SHIVAJI UNIVERSITY, KOLHAPUR - 416 004, MAHARASHTRA

www.unishivaji.ac.in, bos@unishivaji.ac.in

शिवाजी विद्यापीठ, कोल्हापुर - ४१६ ००४, महाराष्ट्र

दरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दरध्वनी ०२३१–२६०९०९३/९४

SU/BOS/Science/499

Date: 10/07/2023

1	
The Principal,	The Head/Co-ordinator/Director
All Concerned Affiliated Colleges/Instituti	ons All Concerned Department (Science)
Shivaji University, Kolhapur	Shivaji University, Kolhapur.

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

Sir/Madam,

Estd. 1962

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

To.

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-I (Sem. I & II) as per NEP-2020 degree programme under the Faculty of Science and Technology.

	M.ScPart I (Sem. I & II) as per NEP-2020						
1.	Microbiology (HM)	10.	Data Science				
2.	Pharmaceutical Microbiology (HM)	11.	Computer Science				
3.	General Microbiology	12.	Information Technology (Entire)				
4.	Electronics	13.	Food Science & Technology				
5.	Embedded Technology	14	Food Science & Nutrition				
6.	Geology	15.	Biochemistry				
7.	Sugar Technology (Entire)	16.	Biotechnology				
8.	Alcohol Technology (Entire)	17.	Medical Information Management				
9.	Agro Chemical & Pest Management (AGPM)	18.	Environmental Science				
		19.	Physics				

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



NAAC "A++" Grade with CGPA 3.52

(NEP-2020)

Syllabus for

M.Sc. (Information Technology)

(under Faculty of Science and Technology)

PART I SEMESTER I & II

(Syllabus to be implemented from Academic year 2023-24)

(NEP-2020) Program Structure M.Sc.I.T Part – I (Level-6)

			SEMES	TER-I (Duration- Si	x Month)					
Sr.	Course Code	Teaching	g Scheme		Examination	Examination Scheme					
No.		Theory a	nd Practica	ıl	Univ	ersity Assessn	nent (UA)	Interna	Internal Assessment (IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours	
1	CC-101: Advanced Web Technology	4	4	4	80	32	3	20	8		
2	CC -102: Cloud Computing	4	4	4	80	32	3	20	8		
3	CCPR -103: Practical-I		6	4	80	32	3	20	8		
4	CC-104: Resear ch in Compu ting	2	2	2	40	16	2	10	4		
5	CCS-105: Elective 1) Machine Learning Processing 2) Advanced Database Management System	4	4	4	80	32	3	20	8		
6	RM -106: Research Methodology	4	4	4	80	32	3	20	8		
	Total (A)			22	440			110			

			SEME	STE	R-II (Dur	ation- Six	x Mon	th)			
Sr.	Course	Teaching	Scheme		Examination	Examination Scheme					
No.	Code	Theory an	nd Practica	al	University As	ssessment (UA	A)	Internal Assessment (IA)			
		Lectures	Hours	Credit	Maximum	Minimum	Exam.	Maximum	Minimum	Exam.	
		(Per	(Per		Marks	Marks	Hours	Marks	Marks	Hours	
		week)	week)								
1	CC-201:	4	4	4	80	32	3	20	8		
	Data										
	Science										
	~~ ~ ~								_		
2	CC -202:	4	4	4	80	32	3	20	8		
	Advanced										
	Java Programmin										
	g										
3	CCPR -		6	4	80	32	3	20	8		
	203:		-			_	_	-	_		
	Practical-II										
4	CC-204:	2	2	2	40	16	2	10	4		
	Big Data										
	Analytic										
	008 205								-		
5	CCS-205:	4	4	4	80	32	3	20	8		
	1) Natural										
	Language										
	Processing										
	Trocessing										
	2) Modern										
	Networking										
6	OJT 206			4	80	32		20	8		
	Internship										
	T-4-1 (D)	1.4			4.40			110			
	Total (B)	14	20	22	440			110			
	$\mathbf{T}_{\mathbf{A}} = 1 \left(\mathbf{A} + \mathbf{D} \right)$		20		000			220			
	i otai (A+B)			44	880			220			
I				1	1			1	1		

• Student contact hours per week : 24 Hours (Min.)	• Total Marks for M.ScI : 1100				
• Theory and Practical Lectures : 60 Minutes Each	• Total Credits for M.ScI (Semester I & II) : 44				
 CC-Core Course CCPR-Core Course Practical RM: Research Methodology OJT: On job training Internship: Student must complete On job training/ Internship during semester break. 	 Practical Examination is Semester wise before Theory Examination. Examination for CCPR -103shall be based on Semester-I Practical. Examination for CCPR -203 shall be based on Semester II Practical. *Duration of Practical Examination as per respective BOS guidelines Separate passing is mandatory for Theory, Internal and Practical Examination 				
• Requirement for Entry at Level 6: Completed all requirements of the Bachelor's de	gree (Level 5).				
 Exit Option at Level 6: Students can exit after Level 6 with Post Graduate Diploma in Computer Science if he/she completes the courses equivalent to minimum of 40-44 credits. 					

