SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(Autonomous Institution)
Puducherry

Department of Computer Science and Engineering and Business Systems

Minutes of 9th BoS Meeting

Venue
Board Room, University Building
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry – 605 107

Date & Time
04.04.2025 & 10.00 AM – 11.00 AM
(Online Mode)

2. A. 11. 1

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)
(APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO PONDICHERRY UNIVERSITY)
(ACCREDITED BY NBA-AICTE, NEW DELHI, ACCREDITED BY NAAC WITH 'A' GRADE)
MADAGADIPET, PUDUCHERRY - 605 107

Minutes of the 9th BoS Meeting

Department of Computer Science and Engineering and Business Systems

Date: 4th April 2025

Time: 10:00AM – 11:00 AM

Venue: Google Meet (Online)-University Block, Board Room II

Chairperson: Dr.N.Danapaquiame, Professor and Head, Department of Computer Science and Engineering and Business Systems (CSEBS)

Agenda 1/BoS/9/2025/CSEBS/UG

Welcome Address by chairperson, Board of Studies (BoS) members.

Feedback:
"The warm and motivating welcome extended by the Chairperson, setting a collaborative discussion for the meeting. The presence of esteemed external members brought a sense of prestige and purpose to the discussion, encouraging active engagement and forward-thinking contributions."

Agenda 2/BoS/9/2025/CSEBS/UG

To confirm the minutes of the Eighth Board of Studies Meeting held on 28.09.2024.

Feedback:
"We thank the external members for their continued involvement and critical validation of the previous meeting's minutes. Their endorsement reflects their confidence in our curriculum development process and ensures accountability and consistency in academic decision-making."

Agenda 3/BoS/9/2025/CSEBS/UG

To discuss and approve the B.Tech. Degree R-2023, Curriculum and syllabi of seventh and eighth Semester for the B. Tech Computer Science and Business System students admitted from the academic year 2023-24

2. A. 11. 4

Feedback:

"A special note of appreciation is extended to the external experts for their thoughtful and practical insights in reviewing the curriculum. Their emphasis on eliminating redundancy, introducing modern technological domains, and justifying each syllabus unit with real-world relevance has significantly elevated the academic structure of the upcoming semesters"

Agenda 4/BoS/8/2025/CSEBS/UG

To consider and approve the professional elective / open elective / Project Work / Internship of the seventh and eighth Semester for R2023.

Feedback:

"We are grateful to the external members for suggesting a more structured and application-oriented approach to electives and internships. Their recommendations on incorporating domain-specific project work and encouraging hands-on learning reflect a progressive academic vision that bridges theory and practice effectively."

Semester	Course Name	Feedback by Expert Member
VII	Information Retrieval	➢ In prerequisite, can include Mathematical Concepts like Linear Algebra, Statistics, Trigonometry, Language related fundamentals Other mathematical tools and to neglect NLP. ➢ To change the order of the CO level. ➢ In Unit V, Refine the topics and include some framework technologies
VII	Foundation and Full Stack Web Development	➢ Course title can be changed to Full Stack Web Development to "**Full Stack fusion with Node & React**" ➢ Can modify last two units based on Node JS, React JS

2.A.11.b

VII Professional **Elective IV**	IoT Systems & Architecture	➢ In Unit I include a strong overview of IoT systems and architecture. ➢ Include Industrial IoT as a part of Unit V, focusing on real-world industrial applications. ➢ Emphasize prerequisite knowledge: Ensure students are familiar with embedded systems and hardware before taking this course or with a pre-introduction of those topics should be given as Value Added Course
VIII Professional **Elective V**	Smart Systems	➢ Clearly specify the course content to avoid ambiguity. ➢ Suggested prerequisite: Embedded Systems (proposed change from current prerequisite). ➢ Ensure no repetition of topics already covered in other courses. ➢ Include content on Neural Networks and Smart Controllers under Unit IV. ➢ Refine the syllabus to improve clarity and structure. ➢ Clearly define Unit V with case studies that demonstrate specific applications.

Agenda 5/BoS/8/2025/CSEBS/UG

To approve the Regulation of R2023 ,Curriculum , syllabi ,Assessment Procedure and Passing criteria of Honours and Minor degree courses (offered from CSE/IT/AIDS) and list of Students registered for the honours course admitted from the academic year 2023-24

Feedback:

- "The external members' deep understanding of academic regulations and their suggestions on assessment reforms, honours criteria, and minor degree relevance were highly valued. Their feedback ensures academic fairness and excellence, encouraging innovation and interdisciplinary learning among students. Honors and Minors Degree Programs: Verified and approved by the board of members since it was also approved by other board members "

2.A.11.8

Agenda 6/BoS/8/2025/CSEBS/UG

To apprise about redo student , admitted in regulation R- 2020 and rejoining under regulation R-2023.

Feedback:

"Our sincere thanks to the external panel for recognizing the importance of academic continuity for redo students. Their suggestions to provide support mechanisms, such as additional courses to map with R-2023 , highlight their empathy and commitment to inclusive education"

Agenda 7/BoS/8/2025/CSEBS/UG

To apprise the academic calendar for the even semester for the academic year 2025-25 and department activities .

Feedback:

"The external members expressed deep appreciation for the well-structured academic calendar that balances academic rigor with opportunities for project-based learning and departmental activities.

A special applause was extended to the Head of the Department for consistently providing growth-oriented leadership and fostering a student-centric academic environment. The HoD's proactive initiatives, such as industry collaboration, skill-building sessions, and personalized academic support, were highly praised as key factors driving the department's holistic development.

The members commended the vision and planning that has gone into ensuring that students not only meet academic expectations but are also equipped for future professional challenges. Their encouragement serves as a motivating endorsement of the department's direction under the HoD's stewardship."

2.A.11.10

Agenda 8/BoS/8/2025/CSEBS/UG

To apprise the result analysis of End Semester Examination Dec 2025 / Jan 2025.

Feedback:
"We are thankful for the external members' data-driven approach to interpreting result trends. Their inputs on performance enhancement strategies, including targeted mentoring and academic support, will go a long way in boosting student performance and faculty involvement" "The outstanding academic performance, especially the 100% pass rate in senior batches, was celebrated. The Board recommended further analysis into improving the success rate for first-year students."

Agenda 9/BoS/9/2025/CSEBS/UG

Any other item with the permission of the chair.

Feedback:
"We extend heartfelt gratitude for the external experts' open and constructive dialogue regarding CCNP (Cisco Certified Network Professional) will be much useful for the students career and about M.Tech pathways. Their clarity and forward-thinking advice demonstrate their dedication to student academic progression and institutional alignment.."

