Estd. 1962
"A++" Accredited by NAAC(2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416 004, MAHARASHTRA
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शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४,महाराष्ट्र
दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९३/९४

SU/BOS/Science/480 **Date: 01/07/2023**

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

Subject: Regarding syllabi of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

M.Sc. Part-II (Sem. III & IV) as per NEP-2020			
1.	Mathematics	8.	Botany
2.	Mathematics (Distance Mode)	9.	Electronics
3.	Mathematics (Online Mode)	10.	Zoology
4.	M.Sc. Tech (Industrial Mathematics With Computer Application)	11.	Agro Chemical and Pest Management (AGPM)
5.	Geography	12.	Alcohol Technology
6.	Statistics	13.	Sugar Technology
7.	Applied Statistics and Informatics	14.	Geology

This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website **www.unishivaji.ac.in**)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

SHIVAJI UNIVERSITY, KOLHAPUR

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Accredited by NAAC: A++ Grade with CGPA 3.52

Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP-2020)

Syllabus For

M.Sc. Tech (Industrial Mathematics with Computer Applications) Part -II

Semester III and IV

(Syllabus to be implemented from the Academic Year2023-24)

Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP-2020)
M.Sc. Tech (Industrial Mathematics with Computer Applications) Programme Structure
M.Sc. Tech (Industrial Mathematics with Computer Applications)Part – II

SEMESTER-III (Duration- Six Month)												
	Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
			Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
			Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
CGPA	1	CC-301	4	-	4	80	32	3	20	8	1
	2	CC-302	4	-	4	80	32	3	20	8	1
	3	CC -303	4	-	4	80	32	3	20	8	1
	4	CC -304	4	-	4	80	32	3	20	8	1
	5	DSE -305	4	-	4	80	32	3	20	8	1
	6	CCPR-306	--	8	4	80	32	3	20	8	--
Total (C)			**--**	**--**	**24**	**480**	**--**	**--**	**120**	**--**	**--**
Non-CGPA	1	AEC-307	2	2	2	--	--	--	50	20	2
	2	EC (SWM MOOC)-308/ OE-308	Number of lectures and credit shall be as specified on SWAYAM- MOOC or as specified on OE								
SEMESTER-IV (Duration- Six Month)											
CGPA	1	CC-401	4	--	4	80	32	3	20	8	1
	2	CC-402	4	--	4	80	32	3	20	8	1
	3	CC -403	4	--	4	80	32	3	20	8	1
	4	CC -404	4	--	4	80	32	3	20	8	1
	5	DSE -405	4	--	4	80	32	3	20	8	1
	6	CCPR-406	--	8	4	80	32	3	20	8	--
Total (D)			**--**	**--**	**24**	**480**	**--**	**--**	**120**	**--**	**--**
Non-CGPA	1	SEC-407	2	2	2	--	--	--	50	20	2
	1	GE-408	2	2	2	--	--	--	50	20	2
Total (C+D)					**48**	**960**	**--**	**--**	**240**	**--**	**--**

<table>
<tr><td>• Student contact hours per week : 30 Hours</td><td>• Total Marks for M.Sc Tech.-II : 1200</td></tr>
<tr><td>• Theory Lectures : 60 Minutes Each
• Practical : 8 Hours per week</td><td>• Total Credits for M.Sc Tech.-II (Semester III & IV) : 48</td></tr>
<tr><td>• CC-Core Course
• CCPR-Core Course Practical
• DSE-Discipline Specific Elective
• AEC-Mandatory Non-CGPA compulsory Ability Enhancement Course
• SEC- Mandatory Non-CGPA compulsory Skill Enhancement Course
• EC (SWM MOOC) - Non-CGPA Elective Course
• GE-Generic Elective
• OE- Open Elective</td><td>• Separate passing is mandatory for Theory and Internal Examination</td></tr>
<tr><td colspan="2">• Requirement for Entry at M.Sc Tech (Industrial Mathematics with Computer Applications)Part-II :
Students of Shivaji University Kolhapur who have completed learning of M.Sc Tech (Industrial Mathematics with Computer Applications)Part-I .</td></tr>
<tr><td colspan="2">• Exit Option at M.Sc Tech (Industrial Mathematics with Computer Applications)Part-II:
PG Diploma Course in M.Sc Tech(Industrial Mathematics with Computer Applications)</td></tr>
</table>