(NEP-2020) M.Sc. Program Structure Part – II (Level-6.5)

		SE	EMESTE	CR-III (D	uration- Si	x Month)				
Sr. No	Course Code		Feaching S	Scheme	Examina	ation Scheme	2			
•		Tł Pr	neory actical	and	Uni (UA	versity Asses	sment	Interr	al Assessme	ent (IA)
		Lectures (Per week)	Hours (Per week)	Cred it	Maximu m Marks	Minim um Marks	Exam Hour s	Maximu m Marks	Minimu m Marks	Exam Hour s
1	CC-301: Artificial Intelligen ce	4	4	4	80	32	3	20	8	
2	CC -302: Image Processing	4	4	4	80	32	3	20	8	
3	CCPR - 303: Practical- III		6	4	80	32	3	20	8	
4	CC-304: Web Developm ent	2	2	2	40	16	2	10	4	
5	CCS-305: 1) R Progra mming 2) Cyber Sec urity	4	4	4	80	32	3	20	8	
6	CC -306: Research Project		6	4	80	32	3	20	8	
	Total (C)	14	26	22	440			110		

		S	EMEST	ER-IV	(Duration- S	Six Month)				
Sr. Course Code Teaching Scheme					Examination	Scheme				
No.		Theory an	nd Practic	cal	University As	ssessment (UA	v)	Internal Asses	ssment (IA)	
		Lectures	Hours	Credit	Maximum	Minimum	Exam.	Maximum	Minimum	Exam.
		(Per	(Per		Marks	Marks	Hours	Marks	Marks	Hours
		week)	wee)							
1	CC-401:	4	4	4	80	32	3	20	8	
	Android									1
	Programming									L
2	CC -402:	4	4	4	80	32	3	20	8	
	Advance									
	Python									
	Programming									
3	CCPR -403:		6	4	80	32	3	20	8	
	Practical-IV	-								

4	CCS-404: 1) Deep	4	4	4	80	32	3	20	8	
	Learning									
	2) Agile									
	Project									
	Management									
5	CC-405: Research Project		10	6	100	40	3	50	20	
	Total (D)	12	28	22	420			130		
	Total (C +D)			44	860			240		

٠	Student contact hours per week : 26 Hours (Min.)	• Total Marks for M.ScII : 1100
٠	Theory and Practical Lectures : 60 Minutes Each	• Total Credits for M.ScII (Semester III & IV) : 44
• • • •	CC-Core Course CCS- Core Course Specialization CCPR-Core Course Practical RP: Research Project	 Practical Examination is Semester wise before theory examination. Examination for CCPR -303shall be based on Semester III Practical. Examination for CCPR-403 shall be based on Semester IV Practical. *Duration of Practical Examination as per respective BOS guidelines Separate passing is mandatory for Theory, Internal and PracticalExamination
•	Requirement for Entry at Level 6.5 Completed all requirements of the 1 6)	: relevant Post Graduate Diploma in Information Technology (Level
•	Exit at Level 6.5: Students will exit a he/she completes the courses equivale	Iter Level 6.5 with Master's Degree in Information Technology if nt to Minimum of 88 credits.

	M.Sc.I.T-I	M.Sc.I.T-II	Total
Marks	1100	1100	2200
Credits	44	44	88

Shivaji University, Kolhapur

M.Sc. (Information

Technology)

(Under faculty of Science & Technology)

Program Outcomes

Upon successful completion of the M.Sc.I.T the student should have met the following Student Learning Outcomes:

- 1. Students will acquire the ability to identify and formulate research problems, enabling them to contribute to the advancement of knowledge in the field of computer science
- 2. Identify, analyze, and synthesize scholarly literature relevant to the field of computer science.
- 3. Employ software development tools, software systems, and modern computing platforms.
- 4. Prepare for academic roles such as NET/SET/PhD.
- 5. Apply design and development principles when constructing software systems of varying complexities.
- 6. The program cultivates the ability to effectively communicate and collaborate as part of a team in multidisciplinary projects, utilizing essential skills for seamless coordination and cooperation.

1. Introduction

1. The name of the programme shall be **M.Sc. (Information Technology)**.

2. The M.Sc. in Information Technology is a postgraduate degree program that provides in-depth knowledge and expertise in various aspects of computer science. This program is designed for students to make a strong foundation in computer science and wish to further their education and skills in specialized areas. It offers advanced coursework and research opportunities to explore cutting-edge topics and contribute to the field of computer science.

3. Completing MSc. in Information Technology equips students with a diverse set of skills and knowledge that can lead to various career opportunities in academia, research, industry, or entrepreneurship. They can pursue roles such as software engineer, data scientist, artificial intelligence specialist, cyber security analyst, research scientist, consultant, or pursue further academic studies such as a Ph.D. in Computer Science.

4. The University Department offering the MSc.I.T program will determine the number of electives based on recent trends in IT industry.

5. The MSc. program in Information Technology is a combination of computer-related courses that cover programming techniques, software packages, databases, and system analysis and design tools. The program includes projects to enhance students' technical skills, IT understanding, and domain knowledge, preparing them for successful careers as software professionals. Emphasis is placed on domain knowledge in various areas, enabling students to develop software applications. The curriculum covers Software Engineering, data science, cyber security and cloud computing, mobile technologies and advanced Internet and web technologies. Soft skills development is integrated to enhance students overall personality and employability. The projects in the M.Sc. program prioritize emerging fields such as mobile app development, full stack development. The current curriculum emphasizes learning from three perspectives: conceptual learning, skills learning, and practical/hands-onexperience.

6. The inclusion of projects at second year ensures the focus on applying the skills learnt at respective levels. It will enhance student's capability to work on various technologies. It will make appropriate platform for students to work in IT Industry. This program aims to enhance student's technical orientation and foster their eagerness to do the research projects as per the IT industry demand.

2. Duration of the Course:

The M,SC.I.T programme will be a full-time TWO years i.e. 4 semesters. Patternof examination will be Semester System.

3. Medium of Instruction:

The medium of Instruction will be English only.