These minutes reflect the detailed course revisions and suggestions provided by the expert members in the board meeting, ensuring that the curriculum remains updated, relevant, and non-repetitive

N. Dan 7/4/25

Signature of BoS Chairperson

Dr.N.Danapaquiame

Professor & HoD - CSEBS

Q.A. 11/4/25

2.A.11.12

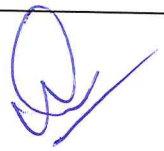
ANNEXURE -I

External Members:

S.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	**Dr. S. R. Balasundaram, M.C.A., M.E., Ph.D.,** Professor and Head Department of Computer Applications, National Institute of Technology, Trichy Specialization: E-Learning, Assessment Technologies	Subject Expert (University Nominee)	S.R.Balasundaram
2	**Dr. E. Ilavarasan, M.Tech., Ph.D.,** Professor/ Dept of CSE, Puducherry Technological University, Pillaichavady, Puducherry.	Subject Expert (Academic Council Nominee)	
3	**Dr. S. Ganesh Kumar, M. Tech., Ph.D.,** Professor/ Data Science and Business Systems, School of Computing , SRM Institute of Science and Technology Kattankulathur, Tamil Nadu 603203 Specialization: Block chain Technology, Data Science	Subject Expert (Academic Council Nominee)	
4	**Dr. B. Jaison, M.E, Ph.D.,** Professor/ Computer Science and Engineering RMK Engineering College, RSMNagar, Gummidipoondi, Kavaraipettai, Tamilnadu-601206 Specialization: Image Processing, Data Mining.	Subject Expert (Academic Council Nominee)	
5	**Mr.Natarajan Swaminathan** Senior Consultant Cyber Security Practices, Tata Consultancy Services, Chennai.	Industry Expert (TCS) (Nominated by the Principal)	
6	**Mr. Pasupathi Loganathan, B.Tech.,** Functional and Automation Tester, Accenture, Chennai.	Postgraduate Alumni (nominated by the Principal)	

2. A. 11. 13

Internal Members:

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	**Dr. N.S.N. Cailassame, M.B.A.,Ph.D.,** Dean Placement, Professor and Head, Department of Management Studies, SMVEC.	Internal Member	
2	**Dr. G. Bala Sendhil Kumar, M.B.A., Ph.D.,** Professor, Department of Management Studies, SMVEC.	Internal Member	
3	**Dr. D. Jaichithra., M.A., M.Phil., Ph.D** Professor and Head, Dept. of English, Sri Manakula Vinayagar Engineering College	Internal Member	
4	**Dr. T. Jayavarthanan., M.Sc., M.Phil., Ph.D** Professor, Dept. of Physics, Sri Manakula Vinayagar Engineering College	Internal Member	
5	**Mrs.B.Kavitha., M.Sc., M.Phil.,** Professor and Head, Dept of Mathematics, Sri Manakula Vinayagar Engineering College	Internal Member	
6	**Dr.N.Sakthipriya** Assistant Professor, Department of Computer Science and Engineering and Business Systems, SMVEC.	Internal Member	
7	**Mrs.K.Devika** Assistant Professor, Department of Computer Science and Engineering and Business Systems, SMVEC.	Internal Member	
8	**Mrs.M.Viji** Assistant Professor, Department of Computer Science and Engineering and Business Systems, SMVEC.	Internal Member	
9	**Ms.C.Jenithamary** Assistant Professor, Department of Computer Science and Engineering and Business Systems, SMVEC.	Internal Member	

2.A.11.15

2. A. 11. 16

10	**Mrs.E.Thamizharasi** Assistant Professor, Department of Computer Science and Engineering and Business Systems, SMVEC.	Internal Member	
11	**Mr.S.Muhilan** Assistant Professor, Department of Computer Science and Engineering and Business Systems, SMVEC.	Internal Member	

2.A.11.17

ANNEXURE- II

Agenda of the Meeting

Agenda 1/BoS/9/2025/CSEBS/UG	
	Welcome Address by chairperson, Board of Studies (BoS) members.
Agenda 2/BoS/9/2025/CSEBS/UG	
	To confirm the minutes of the eighth Board of Studies Meeting held on 28.09.2024.
Agenda 3/BoS/9/2025/CSEBS/UG	
	To discuss and approve the B.Tech. Degree R-2023, Curriculum and syllabi of seventh and eighth Semester for the B. Tech Computer Science and Business System students admitted from the academic year 2023-24.
Agenda 4/BoS/9/2025/CSEBS/UG	
	To consider and approve the professional elective / open elective / Project Work / Internship of the seventh and eighth Semester for R2023.
Agenda 5/BoS/9/2025/CSEBS/UG	
	To approve the Regulation of R2023 ,Curriculum , syllabi ,Assessment Procedure and Passing criteria of Honours and Minor degree courses (offered from CSE/IT/AIDS) and list of Students registered for the honours course admitted from the academic year 2023-24
Agenda 6/BoS/9/2025/CSEBS/UG	
	To apprise about redo student , admitted in regulation 2020 and rejoining under regulation 2023
Agenda 7/BoS/9/2025/CSEBS/UG	
	To apprise the academic calender for the even semester for the academic year 2024-25 and department activities .
Agenda 8/BoS/9/2025/CSEBS/UG	
	To apprise the result analysis of End Semester Examination Dec 2024 / Jan 2025.
Agenda 9/BoS/9/2025/CSEBS/UG	
	Any other item with the permission of chair

2.A.11.19

2.A.11.20

SRI MANAKULA VINAYAGAR

ENGINEERING COLLEGE

(An Autonomous Institution)

Puducherry

B.TECH.

COMPUTER SCIENCE AND BUSINESS SYSTEM

ACADEMIC REGULATIONS 2023

(R-2023)

CURRICULUM AND SYLLABI

25 YEARS

2.A.11.21

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society

Mission

M1 :	**Quality Education**	:	To provide comprehensive academic system that amalgamates the cutting-edge technologies with best practices
M2 :	**Research and Innovation**	:	To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues
M3:	**Employability and Entrepreneurship**	:	To inculcate the employability and entrepreneurial skills through value and skill-based training
M4 :	**Ethical Values**	:	To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society

DEPARTMENT VISION AND MISSION

Vision

To envision the technology and business trends in this domain and to create technically competent professionals for meeting out the needs globally

Mission

M1: To foster knowledge sharing through contemporary curriculum and creative teaching learning process

M2: To impart strong computer and business skills to shine and sustain in the agile IT industry

M3: To promote technocrats with rich expertise in innovation and research

M4: To instill moral values and ethical responsibilities by empowering graduates to be socially responsible

2. A. 11. 22

PROGRAM OUTCOMES (Pos)

PO1: Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis:

Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO8: Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11:Project management and finance:

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

2.A.11.23

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1: To apply computer science and business concepts to solve the real world problems

PEO2: To develop professional skills in contemporary areas of computer science and business systems to obtain employability and pursue higher education

PEO3: To reconcile business demands with state-of-the art technologies by providing innovative solutions and insightful decisions

PEO4: To ensure ample growth with social and ethical responsibilities

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Ability to gain deep knowledge in Computer Science with equal appreciation in humanities, management, sciences and human values.