M.Sc. Tech. (Industrial Mathematics with Computer Applications) (Part-II) (Semester III)

Course Code	Title of Course
CC-301	Complex Analysis
CC-302	Ordinary Differential Equations
CC -303	Design and Analysis of Algorithms
CC -304	Operating System
DSE -305	Python Programming
CCPR-306	Lab Course III
AEC-307	Communicative English-II

M.Sc. Tech. (Industrial Mathematics with Computer Applications) (Part-II) (Semester IV)

Course Code	Title of Course
CC-401	Real Analysis
CC-402	Operations Research
CC -403	Software Engineering
CC -404	PHP with MySQL
DSE -405	Java Programming
CCPR-406	Lab Course IV
SEC-407	Fundamentals of Information Technology : Cyber Security
GE-408	

Subject Equivalence

(Semester III)

Old Course	New Course
Complex Analysis	Complex Analysis
Ordinary Differential Equations	Ordinary Differential Equations
DAA -I	Design and Analysis of Algorithms
Database System	Operating System
Object Oriented Programming with C++	Python Programming

(Semester IV)

Old Course	New Course
Real Analysis	Real Analysis
Operations Research	Operations Research
DAA-II	Software Engineering
PHP with MySQL	PHP with MySQL
Java Programming	Java Programming

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester III)

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code: CC-301
Title of Course: Complex Analysis

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Compute the region of convergence for power series,
2. Prove the cauchy-riemann equations and apply them to complex functions in order to examine differentiability and analyticity of complex functions,
3. Evaluate complex integration along the curve via cauchy's theorem and integral formula
4. Prove the cauchy residue theorem and apply it to several kinds of real integrals.
5. Compute the taylor series and laurent series expansions of complex functions and apply it to for checking the nature of singularities and calculating residues,

Unit I : **15 Lectures**

Power series, Radius of convergence, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Conformal mappings, Mobius Transformations.

Unit II: **15 Lectures**

Line integral, Power series representation of analytic functions, zeros of an analytic function, Liouville's Theorem, Fundamental theorem of algebra, Maximum modulus theorem.

Unit III: **15 Lectures**

The index of a closed curve, Cauchy's theorem and integral formula, Morera's Theorem, Counting zeros, open Mapping theorem, Goursat's Theorem, classification of singularities, Laurent series development, Casorati–Weierstrass theorem.

Unit IV: **15 Lectures**

Residues, residue theorem, evaluation of real integrals, The argument principle, Rouche's theorem, Schwarz's lemma and its application to characterize conformal maps.

Recommended Book:

1. J. B. Conway: Functions of One Complex Variable, 3rd Edition, Narosa Publishing House, 1973.

Reference Books:

1. S. Ponnusamy, Foundations of Complex Analysis, 2nd Edition, Narosa Publishing House, 2015
2. Alfors L. V.: Complex Analysis, McGraw Hill, 1979.
3. S. Ponnusamy, H Silverman, Complex Variables with Applications, Birkhauser Bostan, 2006
4. J. Brown, R.Churchill , Complex Variables and Applications, MacGraw Hill(India). (8th Edition, 2014.
5. Serge Lang, Complex Analysis, Fourth Edition, Springer, 1999.

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code: CC-302

Title of Course: Ordinary Differential Equations

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Study basic notions in Differential Equations and use the results in developing advanced Mathematics.
2. Solve problems modeled by linear differential equations.
3. Use power series methods to solve differential equations about ordinary points and regular Singular points.
4. Construct approximate solutions using method of successive approximation.
5. Establish uniqueness of solutions.