4. Admission Procedure

Eligibility:

- Eligibility: <u>B.Sc. Information Technology (Entire/ optional)</u>, <u>B.Sc. Computer Science</u> (Entire) / <u>B.C.S</u> / <u>B.Sc. Computer Science (Optional)</u> /<u>B.Sc. IT /B.C.A(underScience</u> faculty), <u>B.Sc. Mathematics</u>, <u>B.Sc. Statistics</u>, <u>B.Sc. Electronics</u>
- Admission through University Entrance exam only.
- Only entrance marks should be considered for admission process.
- Reservation of Seats as per rules of Government of Maharashtra

5. Course Structure:

Lectures and Practical should be conducted as per the scheme of lectures and practical indicated in the course structure.

6. Teaching and Practical Scheme

- 1. Each contact session for teaching or practical should be of 60 minutes each.
- 2. Minimum 48 periods should be conducted for each subject of 100 Marks.
- 3. Minimum 24 periods should be conducted for each subject of 50 Marks.
- 4. One Practical Batch should be of 30 students.
- 5. Practical evaluation should be conducted before the commencement of University examination.

7. Project Work:

- 1. Project work may be done individually or in groups in case of bigger projects. However, if project is done in groups, each student must be given a responsibility for a distinct moduleand care should be taken to see the progress of individual modules is independent of others.
- 2. Students should take guidance from assigned guide and prepare a Project Report on "Project Work" in two copies to be submitted to the Director of the Institute/Head of the Department.
- 3. The project report will be duly accessed by the assigned guide and internal marks will be communicated by the Director of the Institute/Head of the Department.
- 4. The project report should be prepared in a format prescribed by the University. The external viva shall be conducted by a panel of minimum two examiners out of which one will be external and other will be internal examiner.

OR

Students will be provided the opportunity to formulate a research project proposal. It requires careful planning, critical thinking, and a thorough understanding of existing literature and technological advancements.

5. Assessment:

- 1. The final total assessment of the candidate is made in terms of an internal assessment and anexternal assessment for each course.
- For each theory paper, 20% marks will be based on internal assessment and 80% marks for semester examination (external assessment), unless otherwise stated.
- The division of the 20 marks allotted to internal assessment of theory papers is as Follows:
- Two tests should be conducted of MCQ type questions. Each test will be of 10marks.
- The division of the 10 marks allotted to internal assessment of theory papers is as

follows. Test of 10 marks should be conducted of MCQ type questions.

- 2. The project will be evaluated by the university appointed examiners both internal as well as external.
- 3. The final practical examination will be conducted by the university appointed examiners both internal as well as external at the end of semester for each lab course and marks will be submitted to the university by the panel. The pattern of final Practical Examination will be as follows;

1	Coding and Execution of Program	60 Marks
2	Viva-voce	20 Marks
3	Journal	20 Marks
4	Total	100 Marks

The practical examination will be conducted semester wise in order to maintain the relevance of the respective theory course with laboratory course.

- 4. The internal marks will be communicated to the University at the end of each semester, but before the semester end examinations. These marks will be considered for the declaration of the results.
- 5. The final Examinations shall be conducted at the end of the semester.
- 6. Nature of question paper:

Nature of question paper is as follows for University end semester examination.

a. Theory Examination (80 marks): For 80 marks:

- 1. There will be seven (7) questions of 16 Marks and out of which four (4) to be attempted from question no 2 to 7.
- 2. Question No.1 is compulsory and is of multiple-choice questions. There will be 8 multiple choice question each carrying 2 marks.
- 3. Question No.2 to Question No. 7 should consist of 2 sub questions each carrying 8 marks.
- 4. Question No. 7 should be a short note, where 4 questions will be given, out of which two questions should be attempted.

For 40 marks:

- 1. There will be six (6) questions of 10 Marks and out of which three (3) to be attempted from question no 2 to 6.
- 2. Question No.1 is compulsory and is of multiple choice questions. There will be5 multiple

Choice question each carrying 2 marks.

b. Practical Examination:

- 1. Duration of Practical Examination: 3 Hrs
- 2. Nature of Practical Question paper: There will be three questions out of which any two questions to be attempted and each question carries 30 Marks.

9. Standard of Passing:

Internal as well as external examination will be held at the end of semester. The candidate must score 40% marks in each head of internal as well as external Examination

10. Board of Paper Setters /Examiners:

For each Semester end examination there will be a board of Paper setters and examiners for every course. While appointing paper setter /examiners, care should be taken to see that there is at least one person specialized in each unit of the course.

11.Award of Class:

There will be numerical marking on each question. At the time of declaration of the result marks obtained by the candidate is converted into grade point as shown below;

Grade Point Table

Range of Marks obtained out of	Grade Points
100 or any fractions	
0	0 To 5
1	6 To 10
1.5	11 To 15
2	16 To 20
2.5	21 To 25
3	26 To 30
3.5	31 To 35
4	36 To 40
4.5	41 To 45
5	46 To 50
5.5	51 To 55
6	56 To 60
6.5	61 To 65

7	66 To 70
7.5	71 To 75
8	76 To 80
8.5	81 To 85
9	86 To 90
9.5	91 To 95
10	96 To 100

Grading: Shivaji University has introduced a Seven-point grading system as follows:

Grades	CGPA Credit Points
0	8.60 To 10
A+	7.00 To 8.59
А	6.00 To 6.99
B+	5.50 To 5.99
В	4.50 To 5.49
С	4.00 To 4.49
D	0.00 To 3.99

Overall Final Grades	Class		Grade
8.60 To 10	Higher Distinction Level	Extraordinary	0
7.00 To 8.59	Distinction Level	Excellent	A+
6.00 To 6.99	First Class	Very Good	А
5.50 To 5.99	Higher Second Class	Good	B+
4.50 To 5.49	Second Class	Satisfactory	В
4.00 To 4.49	Pass	Fair	C
0.00 To 3.99	Fail	Unsatisfactory	D

12.Credit system implementation:

As per the University norms and NEP-2020

13.Clarification of Syllabus:

The syllabus Committee should meet at least once in a year to study and clarify any difficulties from the Institutes. The Workshop on syllabi should be organized at the beginning of every semester on request from Institutes.