PSO2: Ability to demonstrate the technical and business skills and provide solutions for the societal needs

PSO3: Ability to engage lifelong learning and bestow innovative contributions to enhance research in the field of computer science and business system

2.A.11.24

B.Tech. Computer Science and Business System

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAMME

Sl. No.	Course Category	Breakdown of Credits
1.	Humanities, Social Sciences and Management Courses (HS)	28
2.	Basic Science Courses (BS)	30
3.	Engineering Science Courses (ES)	18
4.	Professional Core Courses (PC)	58
5.	Professional Elective Courses (PE)	16
6.	Open Elective Courses (OE)	9
7.	Professional Activity Courses (PA)	13
8.	Mandatory non-Credit Course (MC)	-
9.	Ability Enhancement Courses (AEC)	-
	Total	**172**

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl. No.	Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities, Social Sciences and Management Courses (HS)	5	5	-	5	5	2	2	4	28
2	Basic Science Courses (BS)	11	9	5	5	-	-	-	-	30
3	Engineering Science Courses (ES)	6	8	-	4	-	-	-	-	18
4	Professional Core Courses (PC)	-	4	18	8	6	13	9	-	58
5	Professional Elective Courses (PE)	-	-	-	2	3	2	3	6	16
6	Open Elective Courses (OE)	-	-	-	-	3	3	3	-	9
7	Professional Activity Courses (PA)	-	-	-	-	1	1	3	8	13
8	Mandatory non-Credit Course (MC)*	-	-	-	-	-	-	-	-	-
9	Ability Enhancement Courses (AEC)*	-	-	-	-	-	-	-	-	-
Total		**22**	**26**	**23**	**24**	**18**	**21**	**20**	**18**	**172**

**** AEC and MC are not included for CGPA calculation***

HONOURS DEGREE PROGRAMME:

The student is permitted to opt for earning an *honours degree* in the same discipline of engineering in addition to the degree in his/her own discipline. To earn an honours degree the student is required to earn an additional 18 - 20 credits (over and above the total 170 credits prescribed in the curriculum) starting from fourth semester onwards by completing 5 additional courses offered in respective semesters. A student is eligible to exercise this option if he/she has passed all the courses offered upto third semester in the first attempt itself and has earned a CGPA / GPA* (*for lateral entry) of not less than 8.0. The prescribed courses offered for Honours degree are given in **Annexure V**.

2.A.11.25

SEMESTER-I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MAT101	Discrete Mathematics	BS	3	1	0	4	25	75	100
2	U23MAT102	Introductory Topics in Statistics and Probability	BS	3	1	0	4	25	75	100
3	U23BSTC01	Physical science for Engineers	BS	3	0	0	3	25	75	100
4	U23CBT101	Fundamentals of Computer Science	ES	3	0	0	3	25	75	100
5	U23HSTC01	Universal Human Values-II	HS	2	0	0	2	25	75	100
Theory Cum Practical										
6	U23ENB101	Business Communication & Value Science - I	HS	2	0	2	3	50	50	100
Practical										
7	U23CBP101	Fundamentals of Computer Science Laboratory	ES	0	0	2	1	50	50	100
8	U23ESPC02	Design Thinking and IDEA Lab	ES	0	0	2	1	50	50	100
9	U23ESPC03	Engineering Graphics using AutoCAD	ES	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CBC1XX	Certification Course-I **	AEC	0	0	4	-	100	-	100
Mandatory Course										
11	U23CBM101	Induction Programme	MC	2 Weeks			-	-	-	-
							22	**425**	**575**	**1000**

SEMESTER-II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MAT203	Statistical Methods and Modelling	BS	3	1	0	4	25	75	100
2	U23MAT204	Linear Algebra	BS	3	1	0	4	25	75	100
3	U23HST201	Fundamentals of Economics	HS	2	0	0	2	25	75	100
4	U23ESTC03	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
5	U23ADTC01	Programming in Python	ES	3	0	0	3	25	75	100
6	U23CBT202	Data Structures & Algorithms	PC	3	0	0	3	25	75	100
Theory Cum Practical										
7	U23ENB202	Business Communication & Value Science – II	HS	2	0	2	3	50	50	100
Practical										
8	U23MAP201	Statistical Methods and Modelling Laboratory	BS	0	0	2	1	50	50	100
9	U23ESPC01	Basics of Electrical and Electronics Engineering Laboratory	ES	0	0	2	1	50	50	100
10	U23ADPC01	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
11	U23CBP202	Data Structures & Algorithms Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
12	U23CBC2XX	Certification Course - II**	AEC	0	0	4	-	100	-	100
Mandatory Course										
13	U23CBM202	Sports Yoga and NSS	MC	0	0	2	-	100	-	100
							26	**600**	**700**	**1300**

***** Certification Courses are to be selected from the list given in Annexure II***

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SEMESTER-III										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MAT305	Computational Statistics	BS	3	1	0	4	25	75	100
2	U23CBT303	Computer Organization and Architecture	PC	3	0	0	3	25	75	100
3	U23CBT304	Object Oriented Programming in C++	PC	3	0	0	3	25	75	100
4	U23CBT305	Principles of Operating Systems	PC	3	0	0	3	25	75	100
5	U23CBT306	Database System Concepts	PC	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CBB301	Formal Languages and Automata Theory	PC	2	0	2	3	50	50	100
Practical										
7	U23MAP302	Computational Statistics Laboratory	BS	0	0	2	1	50	50	100
8	U23CBP303	Object Oriented Programming in C++ Laboratory	PC	0	0	2	1	50	50	100
9	U23CBP304	Principles of Operating Systems Laboratory	PC	0	0	2	1	50	50	100
10	U23CBP305	Database System Concepts Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CBC3XX	Certification Course - III**	AEC	0	0	4	-	100	-	100
12	U23CBS301	Skill Enhancement Course 1- R Programming*`	AEC	0	0	2	-	100	-	100
Mandatory Course										
13	U23CBM303	Introduction to Climate Change	MC	2	0	0	-	100	-	100
							23	**675**	**625**	**1300**

SEMESTER-IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MAT406	Operations Research	BS	3	1	0	4	25	75	100
2	U23HST402	Introduction to Innovation, IP Management and Entrepreneurship	HS	3	0	0	3	25	75	100
3	U23ITTC02	Programming in Java	ES	3	0	0	3	25	75	100
4	U23CBT407	Algorithm Design and Applications	PC	3	0	0	3	25	75	100
5	U23CBT408	Software Engineering	PC	3	0	0	3	25	75	100
6	U23CBE4XX	Professional Elective I#	PE	2	0	0	2	25	75	100
Theory Cum Practical										
7	U23ENB403	Business Communication & Value Science – III	HS	2	0	2	2	50	50	100
Practical										
8	U23MAP403	Operations Research Laboratory	BS	0	0	2	1	50	50	100
9	U23ITPC02	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
10	U23CBP406	Algorithm Design Laboratory	PC	0	0	2	1	50	50	100
11	U23CBP407	Software Engineering and Applications Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
12	U23CBC4XX	Certification Course - IV**	AEC	0	0	4	-	100	-	100
13	U23CBS402	Skill Enhancement Course 2- Presentation Tools using ICT*	AEC	0	0	2	-	100	-	100
Mandatory Course										
14	U23CBM404	Right To Information Law and Good Governance	MC	2	0	0	-	100	-	100
							24	**700**	**700**	**1400**