Unit I : **15 Lectures**

Linear differential equations with constant coefficients: The second order homogeneous equation, initial value problems for second order equations, linear dependence and independence, formula for the Wronskian, the non-homogeneous equations of order two.

Unit II: **15 Lectures**

The homogeneous equations of order n, initial value problems for the nth order equations, the non-homogeneous equation of nth order. Linear equations with variable coefficients: Initial value problems for the homogeneous equations. Solutions of the homogeneous equations, the Wronskian and linear independence.

Unit III: **15 Lectures**

Reduction of the order of a homogeneous equation, the non-homogenous equations, homogeneous equations with analytic coefficients, the Legendre equations. Linear equations with regular singular points: The Euler equations, second order equations with regular singular points.

Unit IV: **15 Lectures**

The Bessel equation, regular singular points at infinity. Existence and uniqueness of solutions: The method of successive approximations, the Lipschitz condition, convergence of the successive approximation.

Recommended books:

1. E. A. Coddington: An introduction to ordinary differential equations. (2012) Prentice Hall of India Pvt.Ltd. New Delhi.

Reference books:

1. G. Birkoff and G.G.Rota, Ordinary differential equations, John Willey and Sons.
2. G.F. Simmons, Differential Equations with Applications and Historical note, McGraw-Hill, Inc. New York. (1972).
3. E.A. Coddington and Levinson, Theory of ordinary differential equations, McGraw-Hill, New York(1955).
4. E.D. Rainvills, Elementary differential equations, The Macmillan company, New York. (1964).

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code : CC -303

Title of Course: Design and Analysis of Algorithms (DAA)

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Learn good principles of algorithm design
2. Analyze complexity of algorithms using asymptotic analysis.
3. Study and Solve Problem using different algorithm design strategies.
4. Understand graph algorithms and concepts of NP hard and complete

Unit I : 15 Lectures

Introduction to Algorithms: Problem solving aspect, top down design, implementation of algorithm, the efficiency of algorithm analysis, analysis of Algorithm : time complexity and space complexity, Asymptotic notations**, Divide-and-Conquer** :Multiplying square matrices, Strassen's algorithm for matrix multiplication , substitution method for solving recurrences, recursion-tree method for solving recurrences , master method for solving recurrences .

Unit II: 15 Lectures

Probabilistic Analysis and Randomized Algorithms The hiring problem, Indicator random variables, Randomized algorithms, Probabilistic analysis, **Dynamic Programming** Rod cutting Matrix-chain multiplication Elements of dynamic programming Longest common subsequence, Optimal binary search trees

Unit III: 15 Lectures

All-Pairs Shortest Paths The Floyd-Warshall algorithm , Johnson's algorithm for sparse graphs **Maximum Flow**: Flow networks , The Ford-Fulkerson method , Maximum bipartite matching **Matching's in Bipartite Graphs** :Maximum bipartite matching , The stable-marriage problem The Hungarian algorithm for the assignment problem, **Greedy method**-knapsack problem, Minimum cost spanning tree algorithms, An activity-selection problem , Huffman codes

Unit IV: 15 Lectures

Backtracking – n Queen problem, Hamiltonian circuit problem, **Branch and Bound** – assignment problem and Travelling Salesman problem, **NP-Hard and NP-Complete problems**: basic concepts, non-deterministic algorithms.

Recommended Books:

1. Thomas H. Cormen Charles E. Leiserson Ronald L. Rivest Clifford Stein, **Introduction to Algorithms,** Fourth Edition,
2. R.G. Dromey,‖"How to Solve it by Computes"‖ , Prentice- Hall of India, 1982

Reference Books:

1. Horowitz and Sahani, "Fundamentals of Computer Algorithms", Galgotia Publication, 2nd edition.
2. Weiss, Mark Allen, ―"Data Structures and Algorithm Analysis in C"‖, Addison Wesley, 2nd edition , 1999.