14. Eligibility of Faculty:

A Candidate must possess M. Sc. in Comp. Sci./ MCA (Science) with NET/ SET/SLET or Ph.D.

15.Revision of Syllabus:

In light of the accelerated pace at which computer technology renders knowledge obsolete, it is imperative to contemplate revising the syllabus at regular intervals of approximately two to three years.

16.Backlog

Students should not have more than FOUR (4) backlogs for second year admission.

(NEP-2020)

To be implemented from the academic year 2023-2024

Course Code: CC-101	Title of Course: Advanced Web Technology		
Internal Marks: 20	External Marks: 80	Theory: 04 hours/week	

Course outcomes:

- 1. Students will be able to develop application using MVC.
- 2. Students will be able to understand Entity Framework.
- 3. Students will be able to understand Web API.

UNIT I

Introduction to MVC, Benefits of using ASP.NET MVC, Role of Model, View, and Controller, ASP.NET MVC Works, Naming conventions, Creating views, Defining controllers, Defining a data model, Creating strongly-typed views, Creating strongly-typed views

UNIT II

Razor View Engine: Razor Basics, Razor design goals, Implementation of Razor view, Razor syntax, Accessing Model Data in Razor views Using Entity Framework: Crud Operations, Crud Operation Using BO Class, Crud Operations Using Generic BO Class.

UNIT III

Working with URLs and Routing: Understanding the Routing Mechanism, Adding a Route Entry, Using Parameters, Using Defaults, Using Constraints ASP.NET Web API with MVC: Overview of the ASP.NET Web API, Building servers and clients, Content negotiation, Validation, Dependency Injection

UNIT IV

MVC State Management: Using hidden fields, Session and Application State, Custom model bindings Azure Services: Cloud Computing, Cloud Characteristics, Cloud Computing Service Models, Introduction to Azure, Benefits of Azure, Azure Hosting Models, Azure Services, Azure Portals

References:

- 1. IProfessional ASP.NET MVC 5 by Jon Galloway, Brad Wilson, K. Scott Allen, David Matso
- 2. ASP.NET MVC 4 and the Web AP Jamie Kurtz

(15 Hours)

(15 Hours)

(15 Hours)

(NEP-2020)

To be implemented from the academic year 2023-2024

Title of Course: Cloud Computing **Course Code: CC-102**

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course outcomes:

- 1. To learn how to use Cloud Services.
- 2. To implement Virtualization.
- 3. To implement Task Scheduling algorithms. Apply Map-Reduce concept to applications.

4. To build Private Cloud.Broadly educate to know the impact of engineering on legal and societal issues involved.

UNIT I

Introduction to Cloud Computing: Introduction, Historicaldevelopments, Building Cloud Computing Environments, Principles of Parallel and Distributed Computing: Eras of Computing, Parallel v/sdistributed computing, Elements of Parallel Computing, Elements of distributed computing, Technologies for distributed computing. Virtualization: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization.

UNIT II

Cloud Computing Architecture: Introduction, Fundamental conceptsand models, Roles and boundaries, Cloud Characteristics, CloudDelivery models, Cloud Deployment models, Economics of the cloud, Open challenges. Fundamental Cloud Security: Basics, Threatagents, Cloud security threats, additional considerations. IndustrialPlatforms and New Developments: Amazon Web Services, Google App Engine, Microsoft Azure. **UNIT III**

Specialized Cloud Mechanisms: Automated Scaling listener, Load Balancer, SLA monitor, Pay-peruse monitor, Audit monitor, fail over system, Hypervisor, Resource Centre, Multidevice broker, State Management Database. Cloud Management Mechanisms: Remote administration system, Resource Management System, SLA Management System, Billing Management System, Cloud Security Mechanisms: Encryption, Hashing, Digital Signature, Public KeyInfrastructure (PKI). **UNIT IV** (15 Hours)

Fundamental Cloud Architectures: Workload DistributionArchitecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture. AdvancedCloud Architectures: Hypervisor Clustering Architecture, Load Balanced Virtual Server Instances Architecture.

Reference Books

1. Mastering Cloud Computing Foundations and Applications Programming

Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi

2. Cloud Computing Concepts, Technology & Architecture Thomas Erl, Zaigham Mahmood, and Ricardo Puttini

(15 Hours)

(15 Hours)

(NEP-2020)

To be implemented from the academic year 2023-2024

Course Code: CCPR-103, Title of Course: Practical-I

Internal Marks: 20

External Marks: 80

Practical: 06 hours/week

Course Outcomes:

- 1. To become familiar with programming environment.
- 2. To implement advanced data structures
- 3. Apply data structures in real life problems.
- 4. Able to create tables and generate queries
- 5. To be familiar with different types of databases.

Lab work is based on Advanced Web Technology and Cloud Computing .This laboratory course should consist of 10 to 12 programming exercises with focus on covering the hands-on aspects covered in theory course.

