able to evaluate library resources and locate answer to reference queries. Able to evaluate of Web-Based Resources.	
6	Credit Value	2 Credits	*Credit = 15 Hours - learning & Observation*
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) - 30 Periods (30 Hours)

Module	Topics (Course contents): Learning and Practices	No. of Periods
I	**Understanding Library Resources** • Concept, Definition, Scope • Types of Library and Information Sources • Documentary and Non-Documentary Sources • Primary, Secondary and Tertiary Sources	08 (08Hr)
II	**General and Reference Sources** • Meaning, Definition, Scope • General Resource Materials • Reference Sources-Nature and types • General Sources vs. Reference sources	07 (07Hr)
III	**Electronic and Open Access Resources** • E-resources-meaning, concept and definition • Types, nature and scope • Open access resources-nature and accessibility • Web based resources-nature and accessibility	08 (08Hr)
IV	**Evaluation of Library Resources** • Need and Purpose of Evaluation • Criteria for Evaluation • Evaluation of Documentary Resources • Evaluation of Web-Based Resources	07 (07Hr)
Keywords	....	

Signature of Convener & Members, CBOS:

11/06/24

(Dr. S. Jain)

(Dr. Anamika Shukla Slora)

(Suresh Kaker)

Shailendra Arya

ANJEETA KUJUR

PART–C

Learning Resources: Text Books, Reference Books and Others

Text Books Recommended-

1. Bopp, R. C. & Smith, L.C. Reference & InformationServices,2nd Ed. US.LibrariesUnlimited,2011.
2. Cassell, K. A. & Hiremath,U.Reference&InformationServicesinthe21stCentury:AnIntroduction,2 nd Ed. US, American Library Association, 2011.
3. Kaushal,C.&Mahapatra,R.K.OpenAccessE-ResourcesinLibrary&InformationScience.NewDelhi, Ess Ess Publication, 2013.
4. Kumar, K. Library Manual, 4th Ed. New Delhi, S. Chand, 2018.
5. Kumar, PSG.InformationSourcesandServices-TheoryandPractice.Vol.6.NewDelhi:BR Publishing Corporation, 2004.
6. Ranganathan,SR.LibraryBookSelection.NewDelhi.EssEssPublications,2006
7. Ranganathan,SR.LibraryManual.NewDelhi.EssEssPublications,2008
8. Sharma,(J.S.)andGrover(DR).ReferenceServicesandSourcesofInformation.NewDelhi.EssEss Publications, 1987.
9. Singh, G. Information Sources,Services&Systems.NewDelhi,PrenticeHallIndiaLearning,2013.

Online Resources–

- LCh-009.pdf(nios.ac.in)
- LCh-001.pdf(nios.ac.in)
- https://ebooks.lpude.in/library_and_info_sciences/DLIS/Year_1/DLIS001_FOUNDATION_OF_LIBRARY_AND_INFORMATION_SCIENCE.pdf
- eGyanKosh:BLI-221Library,InformationandSociety
- MicrosoftWord-LG-Lesson1Lib(nios.ac.in)
- MicrosoftWord-BLIS-101.1 (uou.ac.in)
- http://14.139.237.190/other_pdf/BLIS_01_N.pdf(UPRTOU)
- http://14.139.237.190/other_pdf/BLIS-01.pdf(UPRTOU)
- eGyanKosh:बीएलआई221पुस्तकालय,सूचनाएवंसमाज
- LCh-001H.pdf(nios.ac.in)
- LCh-002H.pdf(nios.ac.in)
- e-PGPathshala(inflibnet.ac.in)
- ref1-1(lpude.in)
- eGyanKosh:BLIS-05ReferenceandInformationSources
- pssou.ac.in/read_e_book?id=424c49425f3036
- http://14.139.237.190/other_pdf/BLIS_06.pdf(UPRTOU)
- LCh-008H.pdf(nios.ac.in)
- LCh-007H.pdf(nios.ac.in)
- LCh-006H.pdf(nios.ac.in)
- LCh-005H.pdf(nios.ac.in)
- e-PGPathshala(inflibnet.ac.in)
- unit7 (egyankosh.ac.in)Unit-3.pdf(egyankosh.ac.in)
- BLIS-106.pdf(uou.ac.in)
- BLIS6.pdf(vmou.ac.in)

Online Resources–

☐**e-Resources/e-books and e-learning portals**

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**50 Marks**
Continuous Internal Assessment (CIA):	**15 Marks**
End Semester Exam (ESE):	**35 Marks**

Continuous Internal Assessment (CIA): **(By Course Teacher)**	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz **+** obtained marks in Assignment shall be considered against **15** Marks
End Semester Exam (ESE):	**Two section – A & B** Section **A**: **Q1**. Objective – **05 x1= 05** Mark; **Q2**. Short answer type- **5x2 =10 Marks** Section **B**: Descriptive answer type qts.,**1 out of 2** from each unit- **4x05 =20 Marks**	

Name and Signature of Convener & Members of CBOS:

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(Dr. Anamika Shrivastava)