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Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HST503	Fundamentals of Management Science	HS	2	0	0	2	25	75	100
2	U23CBT509	Cloud, Microservices and Application	PC	3	0	0	3	25	75	100
3	U23CBT510	Machine Learning for Business Systems	PC	2	0	0	2	25	75	100
4	U23HSTC02	Research Methodology	HS	2	0	0	2	25	75	100
5	U23CBE5XX	Professional Elective II#	PE	2	0	0	2	25	75	100
6	U23CBOCXX	Open Elective I$	OE	3	0	0	3	25	75	100
Practical										
7	U23ENP501	Business Communication & Value Science – IV	HS	0	0	2	1	100	-	100
8	U23CBP508	Cloud, Microservices and Application Laboratory	PC	0	0	2	1	50	50	100
9	U23CBEP5X	Professional Elective II# Laboratory	PE	0	0	2	1	50	50	100
10	U23CBW501	Micro Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CBC5XX	Certification Course-V**	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CBM505	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							18	**650**	**550**	**1200**

SEMESTER-VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HST604	Financial and Cost Accounting	HS	2	0	0	2	25	75	100
2	U23CBT611	Computer Networks Architectures and Protocols	PC	3	0	0	3	25	75	100
3	U23ADTC02	NLP and Chatbot	PC	3	0	0	3	25	75	100
4	U23CBT612	Information Security	PC	2	0	0	2	25	75	100
5	U23CBE6XX	Professional Elective III#	PE	2	0	0	2	25	75	100
6	U23CBOCXX	Open Elective II$	OE	3	0	0	3	25	75	100
Theory Cum Practical										
7	U23CBB602	Data Visualization and Analytical Techniques	PC	2	0	2	3	50	50	100
Practical										
8	U23CBP609	Computer Networks Architectures and Protocols Laboratory	PC	0	0	2	1	50	50	100
9	U23CBP610	Information Security Laboratory	PC	0	0	2	1	50	50	100
10	U23CBW602	Mini Project	PA	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CBC6XX	Certification Course - VI**	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CBM606	Gender Equality	MC	2	0	0	-	100	-	100
							21	**550**	**650**	**1200**

#Professional Electives are to be selected from the list given in Annexure I
$ Open Electives are to be selected from the list given in Annexure IV
*** Certification Courses are to be selected from the list given in Annexure II*

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SEMESTER-VII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HST705	Financial Management	HS	2	0	0	2	25	75	100
2	U23CBT713	Artificial Intelligence and Applications	PC	3	0	0	3	25	75	100
3	U23CBT714	Information Retrieval	PC	2	0	0	2	25	75	100
4	U23CBT715	Full Stack fusion with Node & React.js	PC	2	0	0	2	25	75	100
5	U23CBE7XX	Professional Elective IV#	PE	2	0	0	2	25	75	100
6	U23CBOCXX	Open Elective III$	OE	3	0	0	3	25	75	100
Practical										
7	U23CBP711	Artificial Intelligence and Applications Laboratory	PC	0	0	2	1	50	50	100
8	U23CBP712	Full Stack fusion with Node & React.js Laboratory	PC	0	0	2	1	50	50	100
9	U23CBEP7X	Professional Elective IV# Laboratory	PE	0	0	2	1	50	50	100
Project Work										
10	U23CBW703	Project Phase I	PA	0	0	4	2	50	50	100
11	U23CBW704	Internship/ Industrial	PA	0	0	2	1	100	-	100
							20	**450**	**650**	**1100**

SEMESTER-VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HST806	IT Project Management	HS	3	0	0	3	25	75	100
2	U23CBE8XX	Professional Elective V#	PE	2	0	0	2	25	75	100
3	U23CBE8XX	Professional Elective VI#	PE	3	0	0	3	25	75	100
Practical										
4	U23HSP801	IT Project Management Laboratory	HS	0	0	2	1	50	50	100
5	U23CBEP8X	Professional Elective VI# Laboratory	PE	0	0	2	1	50	50	100
Project Work										
6	U23CBW805	Project Phase II	PA	0	0	16	8	50	100	150
							18	**225**	**485**	**650**

#Professional Electives are to be selected from the list given in Annexure I
$ Open Electives are to be selected from the list given in Annexure IV

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ANNEXURE I

PROFESSIONAL ELECTIVE COURSES (18 CREDITS)

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1	U23CBE401	Business Strategies
2	U23CBE402	Business Process
3	U23CBE403	Principles of Compiler Design
4	U23CBE404	Design thinking and its applications
5	U23CBE405	Software Design with UML
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U23CBE506	Business Intelligence and Applications
2	U23CBE507	Robotics and Embedded Systems
3	U23CBE508	Web Applications
4	U23CBE509	Data Mining and Analytics
5	U23CBE510	E- Commerce and E- Payment Systems
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U23CBE611	Human Resource Management
2	U23CBE612	TQM Tools, Techniques and Standards
3	U23CBE613	Digital Marketing
4	U23CBE614	Cognitive Science & Analytics
5	U23CBE615	Cryptology
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CBE716	Quantum Computation & Quantum Information
2	U23CBE717	Advanced Social, Text and Media Analytics
3	U23CBE718	Usability Design of Software Applications
4	U23CBE719	IoT Systems and Architecture
5	U23CBE720	Virtual Reality Systems and Applications
Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CBE821	Behavioral Economics
2	U23CBE822	Computational Finance & Modeling
3	U23CBE823	Psychology
4	U23CBE824	Marketing Research & Marketing Management
5	U23CBE825	Smart Systems
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CBE826	Enterprise Systems
2	U23CBE827	Services Science and Service Operational Management
3	U23CBE828	Image Processing and Pattern Recognition
4	U23CBE829	Block chain and Applications
5	U23CBE830	Augmented Reality Systems and Applications

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PROFESSIONAL ELECTIVE PRACTICAL COURSES (3 CREDITS)

Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U23CBEP51	Business Intelligence and Applications Laboratory
2	U23CBEP52	Robotics and Embedded Systems Laboratory
3	U23CBEP53	Web Applications Laboratory
4	U23CBEP54	Data Mining and Analytics Laboratory
5	U23CBEP55	E- Commerce and E- Payment Systems Laboratory
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CBEP71	Quantum Computation & Quantum Information Laboratory
2	U23CBEP72	Advanced Social, Text and Media Analytics Laboratory
3	U23CBEP73	Usability Design of Software Applications Laboratory
4	U23CBEP74	IoT Systems and Architecture Laboratory
5	U23CBEP75	Virtual Reality Systems and Applications Laboratory
Professional Elective –VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U23CBEP81	Enterprise Systems Laboratory
2	U23CBEP82	Services Science & Service Operational Management Laboratory
3	U23CBEP83	Image Processing and Pattern Recognition Laboratory
4	U23CBEP84	Block chain and Applications Laboratory
5	U23CBEP85	Augmented Reality Systems and Applications Laboratory