(NEP-2020)

To be implemented from the academic year 2023-2024

Course Code: CC-104

Title of Course: Research in Computing

Internal Marks: 10 External Marks: 40 Theory: 02 hours/week

Course Outcomes:

After completion of this course, student will able to,

1. To be able to conduct business research with an understanding of allthe latest theories.

2. To develop the ability to explore research techniques used for solvingany real world or innovate problem.

UNIT I

(15 Hours)

Introduction: Role of Business Research, Information Systems and Knowledge Management, Theory Building, Organization ethics and Issues Beginning Stages of Research Process: Problem definition, Qualitative research tools, Secondary data research Research Methods and Data Collection: Survey research, communicating with respondents, Observation methods, Experimentalresearch

UNIT II

(15 Hours)

Measurement Concepts, Sampling and Field work: Levels of Scalemeasurement, attitude measurement, questionnaire design, sampling designs and procedures, determination of sample size **Data Analysis and Presentation:** Editing and Coding, Basic Data Analysis, Univariate Statistical Analysis and Bivariate Statistical analysis and differences between two variables. Multivariate Statistical Analysis.

References

- 1. Business Research Methods William G.Zikmund, B.J Babin, J.C. Carr, Atanu Adhikari, M.Griffin
- 2. Business Analytics AlbrightWinston
- 3. Research Methods for Business Students FifthEdition Mark Saunders

(NEP-2020)

To be implemented from the academic year 2023-2024 Course Code: CCS-105 Title of Course: Machine Learning

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

- 1. Develop an appreciation for what is involved in learning models from data.
- 2. Understand a wide variety of learning algorithms.
- 3. Understand how to evaluate models generated from data. solving

UNIT I

(15 Hours)

Introduction to Machine Learning • Introduction • Evolution of machine learning • Difference between AI and Machine learning • Developments in machine learning • Introduction to Knearest neighbor method, different phases of predicative modeling

UNIT II

Aspects of Machine Learning • Definition of learning System • Goals and applications of machine learning • Aspects of developing a learning system: training data, concept representation, function approximation

UNIT III

(15 Hours)

(15 Hours)

Machine Learning Modelling • ML Modeling flow, How to treat Data in ML • Types of machine learning, performance measures • Bias-Variancde Trade-Off • Overfitting & Underfitting, Bootstrap Sampling, Bagging Aggregation 12 4 Basic Probability

UNIT IV

Handling Test Data Reading test data from excel file Reading test configuration data from text file Writing data to excel file Test logging Machine Learning Grid Overview

References:

- 1. EthemAlpaydin, Introduction to Machine Learning, Second Edition
- 2. Rich & Knight, Artificial Intelligence Tata McGraw Hill

(NEP-2020)

To be implemented from the academic year 2023-2024

Course Code: CCS-105

Title of Course: Advanced Database Management System

Internal Marks: 20

External Marks: 80

Theory: 04 hours/week

Course Outcomes:

After Completion of this course, students will be able to;

- 1. Use PL/SQL for handing data in a database as per the user's requirement using programming features
- 2. Define various cursors and its implementation along with procedure and functions.
- 3. To study usage and applications of parallel and distributed databases, object relational database.

4. To acquire knowledge on NoSQL databases.

UNIT I

Introduction to RDBMS: Introduction to DBMS & RDBMS. Data constraintprimary key, foreign key, unique key, null, notnull, default key etc.

SQL: Introduction to SQL, Features of SQL, Basic data types, SQL statements/commands, Set operations in SQL, order by and group by clause like, between, in, like, create index, view and join command Nested queries, GRANT and REVOKE, Commit, Rollback, Steps for processing a query, Sorting , Join Operation , Hash Join . SQL functions: MAX, MIN SORT, COUNT, AVERAGE, Numeric, String, Date Functions, Type conversion functions.

UNIT II

(15 Hours)

(15 Hours)

Introduction to PL /SQL: Introduction, Difference between SQL AND PL/SQL, Block definition structure and Data types, Block Functions - % Type, % RowType, Control statements, Looping statements and sequential statement, Exceptionhandling. SimplePL/SQL blocks. Cursor management: meaning, types and importance, implicit and explicit cursor

management using simple example. Trigger: meaning importance and types of

trigger, examples using trigger Procedures-Definition, creating procedures, passing

parameters. Function -Definition, syntax and calling methods, passing parameters.

UNIT III (15 Hours) Database System Architectures: Spatial data management, Web based systems, Centralized and Client-Server Architectures, Server System Architectures, Parallel System, Distributed Systems. Parallel Databases: Introduction, Parallel database architecture, I/O parallelism , Inter-query and Intra-query parallelism, Inter operational and Intra-operational parallelism, Design of parallel systems Distributed Database Concepts: Introduction, DDBMS architectures ,Homogeneous and Heterogeneous Databases , Distributed data storage, Distributed transactions, Commit protocols ,Concurrency control & recovery in distributed databases ,Directory systems, Distributed Query Processing, Three tier Client Server Architecture. Object Relational Databases, Multimedia databases, Mobile databases.