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code : CC -304

Title of Course: Operating System

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Describe process management and concepts of threading, multitasking, IPC.
2. Differentiation of various scheduling algorithms and identify the reasons of deadlock and their remedial measures in an operating system.
3. Describe various memory management techniques.
4. Know the components and management aspects of concurrency control
5. Understand representation of file system structure.

Unit I : **15 Lectures**

Operating System: Introduction, Objectives and Functions, different vies of operating system, Types of operating systems: Batch Operating Systems, Multiprogramming Operating Systems, Time-sharing Systems, Real-Time Operating Systems, Distributed Operating Systems, Personal Computer Operating Systems, Mobile Operating Systems, **Processes and Threads:** Processes, Threads, inter process communication, Classical IPC problems such as Dining philosophers, Readers and writers, and Sleeping barber

Unit II: **15 Lectures**

CPU Scheduling: Basic Concepts, Scheduling Criteria, **Scheduling Algorithms:** FCFS, SJF, SRTF, RR, Priority-based scheduling, **Deadlocks:** Resources, Deadlocks, Deadlock Characterization, Deadlock prevention, Deadlock Avoidance: Resource Allocation Graph Algorithm, Banker's Algorithm, Ostrich algorithm, Deadlock detection, Deadlock recovery.

Unit III: **15 Lectures**

Memory management: Basic memory management, **Contiguous Memory allocation:** Single Partition, Multiple Partition, Fragmentation, **Non-Contiguous Memory allocation:** Paging, Segmentation, Swapping, Overlays, Virtual Memory, Demand Paging, **Page replacement algorithms:** FIFO, OPR, LRU

Unit IV: **15 Lectures**

Input/output: Principles of I/O hardware and software, I/O software layers. I/O Techniques: Polling, Interrupt driven I/O, DMA, **File systems:** Files, Basic Concepts, File Attributes, File Operations, File Types, File Structure, File Access, Directories: Single level, Two level, Hierarchical level Directory System.

Recommended Books:

1. Tanenbaum A. S.: Modern Operating Systems, Pearson Education Aisa, First Indian reprint 2001
2. Operating System: Rohit Khurana, ITLESL, Delhi

Reference Books:

1. Operating Systems: Concepts: By Abraham Siberschatz, Peter Galvin- Willey- 6th edition
2. Milan milenkovic: operating systems: concepts and Design, Tata McGraw-Hill Education.
3. System Programming and Operating Systems by D.M. Dhamdhere-TMH –Second Edition.
4. Operating Systems: Internals and Design Principles, Seventh Edition by William Stallings, Pearson Publications

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code : DSE -305

Title of Course: Python Programming

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Learn Basic Syntax of Python Programming.
2. Understand and implement concepts of object oriented methodology using Python.
3. Demonstrate file handling techniques.
4. Understand how Python can be used for application development.
5. Design Real life problems and think creatively about solution of them.

Unit I : **15 Lectures**

Introduction to Python- an interpreted high level language, interactive mode and script mode. Variables, Expressions and Statements, Variables and Types-mutable and Immutable variable and Keywords. , Operators and Operands in Python. (Arithmetic, relational and logical operators), Operator precedence .Expressions and Statements (Assignment statement); Taking input (using raw_input () and input ()) and displaying output - print statement, Comments in Python. **Conditional and Looping Construct:** if - else statement and nested if – else while, for, use of range function in for, Nested loops, break, continue.

Unit II: **15 Lectures**

Functions : Built-In Function, invoking built in functions , Functions from math, random, time & date, User Define Function . Strings: Creating, initializing and accessing the elements; String operators: +, *, in, not in, range, slice [n: m], String built in functions & methods, Strings constants defined in string module.

Unit III: **15 Lectures**

Lists: Concept of mutable lists, creating, initializing and accessing the elements of list, List operations. **Tuples :** Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple() .**Sets :**Concept of Sets , creating, initializing and accessing the elements of ,Sets operation(Membership, union, intersection, difference, and symmetric difference. **Dictionaries:** Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, Traversing, Dictionary functions & Methods.