Annexure – II

ABILITY ENHANCEMENT COURSES – (A). CERTIFICATION COURSES

S. No	Course Code	Course Title	Certified By
1	U23CBCX01	Adobe Photoshop	Adobe
2	U23CBCX02	Adobe Animate	Adobe
3	U23CBCX03	Adobe Dreamweaver	Adobe
4	U23CBCX04	Adobe After Effects	Adobe
5	U23CBCX05	Adobe Illustrator	Adobe
6	U23CBCX06	Adobe InDesign	Adobe
7	U23CBCX07	Autodesk AutoCAD -ACU	Autodesk
8	U23CBCX08	Autodesk Inventor - ACU	Autodesk
9	U23CBCX09	Autodesk Revit - ACU	Autodesk
10	U23CBCX10	Autodesk Fusion 360 - ACU	Autodesk
11	U23CBCX11	Autodesk 3ds Max - ACU	Autodesk
12	U23CBCX12	Autodesk Maya - ACU	Autodesk
13	U23CBCX13	Cloud Security Foundations	AWS
14	U23CBCX14	Cloud Computing Architecture	AWS
15	U23CBCX15	Cloud Foundation	AWS
16	U23CBCX16	Cloud Practitioner	AWS
17	U23CBCX17	Cloud Solution Architect	AWS
18	U23CBCX18	Data Engineering	AWS
19	U23CBCX19	Machine Learning Foundation	AWS
20	U23CBCX20	Robotic Process Automation / Medical Robotics	Blue Prism
21	U23CBCX21	Advance Programming Using C	CISCO
22	U23CBCX22	Advance Programming Using C ++	CISCO
23	U23CBCX23	C Programming	CISCO
24	U23CBCX24	C++ Programming	CISCO
25	U23CBCX25	CCNP Enterprise: Advanced Routing	CISCO
26	U23CBCX26	CCNP Enterprise: Core Networking	CISCO
27	U23CBCX27	Cisco Certified Network Associate - Level 2	CISCO
28	U23CBCX28	Cisco Certified Network Associate- Level 1	CISCO
29	U23CBCX29	Cisco Certified Network Associate- Level 3	CISCO
30	U23CBCX30	Fundamentals Of Internet of Things	CISCO
31	U23CBCX31	Internet Of Things / Solar and Smart Energy System with IoT	CISCO
32	U23CBCX32	Java Script Programming	CISCO
33	U23CBCX33	NGD Linux Essentials	CISCO
34	U23CBCX34	NGD Linux I	CISCO
35	U23CBCX35	NGD Linux II	CISCO
36	U23CBCX36	Advance Java Programming	Ethnotech
37	U23CBCX37	Android Programming / Android Medical App Development	Ethnotech
38	U23CBCX38	Angular JS	Ethnotech
39	U23CBCX39	Catia	Ethnotech
40	U23CBCX40	Communication Skills for Business	Ethnotech
41	U23CBCX41	Coral Draw	Ethnotech
42	U23CBCX42	Data Science Using R	Ethnotech
43	U23CBCX43	Digital Marketing	Ethnotech
44	U23CBCX44	Embedded System Using C	Ethnotech
45	U23CBCX45	Embedded System with IOT / Arduino	Ethnotech

46	U23CBCX46	English For IT	Ethnotech
47	U23CBCX47	Plaxis	Ethnotech
48	U23CBCX48	Sketch Up	Ethnotech
49	U23CBCX49	Financial Planning, Banking and Investment Management	Ethnotech
50	U23CBCX50	Foundation Of Stock Market Investing	Ethnotech
51	U23CBCX51	Machine Learning / Machine Learning for Medical Diagnosis	Ethnotech
52	U23CBCX52	IOT Using Python	Ethnotech
53	U23CBCX53	Creo (Modelling & Simulation)	Ethnotech
54	U23CBCX54	Soft Skills, Verbal, Aptitude	Ethnotech
55	U23CBCX55	Software Testing	Ethnotech
56	U23CBCX56	MX-Road	Ethnotech
57	U23CBCX57	CLO 3D	Ethnotech
58	U23CBCX58	Solid works	Ethnotech
59	U23CBCX59	Staad Pro	Ethnotech
60	U23CBCX60	Total Station	Ethnotech
61	U23CBCX61	Hydraulic Automation	Festo
62	U23CBCX62	Industrial Automation	Festo
63	U23CBCX63	Pneumatics Automation	Festo
64	U23CBCX64	Agile Methodologies	IBM
65	U23CBCX65	Block Chain	IBM
66	U23CBCX66	Devops	IBM
67	U23CBCX67	Artificial Intelligence	ITS
68	U23CBCX68	Cloud Computing	ITS
69	U23CBCX69	Computational Thinking	ITS
70	U23CBCX70	Cyber Security	ITS
71	U23CBCX71	Data Analytics	ITS
72	U23CBCX72	Databases	ITS
73	U23CBCX73	Java Programming	ITS
74	U23CBCX74	Networking	ITS
75	U23CBCX75	Python Programming	ITS
76	U23CBCX76	Web Application Development (HTML, CSS, JS)	ITS
77	U23CBCX77	Network Security	ITS & Palo alto
78	U23CBCX78	MATLAB	MathWorks
79	U23CBCX79	Azure Fundamentals	Microsoft
80	U23CBCX80	Azure AI (AI-900)	Microsoft
81	U23CBCX81	Azure Data (DP -900)	Microsoft
82	U23CBCX82	Microsoft 365 Fundamentals (SS-900)	Microsoft
83	U23CBCX83	Microsoft Security, Compliance and Identity (SC-900)	Microsoft
84	U23CBCX84	Microsoft Power Platform (PI-900)	Microsoft
85	U23CBCX85	Microsoft Dynamics Fundamentals 365 – CRM	Microsoft
86	U23CBCX86	Microsoft Excel	Microsoft
87	U23CBCX87	Microsoft Excel Expert	Microsoft
88	U23CBCX88	Securities Market Foundation	NISM
89	U23CBCX89	Derivatives Equinity	NISM
90	U23CBCX90	Research Analyst	NISM
91	U23CBCX91	Portfolio Management Services	NISM
92	U23CBCX92	Cyber Security	Palo alto
93	U23CBCX93	Cloud Security	Palo alto
94	U23CBCX94	PMI – Ready	PMI
95	U23CBCX95	Tally – GST & TDS	Tally
96	U23CBCX96	Advance Tally	Tally

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97	U23CBCX97	Associate Artist	Unity
98	U23CBCX98	Certified Unity Programming	Unity
99	U23CBCX99	VR Development	Unity

#Professional Electives are to be selected from the list given in Annexure I
***** Certification Courses are to be selected from the list given in Annexure II***
**** Skill Enhancement Courses (1 and 2) are to be selected from the list given in Annexure III***

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ANNEXURE-III

ABILITY ENHANCEMENT COURSES-(B) SKILL ENHANCEMENT COURSES

Sl. No.	Course Code	Course Title
1.	U23CBS301	Skill Enhancement Course 1: R Programming
2.	U23CBS402	Skill Enhancement Course 2: Presentation Tools using ICT

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ANNEXURE IV

OPEN ELECTIVE COURSES (9 CREDITS)

S. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I / II (Offered in Semester V/VI)				
1	U23CBOC01	Object Oriented Programming	CSBS	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME, CCE
2	U23CBOC02	Cryptology and Analysis	CSBS	EEE, MECH, CIVIL, ICE, Mechatronics, BME
Open Elective – III (Offered in Semester VII)				
1	U23CBOC03	Engineering Economics	CSBS	EEE, ECE, CSE, IT, MECH, CIVIL, ICE, Mechatronics, BME, AIDS, CCE, FT
2	U23CBOC04	Conversational AI	CSBS	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME

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ANNEXURE I

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SEMESTER VII

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Department	Computer Science and Business System	Programme: B.Tech.						
Semester	VII	Course Category: HS			*End Semester Exam Type: TE			
Course Code	U23HST705	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	FINANCIAL MANAGEMENT	2	0	0	2	25	75	100
Prerequisite	Basic Accounting Principles, Mathematics & Quantitative Skills							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Enables the budding Technocrat Managers to understand the Financial Management concepts and to appreciate the concepts of "time value of money" in the decision-making process.	K2
	CO2 Evaluates the Securities and know the concept of Risk and return.	K3
	CO3 Evaluates the "Leverage" "cost of capital" & the projects using the Capital budgeting concepts.	K3
	CO4 Understands the concepts of Capital components, their implications and Working Capital requirements.	K2
	CO5 Analyze the Components of Working Capital.	K4

UNIT-I	INTRODUCTION	(6Hrs)
Introduction to Financial Management - Goals of the firm - Financial Environments. **Time Value of Money:** Simple and Compound Interest Rates, Amortization, Computing more than once a year, Annuity Factor.		CO1

UNIT-II	VALUATION OF SECURITIES / RISK & RETURN	(6Hrs)
Valuation of Securities: Bond Valuation, Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM. **Risk & Return:** Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM), Practical Applications using MS Excel		CO2

UNIT-III	LEVERAGE / COST OF CAPITAL	(6Hrs)
Operating & Financial Leverage: Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study **Cost of Capital**: Concept, Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital 4L		CO3

UNIT- IV	CAPITAL BUDGETING AND WORKING CAPITAL MANAGEMENT	(6Hrs)
Capital Budgeting: The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Capital Budgeting Techniques, Project Evaluation, and Selection - Alternative Methods **Working Capital Management**: Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Estimation of Working Capital.		CO4

UNIT- V	CASH MANAGEMENT AND ACCOUNTS RECEIVABLE MANAGEMENT	(6Hrs)
Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring. **Accounts Receivable Management**: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period.		CO5

Text Books

1. Chandra, Prasanna - Financial Management - Theory & Practice, Prentice Hall/Pearson Education.2023.

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2. I.M. Pandey, Financial Management, Vikas Publishing House, 2022.
3. James C. Van Horne and John M. Wachowicz, Jr. Fundamentals of Financial Management. Prentice Hall - Financial Times, New York. (2023).
4. **"Principles of Corporate Finance"** – Richard A. Brealey, Stewart C. Myers, & Franklin Allen ,2024
5. **Financial Management: Theory & Practice"** – *Eugene F. Brigham & Michael C. Ehrhardt(2023)*

Reference Books

1. Eugene F. Brigham and Joel F. Houston. Fundamentals of Financial Management. Cengage Learning, New York. (Latest available edition),2024
2. Eugene F. Brigham and Michael C. Ehrhardt. Financial Management: Theory & Practice. Thomson Westerr Learning, New York. (Latest available edition).
3. Vishwanath. S.R. Corporate Finance: Theory and Practice. Sage Response, New Delhi. (2023).
4. Bhabatosh Banerjee. Fundamentals of Financial Management. Prentice-Hall of India, New Delhi. (2023 o later edition).
5. **Financial Management: Theory & Practice"** – Eugene F. Brigham & Michael C. Ehrhardt (2023)

Web References

1. https://www.khanacademy.org/economics-finance-domain/core-finance/interest-tutorial
2. https://efinancemanagement.com/financial-management/capital-budgeting-techniques-with-an-example
3. https://static.careers360.mobi/media/uploads/froala_editor/files/Dividend-Decisions.pdf
4. https://efinancemanagement.com/costing-terms/inventory-management-techniques
5. https://booksc.org/book/71927964/4e63e6
6. https://silo.tips/queue/working-capital-management-of-bajaj-auto-ltd-with-special-reference-to-automobil?&queue_id=-1&v=1626159679&u=MTA2LjIwMy41MC4xMzk=

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	1	1	1	1	1	-	-	-	1	-	1	-	1	1	1
2	2	1	1	1	1	-	-	-	1	-	2	1	1	2	2
3	1	1	1	2	1	-	-	-	2	-	2	1	1	1	1
4	1	2	1	1	1	-	-	-	2	-	2	1	1	2	1
5	1	2	1	2	1	-	-	-	2	-	2	1	1	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	Computer Science and Business System	Programme: B.Tech.						
Semester	VII	Course Category: PC			*End Semester Exam Type: TE			
Course Code	U23CBT713	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Artificial Intelligence and Applications	3	0	0	3	25	75	100
Prerequisite	Mathematics & Statistics, Machine Learning Fundamentals.							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand agent and environment	K2
	CO2 Recognize appropriate search algorithms for any AI problem	K2
	CO3 Represent and inferring knowledge in propositional and predicate logic	K2
	CO4 Apply various reasoning techniques in uncertain domain	K3
	CO5 Use various Planning strategies to solve a problem	K3

UNIT-I	OVERVIEW OF ARTIFICIAL INTELLIGENCE AND PROBLEM SOLVING	(9Hrs)	
Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents. Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.			CO1
UNIT-II	**SEARCH TECHNIQUES**	**(9Hrs)**	
Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.			CO2
UNIT-III	**KNOWLEDGE & REASONING**	**(9Hrs)**	
Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.			CO3
UNIT- IV	**UNCERTAINTY**	**(9Hrs)**	
Reasoning Under Uncertainty: Inference - Probabilistic inference - Types of Reasoning- Expectation Maximization - Bayesian networks - Hidden Markov models - Reasoning Systems for Categories - Reasoning with Default Information.			CO4
UNIT- V	**PROBABILISTIC REASONING AND EXPERT SYSTEMS**	**(9Hrs)**	
Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques Representing and using domain knowledge, expert system shells, and knowledge acquisition. **Case Studies:** Tic-Tac-Toe Game Agent, Pathfinding in Video Games, Expert System for Medical Diagnosis Using Predicate Logic, Weather Forecasting Using Bayesian Networks & Expert Systems for Fault Diagnosis in Engineering Systems.			CO5

Text Books

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2023.
2. Deepak Khemani "Artificial Intelligence", Tata McGraw Hill Education 2023.
3. Joseph C. Giarratano, Gary D. Riley,"Expert Systems: Principles and Programming", Fourth Edition, Cengage, 2024

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4. "Artificial Intelligence: A Modern Approach" – Stuart Russell & Peter Norvig (2023)
5. **"Deep Learning"** – *Ian Goodfellow, Yoshua Bengio & Aaron Courville(2024*