UNIT IV

(15 Hours)

Introduction to NoSQL: History, concept, Different NoSQL products: MongoDB, CouchDB, Advantages of Mongo over RDBMS, CRUD operations with MongoDB, Querying, Modifying and Managing NoSQL data stores, indexing and ordering datasets, surveying database internals migrating from RDBMS to NoSQL. Information Retrieval & XML data Introduction to information retrival , Indexing for Text search Web search engines ,Managing text in DBMS , Data model for XML, XML DTD's, , Domain specific DTD's ,Querying XML data

References

1. Henry Korth, Abraham Silberschatz and S.Sudarshan,: Database System Concepts" Sixthedition,McGraw Hill,2011.

2. M.Tamer Ozsu and Patrick Valduriez,"Principles of Distributed Database System",Third edition,Springer,2011

3. R.Elmasri,S.B. Navathe," Fundamental of Data Systems", Seventh Edition, 2007

4. Kristina Chodorow,"MongoDB-The Definitive Guide",Second Edition,O'Reilly,2013

5. ORACLE PL/SQL Programming Scott Ulman TMH 9th

M.Sc. (Computer Science) Part I Semester I (NEP-2020)

To be implemented from the academic year 2023-2024

Course Code: CC-106, Title of Course: Research Methodology

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

- 1. Understand the fundamental concepts and principles of research methodology in computer science
- 2. Identify and select appropriate research methodologies based on the research problem
- 3. Formulate research questions and hypotheses in the context of computer science research
- 4. Design and execute research studies using quantitative and qualitative approaches
- 5. Apply ethical considerations in conducting computer science research
- 6. Develop critical thinking and problem-solving skills required for computer science research

UNIT I

Meaning of Research, objectives of Research, motivation in Research, Types of Research, Significance of Research, Research and Scientific Method, Criteria of good Research, Current trends in Research, Survey research, Data collection techniques, problems encountered by Researchers in Data Collection, Statistical Data analysis and interpretation, Triangulation in research design, Sequential and concurrent mixed methods design, Sampling Techniques in Computer Science Research.

UNIT II

Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline, Use of tools / techniques for Research: methods to search required information effectively, study and implementation of various databases like Google scholar, Scopus index, web of science, research gate etc. Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office.

UNIT III

Nature of Intellectual properties like patents, trade and copyright, Common rules of IPR practice, types and features of IPR agreement, Population and sample selection, Probability and non-probability sampling, Sample size determination, Observation methods,

(15 Hours)

(15 Hours)

Questionnaire design, Descriptive statistics, Inferential statistics, Qualitative data analysis techniques (thematic analysis, content analysis), Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Impact factor of Journals, H-index of the researcher, various citation styles, Ethical issues related to publishing, Plagiarism and Self-Plagiarism, Software for detection of Plagiarism

UNIT IV

(15 Hours)

Research reports: Writing preliminaries, main body of research, references and bibliography; Meaning and importance of workshop, seminar, conference, symposium etc. in research, Report format and style. Review of related literature its implications at various stages of research, Significance of Report Writing, Steps in Writing Report, Layout of the Research Report, Types of Reports. Writing a research proposal.

References

- 1. Research Methodology in Computer Science by Ryhan Ebad, Centrum Press.
- 2. Research Methodology by C.R.Kothari
- 3. Research Methods by Rashmi Agrawal
- 4. Qualitative Research for Education by Bogdan & Biklen
- 5. Methods of Educational Research by Max Engelhart
- 6. Business Research Methods by Alan Bryman & Emma Bell, Oxford University Press

M.Sc. (Information Technology) Part I Semester II(NEP-2020) To be implemented from the academic year 2023-2024 Course Code: CC -201 Title of Course: Data Science Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

Develop in depth understanding of the key technologies in data science. Practice problem analysis and decision-making. Gain practical, hands-on experience with statistics programming languages .

UNIT I

(15 Hours)

Data Science Technology Stack: Rapid Information Factory Ecosystem, Data Science Storage Tools, Data Lake, Data Vault, Data Warehouse Bus Matrix, Data Science Processing Tools ,Spark, Mesos, Akka , Cassandra, Kafka, Elastic Search, R ,Scala, Python, MQTT, The Future Layered Framework: Definition of Data Science Framework, Cross- Industry Standard Process for Data Mining (CRISP-DM), Homogeneous Ontology for Recursive Uniform Schema, The Top Layers of a Layered Framework, Layered Framework for High-Level Data Science and Engineering Business Layer: Business Layer, Engineering a Practical Business Layer Utility Layer: Basic Utility Design, Engineering a Practical Utility Layer.

UNIT II

(15 Hours)

Three Management Layers:Operational Management Layer, Processing-Stream Definition and Management, Audit, Balance, and Control Layer, Balance, Control, Yoke Solution, Cause-and-Effect, Analysis System, Functional Layer, Data Science Process Retrieve Superstep : Data Lakes, Data Swamps, Training the Trainer Model, Understanding the Business Dynamics of the Data Lake, Actionable Business Knowledge from Data Lakes, Engineering a Practical Retrieve Superstep, Connecting to Other Data Sources.

UNIT III

Transform Superstep : Transform Superstep, Building a Data Warehouse, Transforming with Data Science, Hypothesis Testing, Overfitting and Underfitting, Precision-Recall, Cross-Validation Test. Assess Superstep: Assess Superstep, Errors, Analysis of Data, Practical Actions, Engineering a Practical Assess Superstep, Process Superstep : Data Vault, Time-Person-Object-Location-Event Data Vault, Data Science Process, Data Science.

UNIT IV

(15 Hours)

(15 Hours)

Organize and Report Supersteps : Organize Superstep, Report Superstep, Graphics, Pictures, Showing the

Difference Transform Superstep: Univariate Analysis, Bivariate Analysis, Multivariate Analysis, Linear Regression, Logistic Regression, Clustering Techniques, ANOVA, Principal Component Analysis (PCA), Decision Trees, Support Vector Machines, Networks, Clusters, and Grids, Data Mining, Pattern Recognition, Machine Learning, Bagging Data,Random Forests, Computer Vision (CV), Natural Language Processing (NLP), Neural Networks, TensorFlow.