Unit IV: **15 Lectures**

Modules: Executing modules as scripts, The Module Search Path, “Compiled” Python files Standard Modules , The dir( ) Function ,Packages Importing * From a Package. I/O and **File Handling:** Output Formatting, Reading and Writing Files (text and binary mode). Exceptions Handling.

Recommended Books:

1. Learning Python By Mark Lutz, O’Reilly Publication
2. Programming with python, A users Book, Michael Dawson, Cengage Learning

References:

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
2. Python for Informatics: Exploring Information, Charles Severance
3. Introduction to Python for Computational Science and Engineering (A beginner's guide), Hans Fangohr

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester III)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code : CCPR-306

Title of Course: Lab Course-III

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements
2. Express proficiency in the handling of strings and functions
3. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets
4. Read and write data from & to files in Python

The programs related to Python Programming.
Minimum 4 practical based on the syllabus of each unit of Python Programming course.

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester IV)

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code : CC-401
Title of Course: Real Analysis

Course Outcomes: Upon successful completion of this course, the student will be able to:
1. generalize the concept of length of interval.
2. analyze the properties of Lebesgue measurable sets.
3. demonstrate the measurable functions and their properties.
4. understand the concept of Lebesgue integration of measurable functions.
5. characterize Riemann and Lebesgue integrability.
6. prove completeness of L^P Spaces.

Unit I : **15 Lectures**

σ-algebra and Borel Sets of Real numbers, Lebesgue Outer Measure, The sigma algebra of Lebesgue measurable sets, Outer and Inner approximation of Lebesgue Measurable Sets, Countable Additivity, Continuity and Borel-Cantelli Lemma.

Unit II : **15 Lectures**

Nonmeasurable Sets, Lebesgue Measurable Functions: Sums, Product and Composition of Measurable Functions, Sequential Pointwise Limits and Simple Approximation, Littlewood's Three Principles: Egoroff's Theorem and Lusin's Theorem (Only statements)

Unit III: **15 Lectures**

Lebesgue Integral of a Bounded Measurable Function over a Set of Finite Measure, Lebesgue integral of a Measurable Non-negative Function, The General Lebesgue Integral, Characterizations of Riemann and Lebesgue Integrability.

Unit IV : **15 Lectures**

Differentiability of Monotone Functions, Lebesgue's Theorem(Only statement), Functions of Bounded Variations, Jordan's theorem, Absolutely Continuous Functions, Integrating Derivatives: Differentiating Indefinite Integrals, The L^P Spaces: Normed Linear Spaces, The Inequalities of Young, Hölder and Minkowski, The Riesz-Fischer Theorem(Only statement).

Recommended Books:

1. H. L. Royden, P.M. Fitzpatrick, Real Analysis, Fourth Edition, PHI Learning Pvt. Ltd., New Delhi, 2010

Reference Books:

1. G. de Barra, Measure Theory and Integration, New Age International (P) Ltd., 1981.
2. I. K. Rana, An Introduction to Measure and Integration, Narosa Book Company, 1997.
3. S. K. Berberian, Measure and Integration, McMillan, New York, 1965.
4. P. K. Jain, V. P. Gupta, Lebesgue measure and Integration, Wiley Easter Limited, 1986.
5. W. Rudin, Principles of Mathematical Analysis, McGraw-Hill Book Co, 1964.
6. P. K. Halmos, Measure Theory, Van Nostrand, 1950.

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code: CC-402

Title of Course: Operations Research

Course Outcome: Upon successful completion of this course, the student will be able to:

1. Recognize convex sets and convex functions.
2. Calculate maximum and minimum value of a function of several variables.
3. Solve LPP by simplex and dual simplex methods.
4. Construct codes, efficiency and redundancy in Encoding
5. Find optimal value of nonlinear objective function subject to constraints.

Unit I : **15 Lectures**

Convex sets and their properties: Lines and hyper planes, convex sets, Extreme points of convex set, convex combination of vectors, Convex hull, Convex polyhedron, convex cone, simplex and convex function, General formulation of linear programming problem, Matrix form of LP problem.