Reference Books

1. Ritch & Knight, "Artificial Intelligence", Third Edition, Tata McGraw Hill, 2024.
2. Patterson, "Introduction to Artificial Intelligence & Expert Systems", First Edition, Pearson, 2023.
3. Saroj Kaushik, "Logic & Prolog Programming", First Edition, New Age International, 2022.
4. "Reinforcement Learning: An Introduction" – Richard S. Sutton & Andrew G. Barto(2022)
5. **Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow"** – *Aurélien Géron (2022)*

Web References

1. https://nptel.ac.in/courses/106/105/106105077/
2. https://www.javatpoint.com/artificial-intelligence-tutorial
3. https://www.tutorialspoint.com/artificial_intelligence/index.htm
4. https://www.guru99.com/artificial-intelligence-tutorial.html
5. https://data-flair.training/blogs/ai-tutorials-home/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
2	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
3	3	2	1	1	-	-	-	-	-	-	-	1	2	1	-
4	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
5	2	1	-	-	-	-	-	-	-	-	-	1	2	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	**Computer Science and Business System**	Programme: **B.Tech.**						
Semester	**VII**	Course Category: PC			*End Semester Exam Type: **TE**			
Course Code	**U23CBT714**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Information Retrieval**	**2**	**0**	**0**	**2**	**25**	**75**	**100**
Prerequisite	**Language-related fundamentals, Mathematical concepts like Linear Algebra , Statistics, and trigonometry**							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand various models and processes of Information Retrieval	**K2**
	CO2 Apply Boolean Vector space and Tolerant retrieval models for IR systems	**K3**
	CO3 Evaluate retrieval systems using precision , recall ,semantic indexing techniques	**K4**
	CO4 Apply probabilistic models and relevance feedback for better information retrieval	**K3**
	CO5 Implement image based retrieval with support of modern frameworks	**K3**

UNIT-I	**Introduction to Information retrieval**	**(6Hrs)**
Information retrieval process, Indexing, Information retrieval model, Boolean retieval model **Dictionary and Postings** Tokenization, Stop words, Stemming, Inverted index, Skip pointers, Phrase queries		**CO1**
UNIT-II	**Tolerant Retrieval**	**(6Hrs)**
Wild card queries, Permuterm index, Bigram index,Spelling correction, Edit distance, Jaccard coefficient, Soundex . **Term Weighting and Vector Space Model :** Wild card queries, Permuterm index, Bigram index,Spelling correction, Edit distance, Jaccard coefficient, Soundex		**CO2**
UNIT-III	**Evaluation and Latent Semantic Indexing**	**(6Hrs)**
Precision, Recall, F-measure, E-measure, Normalized recall, Evaluation problems.**Latent Semantic Indexing :**Eigen vectors, Singular value decomposition, Low- rank approximation, Problems with Lexical Semantics		**CO3**
UNIT- IV	**Probabilistic Information Retrieval**	**(6Hrs)**
Query Expansion: Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Query Expansion and its types, Query drift .**Probabilistic Information Retrieval :** Probabilistic relavance feedback, Probability ranking principle, Binary Independence Model, Bayesian network for text retrieval.		**CO4**
UNIT- V	**Content Based Image Retrieval**	**(6Hrs)**
Content-Based Image Retrieval (CBIR): Introduction to CBIR, color, shape, texture features, Image Feature Extraction: Local and Global descriptors ,Challenges in CBIR: Semantic gap, relevance feedback, scalability **Frameworks and Tools:** OpenCV for image processing, TensorFlow/Keras for feature-based similarity ,Apache Lucene and Elasticsearch for scalable retrieval ,PyTorch for learning image representation		**CO5**

Text Books

1. Introduction to Information Retrieval by Christopher D. Manning,2024
2. Natural Language Processing And Information Retrieval by Tanveer Siddiqui and U. S. Tiwary,2023
3. Gerald J. Kowalski, Mark T. Maybury (2022), Information Storage and Retrieval Systems: Theory and Implementation, 2nd edition, Springer International Edition, USA ,2023
4. Information Retrieval: Algorithms and Heuristics By David A Grossman and Ophir Frieder, 2nd Edition, Springer ,2024
5. **Introduction to Information Retrieval"** – *Christopher D. Manning, Prabhakar Raghavan & Hinrich Schütze*.2024

Reference Books

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 2023.
2. Modern Information Retrival By Yates Pearson Education.2023
3. Information Storage & Retieval By Robert Korfhage - John Wiley & Sons. 2024

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4. **Foundations of Statistical Natural Language Processing"** – *Christopher D. Manning & Hinrich Schütze,2024*
5. **"Speech and Language Processing"** – *Daniel Jurafsky & James H. Martin,2024*

Web References

1. https://cse.iitkgp.ac.in/~pawang/courses/IR16/lec1.pdf .

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
2	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
3	3	2	1	1	-	-	-	-	-	-	-	1	2	1	-
4	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
5	2	1	-	-	-	-	-	-	-	-	-	1	2	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.11.46

Department	Computer Science and Business System				Programme: B.Tech.			
Semester	VII				Course Category: PC		*End Semester Exam Type: TE	
Course Code	U23CBT715	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Full Stack fusion with Node & React.js	2	0	0	2	25	75	100
Prerequisite	Database Management , Java Programming							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand and Implement Full Stack Development	K2
CO2	Develop Multithreaded and Reactive Java Applications	K3
CO3	Utilize the Spring Framework for Web Development	K4
CO4	Develop and deploy backend services using Node.js	K5
CO5	Design interactive UIs and integrate them with backend APIs using React	K3

UNIT-I	Introduction to Full Stack Development	(6Hrs)	
Introduction to Full Stack Web Development, Front-End Technologies, Back-End Technologies (ServerSide), Back-end Development with Java 11, Model View Controller (MVC),Web Services: API-Based Architecture with REST, Communication Between Front-End and Back-End, Object Relational Mapping (ORM) with Hibernate.			CO1
UNIT-II	**Multithreading and Reactive Programming in JAVA**	**(6Hrs)**	
Multithreading, Concurrency, Deadlock, Concurrent Data Structures, Multithreading Examples, Reactive Programming, Designing Concurrent Java Programs -Functional Programming in Java, Object-Oriented versus Functional Programming, Lambdas, Date and Time API			CO2
UNIT-III	**Spring and Spring MVC**	**(6Hrs)**	
Spring Framework, Spring Architecture, Spring MVC, Interception, Chain of Resolvers, View Resolution, Multiple View Pages, Multiple Controllers, Model Interface, Request Param, Form TagLibrary, Form Text Field, CRUD Example, File Upload in Spring MVC, Validation in Spring MVC, Validation with Regular Expression, Validation with Numbers			CO3
UNIT- IV	**Node.js for Backend Services**	**(6Hrs)**	
Introduction to Node.js and its architecture,Setting up Node.js environment, Asynchronous programming with Callbacks, Promises, and Async/Await, Creating RESTful APIs using Express.js, Middleware, Routing, Error Handling, Connecting Node.js with databases (MongoDB/MySQL)			CO4
UNIT- V	**React .js for Frontend Development**	**(6Hrs)**	
Introduction to React.js and its core concepts (JSX, Components, Props, State) , Component Lifecycle, Hooks (useState, useEffect) , React Router for navigation , Handling forms and validations, Integrating with REST APIs , Deployment of full-stack application			CO5