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Practical Data Science	Andreas François Vermeulen	APress		2018
2.	Principles of Data Science	Sinan Ozdemir	РАСКТ		2016
3.	Data Science from Scratch	Joel Grus	O'Reilly		2015
4.	Data Science from Scratch first Principle in python	Joel Grus	Shroff Publishers		2017
5.	Experimental Design in Data science with Least Resources	N C Das	Shroff Publishers		2018

M.Sc. (Information Technology) Part I Semester II(NEP-2020) To be implemented from the academic year 2023-2024 Course Code: CC -202 Title of Course: Advanced Java Programming Internal Marks: 20 External Marks: 80 Theory: 04

UNIT I

Features of Java; Java Magic: Byte Code, OOP in Java ,Objects and classes, Inheritance, Polymorphism ,Interfaces, inner classes, Constructor, Garbage collector , Method Overloading ,Method Overriding, Packages. Understanding Class path, Introduction to Java Utility classes and collection classes -Date, DateFormat and Gregorian calendar classes. A Simple Java Program, Object Creation, Using Java.lang. Object class in program, programs using inheritance, using packages in java program

UNIT II

Java Database Connectivity: JDBC overview , Architecture , Steps to create JDBC Application, Drivers, database connection statements , Resultsets, transaction, Metadata and Aggregate functions , callable statements. Connection pooling, Java Servlets: Servlet vs CGI, Servlet life cycle , servlet basics , Generic servlet, HTTPServlet, The Servlets API, request server side –Cookies , session tracking , databases and non-HTML content , request dispatching , shared attributes, resource abstraction

UNIT III

RMI: Introduction & Architecture of RMI, Stubs & skeleton, Java RMI classes and interfaces ,Writing simple RMI application , Parameter passing in remote methods (marshalling and unmarshalling) Java Beans: Java Beans Introduction, design pattern, Beans persistence &

(15 Hours)

(15 Hour)

(15 Hours)

Theory: 04 hours/week

introspection, writing simple bean. JSP(Java Server Pages: Introduction to JSP, Use of JSP, JSP Architecture, JSP tags, Implicit and Explicit objects, Request forward, Request –time include ,use of Beans in JSP and their scopes. JSF(Java Server Faces):Introduction of JSF, components of JSF, Benefits of JSF

UNIT IV

(15 Hours)

Hibernate framework application, Introduction Working on Hibernate framework, Introduction Hibernate framework, its advantage and disadvantage, Struts framework Architecture and details, Struts frameworks Components. Overview of the Spring Framework, Spring MVC Architecture Hibernate with Spring, Benefits of using Spring with Hibernate.

References:

- 1. The complete Reference Java- 5th edition Herbert Schildt- Tata McGraw Hill
- 2. Java 8 Programming Black Book
- 3. Inside Java 2 Virtual Machine by Venners Bill, Mcgraw Hill Education
- 4. Developing Java Servlets James Goodwill, Techmedia Pub.
- 5. Professional JSP Wrox press
- 6. JDBC, Servlet and JSP, Black Book, Santosh Kumar K. Dremtech publication
- 7. Spring and Hibernate, Santosh Kumar K. Mc.Graw Hill Education
- 8. Spring Persistence with Hibernate, Ahmad Seddighi
- 9. Java unleashed,; Micheal Morrison

M.Sc. (Information Technology) Part I Semester II(NEP-2020) To be implemented from the academic year 2023-2024 Course Code: CCPR -203 Title of Course: Practical-II Internal Marks: 20 External Marks: 80 Practical: 06 hours/week

Course Outcomes:

- 1. To become acquainted with programming environment.
- Student will be able to use advanced technology in Java such as remote method Invocation and JDBC.
- 3. Student will learn how to work with Java Frameworks.
- Student will be able to develop web application using Java Servlet and Java Server Pages technology.
- 5. Design and develop solutions Data Science

Lab work is based on Data Science and Advanced Java Programming .This laboratory course should consist of 10 to 12 programming exercises with focus on covering the hands-on aspects covered in theory course.

M.Sc. (Computer Science) Part I Semester II (NEP-2020)

To be implemented from the academic year 2023-2024

Course Code: CC -204 Title of Course: Big Data Analytics

Internal Marks: 10 External Marks: 40 Theory: 02 hours/week

Course Outcomes:

- 1. To provide an overview of an exciting growing field of big data analytics.
- To introduce the tools required to manage and analyze big data likeHadoop, NoSql MapReduce.
- 3. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- 4. To enable students to have skills that will help them to solve complex real-world problems in for decision support.

UNIT I

Introduction to Big Data, Characteristics of Data, and Big Data Evolution of Big Data, Definition of Big Data, Challenges with big data, Why Big data? Data Warehouse environment, Traditional Business Intelligence versus Big Data. State of Practice in Analytics, Key roles for New Big Data Ecosystems, Examples of big Data Analytics. Big Data Analytics, Introduction to big data analytics, Classification of Analytics, Challenges of Big Data, Importance of Big Data, Big Data Technologies, Data Science, Responsibilities, Soft state eventual consistency. Data Analytics Life Cycle.

UNIT II

Analytical Theory and Methods: Clustering and AssociatedAlgorithms, Association Rules, Apriori Algorithm, Candidate Rules, Applications of Association Rules, Validation and Testing, Diagnostics, Regression, Linear Regression, Logistic Regression, Additional Regression Models.