Unit II : **15 Lectures**

Definitions of standard LPP, Fundamental Theorem of linear programming. Simplex method, Computational procedure of simplex method, Artificial variable techniques, two phase simplex method, problem of degeneracy and method to resolve degeneracy. Duality in linear programming, Concept of duality, definition of primal dual problems, General rules for converting any primal into its dual.

Unit III: **15 Lectures**

Duality theorems, Primal and dual correspondence, Duality and simplex method. Dual simplex method , Computational procedure of dual simplex method, Integer linear programming, Gomory's constraint, Gomory's cutting plane, Computational demonstration of Gomory's algorith , Gomory's cutting plane method, Branch and Bound method, Computational demonstration of Branch and Bound method, Applications of integer programming

Unit IV : **15 Lectures**

Information Theory : Communication process, Model for communication system,, Fundamental theorem of information theory, Statistical nature of communication systems, measure of information, A binary unit of information, measure of uncertainty of entropy, basic properties of entropy function (H), Joint and conditional entropies, Uniqueness theorem, Chanel capacity, efficiency and redundancy, Encoding, The problem of unique Decipherability, Shannon Fano encoding procedure.

Recommended Books :

1. S.D. Sharma: Operations Research, Kedar Nath Ram Noth and co. 15th edition Reprint 2009

Reference Books:

1. J.K.Sharma : Operations research
2. Kanti Swarup ,P.K.Gupta and Manmohan : Operations research, S.Chand& Co.
3. Hamady Taha : Operations Research :Mac Millan Co.
4. R.K.Gupta : Operations Research Krishna Prakashan Mandir, Meeru
5. G.Hadley : Linear programming, Oxford and IBH Publishing Co. 6. S.I.Gass : Linear Programming,Mc Graw Hill Book Co

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code: CC-403

Title of Course: Software Engineering

Course Outcome: Upon successful completion of this course, the student will be able to:

1. Understand various models of Software Development.
2. Understand requirement gathering and requirement modeling.
3. Explore concepts and models in software design.
4. Understand the testing and debugging methods for software.

Unit I : **15 Lectures**

Introduction: Software problem, Software Engineering problem, Software Engineering approach . **Software process**: Software process, characteristics, **Software development process:** A Process Step Specification, Waterfall Model, Prototyping Model, Iterative Enhancement, The Spiral Model, project management process, Software configuration management process, process management process.

Unit II : **15 Lectures**

Software requirement analysis and specification: Software requirement, problem analysis, requirement specification, Validation, **Matrices:** Size Measures, case study. **Planning a Software project**: Cost estimation, Project scheduling, Staffing and personal planning, **Quality assurance plan:** Verification and Validation, Inspections and Reviews, project maintaining plans, **Risk management:** Risk Management Overview, Risk Assessment, Risk Control.

Unit III: **15 Lectures**

Function oriented design: Design principles: Problem Partitioning and Hierarchy, Abstraction, Modularity, Top-Down and Bottom-Up Strategies, **Modulo level concepts:** Coupling, Cohesion, **Design notation and specification:** Structure Charts, Structured design Methodology, Verification, **Metrics:** Network Metrics, Stability Metrics, Information Flow Metrics, Object oriented design – object oriented analysis and design, **UML**, design methodology, Metrics.

Unit IV : **15 Lectures**

Detailed design: modulo specification, **Detailed design verification:** Design Walkthroughs, Critical Design Review, Consistency Checkers, **Testing**: Testing fundamentals: Error, Fault, and Failure, White box and black box testing, Functional Testing: Equivalence Class Partitioning, Boundary Value Analysis, Structural Testing, testing object oriented program, Stubs and Drivers, **Testing process:** Comparison of Different Techniques, Levels of Testing, **STLC**: Phases of STLC, Software Bug, Defect Life cycle, Defect Removal Efficiency

Recommended Books :

1. An interpreted approach to software engineering- Pankaj Jalote

Reference Books:

1. Software Engineering – A Practitioners Approach 5th and 6th edition, Roger Pressman
2. Software engineering concepts – Richard Fairley
3. The Practical guide to Structural design – Miller Paige Jones
4. Software Engineering – Martin Shooman

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code : CC-404

Title of Course: PHP with MySQL

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Gain knowledge and skills for the design and construction of Website and Web Application Development using Open Source Language PHP.
2. Develop a web application using PHP technologies.
3. Demonstrate the skills and project-based experience needed for entry into web application and development careers.
4. Compare multiple web technologies to create advanced, dynamic & effective website by the using of HTML, Java script, MySQL, CSS and PHP.
5. Acquire knowledge and Skills for creation of Web Site using PHP and MySQL.

Unit I : **15 Lectures**

Introduction of PHP: Embedding PHP with HTML, Enhancing further, PHP Language Basics: Using variable in PHP, understanding Data types, operator and expressions. Making decisions: simple decision with if statements, switch, ternary operator, do-While loop, for statement, break, loop skip iteration, nested loop. Arrays: creating and accessing array elements, looping through arrays, multidimensional array, manipulating array. Function: calling functions, working with variable functions, own functions references, recursive functions. Strings: creating and accessing strings, searching strings, replacing text within strings and formatting strings.

Unit II : **15 Lectures**

Handling HTML forms with PHP: HTML forms work, capture form data with PHP, multivalued fields, web forms with PHP, storing PHP variables in forms, create file upload forms, redirecting PHP. **Introducing MySQL Database:** Deciding how to store data, quick play with MYSQL, connecting to MYSQL from PHP, retrieving data from MYSQL with PHP. PHP CRUD with MYSQL

Unit III : **15 Lectures**

Cookies: introduction to Cookie, Cookie Syntax, How to Create, Store, Retrieve and Delete Cookie. **PHP File Upload:** Create an Upload-File Form, Upload Script and Save Uploaded file, putting restrictions on uploads. **Session:** introduction to Session, Creating, Storing and Destroying Sessions. **Classes & Object:** OO Concepts, Define Class, Class Attributes, An Object, Creating an Object, Object Properties & Methods, Object constructors and destructors, Static Method, Class Inheritance, Abstract Class, Implement Inheritance.

Unit IV : **15 Lectures**

File Handling in PHP : File I/O Operations , Checking File Permissions , Local File System Manipulation , Working with CSV Files, PHP Directory Operations, **Exception Handling**: Error Handling , Definition of Exception , Standard Keywords in Exception Handling , General Structure of Exception Handling Block , Difference Between Exception and Error.

Recommended Books:

1. PHP Concepts Unleashed For Novice –Evincepub Publishing byDr.P G Naik, Dr. K.S.Oza
2. PHP: A Beginners guide,TataMcgraw Hill,2009., VikramVaswani

References:

1. Matt Doyle, Beginning PHP 5.3,Wiley India Edition,2012 .
2. PHP6 and MySQL, Steve Suehring, Tim Converse and Joyce Park, Wiley India 2010
3. Beginning PHP 5.3,Wiley India Edition,2012 , Matt Doyle
4. Core PHP Programming" by Atkinson Leon, SuraskiZeev, Pearson Publication

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code : DSE -405

Title of Course: Java Programming

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Understand basic concepts of Java such as operators, classes, objects, inheritance, packages, enumeration and various keywords
2. Identify classes, objects, members of a class and relationships among them needed for a specific problem
3. Demonstrate the concepts of polymorphism and inheritance
4. Implement Exceptional handling mechanism
5. Design applications of Java using Java applet, Event Handling, Abstract Window Toolkit and database connectivity

Unit I : **15 Lectures**

Introduction: The Java Virtual Machine, The Editions of Java, A Simple Java Program. **Java Fundamentals:** Java Keywords, Identifiers, Java's Eight Primitive Data Types. **Control Structures:** Flow of Control, Boolean Logic, Boolean Operators, The if Statements, The if/else Statements, The Switch Statements, The While Loop, The do/While Loop, For Loop. Classes and Objects, Garbage Collection.