Operating System for Big Data, Concepts, Hadoop Architecture, Working with Distributed file system

Books and References:						
Sr. No.	Title	Author/s	Publisher	Edition	Year	
1.	Big Data and Analytics	Subhashini Chellappan Seema Acharya	Wiley	First		
2.	Data Analytics with Hadoop An Introduction for Data Scientists	Benjamin Bengfort and Jenny Kim	O'Reilly		2016	
3.	Big Data and Hadoop	V.K Jain	Khanna Publishing	First	2018	

(15 Hours)

M.Sc. (Information Technology) Part I

Semester II(NEP-2020)

To be implemented from the academic year 2023-2024

Course Code: CC -205 **Title of Course: Natural**

Language Processing

Internal Marks: 20 External Marks: 80

Theory: 04 hours/week

Course Outcomes:

- 1. To learn how to use Natural Language Processing
- 2. To implement NLP.
- 3. The ultimate aim of NLP is to read, understand, and decode human words in a valuable manner

UNIT I

Natural Language Processing: Introduction, Phases of NLP, advantages, disadvantages, applications. Genetic Algorithm: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, the Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm, Introduction to Expert System.

UNIT II

NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.

UNIT III

N-gram Language Models:-The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.Part Of Speech Tagging and Sequence Labeling:-Lexical syntax. Hidden Markov Models (Forward and Viterbi algorithms and EM training).

UNIT IV

Syntactic parsing:- Grammar formalisms and treebanks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs.

Semantic Analysis:- Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labeling and Sematic Parsing.

(15 Hours)

(15 Hours)

(15 Hours)

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Natural Language Processing	James Allen	Elsevier	II	1995
2.		Alexandar	Willey-	Kindle	
	Computational Linguistics and	Clark, Chris	Blackwe		
	-	Fox and	11		
	Natural Language Processing	Shallom			
		Lappin			
3.		Nitin Indurkhya and	С	Kindle	
	Handbook of Natural Language	Fred			
		J.Damerau			
	Processing				

M.Sc. (Information Technology) Part I

Semester II(NEP-2020)

To be implemented from the academic year 2023-2024

Course Code: CC -205	Title of Course: Modern Networking

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

- 1. To understand the state-of-the-art in network protocols, architectures and applications.
- 2. Analyze existing network protocols and networks.
- 3. Develop new protocols in networking
- 4. To understand how networking research is done
- 5. To investigate novel ideas in the area of Networking via term-long researchprojects.

UNIT I

(15 Hours)

Modern Networking, Elements of Modern Networking .The Networking Ecosystem ,Example Network Architectures,Global Network Architecture,A Typical Network Hierarchy Ethernet Applications of Ethernet Standards Ethernet Data Rates Wi-Fi Applications of Wi-Fi,Standards Wi-Fi Data Rates 4G/5G Cellular First Generation Second Generation, Third Generation Fourth Generation Fifth Generation, Cloud Computing Cloud Computing Concepts The Benefits of Cloud Computing Cloud Networking Cloud Storage.

UNIT II

(15Hours)

Software-Defined Networks SDN: Background and Motivation, Evolving Network Requirements Demand Is Increasing,Supply Is IncreasingTraffic Patterns Are More ComplexTraditional Network Architectures are Inadequate, The SDN Approach Requirements SDN Architecture Characteristics of Software- Defined Networking, SDN- and NFV-Related Standards Standards- Developing Organizations Industry Consortia Open Development Initiatives, SDN Data Plane and OpenFlow SDN Data Plane, Data Plane Functions Data Plane Protocols OpenFlow Logical NetworkDevice Flow Table Structure Flow Table Pipeline, The Use of MultipleTables Group Table OpenFlow Protocol, SDN Control Plane.

UNIT III

(15 Hours)

Virtualization, Network Functions Virtualization: Concepts and Architecture, Background and Motivation for NFV, Virtual Machines The Virtual Machine Monitor, Architectural Approaches Container Virtualization, NFV Concepts Simple Example of the Use of NFV, NFV Principles High-Level NFV Framework, NFV Benefits and Requirements NFV Benefits, NFV Requirements, NFV Reference Architecture NFV Management and Orchestration, Reference Points Implementation, NFV Functionality.

UNIT IV

(15 Hours)

Defining and Supporting User Needs, Quality of Service, Background, QoS Architectural Framework, Data Plane, Control Plane, ManagementPlane, Integrated Services Architecture, ISA Approach ISA Components, ISA Services, Queuing Discipline, Differentiated Services, Services, DiffServ Field, DiffServ Configuration and Operation, Per-Hop Behavior, Default Forwarding PHB, Service Level Agreements, IP Performance Metrics, OpenFlow QoS Support, QueueStructures, Meters, QoE: User Quality of Experience, Why QoE?,Online Video Content Delivery, Service Failures Due to Inadequate .

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud	William Stallings	Addison- Wesley Professional		October 2015
2.	SDN and NFV Simplified A Visual Guide to Understanding Software Defined Networks and Network Function Virtualization	Jim Doherty	Pearson Education, Inc		
3.	Network Functions Virtualization (NFV) with a Touch of SDN	Rajendra Chayapathi Syed Farrukh Hassan	Addison- Wesley		
4.	CCIE and CCDE Evolving Technologies Study Guide	Brad dgeworth, Jason Gooley, Ramiro Garza Rios	Pearson Education, Inc		2019

M.Sc. (Information Technology) Part I Semester II(NEP-2020) To be implemented from the academic year 2023-2024 Course Code: OJT -206 Title of Course: On Job Training

Internal Marks: 00 External Marks: 100 Theory: not applicable

The student is required to engage in on job training during their semester break.

ning during their semester break.