Unit II : **15 Lectures**

Method: Method Call Stack, Method Signature, Call by Value, Overloading Methods, Constructors, A Class with Multiple Constructors, Using this in Constructor. **Understanding Inheritance:** The is a Relationship, Single Versus Multiple Inheritance, The Java Lang. Object Class, Method Overriding, The Super Keyword, The Final Keyword, Invoking a Parent Class Constructor. **Package:** Packages, The Access Specifies, Encapsulation, Understanding Static Members, Accessing Static Fields and Methods, Static Initializes, Instance Initializes. **Polymorphism and Abstraction:** Polymorphism, Casting References, The Instance of Keyword, Virtual Methods, Abstraction, Abstract Classes, Abstract Methods.

Unit III : **15 Lectures**

Interfaces: User-Defined Interfaces, Implementing an Interfaces, Extending Interfaces, Interfaces and Polymorphism. **Exception Handling:** Flow of Control of Exceptions, Catching Exceptions, Writing try/catch Blocks, Multiple catch Blocks, Handle or Declare Rule, Declaring Exceptions, The throws Keyword, Throwing Exceptions The Finally Keyword, Overridden Methods and Exceptions, User-Defined Exceptions. **JDBC-ODBC Connectivity**

Unit IV : **15 Lectures**

GUI Programming: AWT Versus Swing, Creating Windows, Containers and Components, Layout Managers, Panels, **GUI Components and Event Handling:** The Delegation Model, The Event Listener Interfaces, Creating an Event Listener, Registering a Listener with an Event Source, **Applets:** The java.applet.Applet Class, Swing Applets, Life Cycle of an Applet.

Recommended Books:

1. Richard F. Raposa,: Learning JAVA, Wiely Publishing Inc.

Reference Books:

1. Herbert Schildt: The Complete Reference to JAVA , Fifth Edition
2. V.V. Bhaskar, P. V. Subba Reddy: Object Oriented Programming Through JAVA, Scitech Publications (India) Pvt. LTD.
3. Fundamentals of Core JAVA Volume –I & II

M. Sc. Tech (Industrial Mathematics with Computer Applications)
(Part II) (Semester IV)
(NEP-2020)
(Introduced from Academic Year 2023-24)

Course Code : CCPR-406

Title of Course: Lab Course-IV

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Analyze PHP scripts and determine their behavior.
2. Create PHP scripts capable of inserting and modifying data in a mysql database.
3. Construct PHP scripts to create dynamic web content, use cookies to store some data in the browser and pass it to the next request.
4. Demonstrate the use of good object-oriented design principles including encapsulation and information hiding.
5. Write GUI programs using swing controls in Java

The programs related to PHP with MySQL and Java Programming.
Minimum 4 practical based on the syllabus of each unit of both courses.

1. Nature of the Theory Question Papers:

1. There shall be 7 questions each carrying 16 marks
2. Question No.1 is compulsory. It consists of objective type questions.
3. Students have to attempt any four questions from Question No.2 to Question No.7.
4. Question No.2 to Question No.7 shall consist of short/ descriptive-answer type sub-questions.

2. Nature of the Lab Course Question Papers:

Lab Course-III:

1. Practical Examinations will be conducted at the end of semester.
2. Exam will be of 3 hrs duration.
3. There shall be 6 questions (based on DSE -305) each of 20 marks, of which a student has to attempt any 4 questions.
4. There shall be 20 marks for practical assignments.

Lab Course-IV:

1. In Practical Examination there shall be 2 sections.
2. In section 1 (based on CC-404) there shall be 3 questions each of 20 marks, of which a student has to attempt any 2 questions.
3. In section 2 (based on DSE-405) there shall be 3 questions each of 20 marks, of which a student has to attempt any 2 questions.
4. There shall be 10 marks for practical viva and 10 marks for practical assignments.

3. There shall be 1 internal examiner and 1 external examiner to conduct practical examination.