Text Books

1. Full Stack Java Development with Spring MVC, Hibernate, jQuery, and Bootstrap Mayur Ramgir, Wiley Learning Technology Series,2024
2. "Full Stack Development with Spring Boot and React" – Juha Hinkula, Packt Publishing, 2023
3. "Java: The Complete Reference" – Herbert Schildt, McGraw Hill, 11th Edition, 2023
4. "Node.js Design Patterns" – Mario Casciaro & Luciano Mammino, Packt Publishing, 3rd Edition, 2022
5. "Learning React: Functional Web Development with React and Redux" – Alex Banks & Eve Porcello, O'Reilly Media, 3rd Edition, 2022

Reference Books

1. FULL STACK WEB DEVELOPMENT GUIDE: Everything HTML 5, CSS 3, Bootstrap 4, JavaScript, jQuery, GIT, GITHUB, and Version Control for Modern Web Development by SAMMIE SMITH (latest edition)
2. Java Complete Reference 11th Edition by Herbert Schildt,2023

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3. Pro Spring 5: An In-Depth Guide to the Spring Framework" – Iuliana Cosmina, Rob Harrop, Chris Schaefer, Apress, 5th Edition, 2022
4. "RESTful Java Web Services" – Jobinesh Purushothaman, Packt Publishing, 2nd Edition, 2021.
5. "Java Concurrency in Practice" – Brian Goetz, Addison-Wesley, 1st Edition, 2021

Web References

1. https://docs.oracle.com/en/java/javase/11/
2. https://docs.spring.io/spring-framework/docs/current/reference/html/
3. https://hibernate.org/orm/documentation/
4. https://spring.io/guides/gs/rest-service/
5. https://www.baeldung.com/java-concurrency

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
2	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
3	3	2	1	1	-	-	-	-	-	-	-	1	2	1	-
4	3	2	1	1	-	-	-	-	-	-	-	1	2	-	1
5	2	1	-	-	-	-	-	-	-	-	-	1	2	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2. A. 11. 48

Department	Computer Science and Business System	Programme: B.Tech.						
Semester	VII	Course Category: PC				*End Semester Exam Type: LE		
Course Code	U23CBP712	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	Total
Course Name	Full Stack fusion with Node & React.js Laboratory	0	0	2	1	50	50	100
Prequisites	Basic Programming Knowledge, Database Management							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understanding and Setting Up Development Environments	K2
CO2	Developing Object-Oriented Java Applications	K2
CO3	Building and Designing Web Applications	K3
CO4	Database Management and Connectivity	K3
CO5	Performing Full-Stack Operations Using Node & React.js	K3

List of Experiments

1. **Design a static responsive website** using HTML, CSS, and JavaScript with basic form validation.
2. **Develop a Java-based web application** using the MVC pattern with Servlets and JSP.
3. **Create RESTful APIs using Spring Boot** to perform CRUD operations on a Student entity.
4. **Implement Object-Relational Mapping with Hibernate** to manage database operations on an Employee entity.
5. **Develop a multithreaded Java application** using Threads, executor service, and Lambda expressions.
6. **Build a Spring MVC form-based application** with input validation using annotations and tag libraries.
7. **Create a RESTful API using Node.js and Express.js** with routing, middleware, and error handling.
8. **Integrate MongoDB with Node.js** using Mongoose to perform CRUD on a Book collection.
9. **Develop a React.js front-end application** that consumes a REST API using useEffect and useState.
10. **Build and deploy a full-stack application** integrating Spring Boot (back-end) and React.js (front-end) with database connectivity and hosting.

Lecture Periods:	Tutorial Periods:	Practical Periods: 30	Total Periods: 30

Text Books

1. Herbert Schildt – Java: The Complete Reference (11th Edition, McGraw-Hill) Covers Java fundamentals, JDBC, Servlets, and Hibernate,2024
2. Kathy Sierra & Bert Bates – Head First Java (2nd Edition, O'Reilly) Best for understanding object-oriented programming and Java concepts,2023
3. Budi Kurniawan – Servlet, JSP, and Spring MVC: A Tutorial Guides on Java web development, including Servlets, JSP, and Spring MVC,2023
4. Paul Deitel & Harvey Deitel – Java How to Program (10th Edition, Pearson) Covers Java programming, database connectivity, and web development.2022
5. Craig Walls – Spring in Action (6th Edition, Manning) Comprehensive guide on Spring Boot and Spring Framework.2022

Reference Books

1. Marty Hall & Larry Brown – Core Servlets and JavaServer Pages (2nd Edition, Prentice Hall),2025
2. Gavin King – Hibernate in Action (Manning),2024
3. Ben Forta – MySQL Crash Course,(latest)
4. Eric Freeman & Elisabeth Robson – Head First HTML and CSS (O'Reilly),2023
5. Jason Hunter – Java Servlet Programming (O'Reilly),2023

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Web references

1. Oracle Java Documentation – https://docs.oracle.com/en/java/
2. Spring Framework Documentation – https://spring.io/projects/spring-framework
3. W3Schools JavaScript & HTML – https://www.w3schools.com/
4. Baeldung Java & Spring Tutorials – https://www.baeldung.com/
5. MySQL Documentation – https://dev.mysql.com/doc/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
2	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
3	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
4	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
5	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2. A. 11. 50

Department	**Computer Science and Business System**	Programme: **B.Tech.**						
Semester	**VII**	Course Category: **PC**				*End Semester Exam Type: **LE**		
Course Code	**U23CBP711**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	Total
Course Name	**Artificial Intelligence and Applications Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Perquisites	**Mathematics & Statistics, Machine Learning Fundamentals**							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Use of search strategies to solve problems	**K3**
	CO2 Implement of minimax and A* algorithm	**K3**
	CO3 Implement inference algorithm using prolog	**K3**
	CO4 Implement of planning algorithm	**K3**
	CO5 Implement of learning algorithm	**K3**

List of Experiment

1. **Programs on Problem Solving**
   a. Write a program to solve 8 Queens problem.
   b. Solve any problem using depth first search.
   c. Implement MINIMAX algorithm.
   d. Implement A* algorithm
2. **Programs on Decision Making and Knowledge Representation.**
   a. Introduction to PROLOG
   b. Implementation of Unification and Resolution Algorithm.
   c. Implementation of Backward Chaining
3. **Programs on Planning and Learning**
   a. Implementation of Blocks World program.
   b. Implementation of SVM for an application using python.
   c. Implementing Artificial Neural Networks for an application using python.
   d. Implementation of Decision Tree
   e. Implementation of K-mean algorithm

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2022.
2. Deepak Khemani "Artificial Intelligence", Tata McGraw Hill Education 2023.
3. Joseph C. Giarratano, Gary D. Riley,"Expert Systems: Principles and Programming", Fourth Edition, Cengage, 2022
4. **Elaine Rich, Kevin Knight, Shivashankar B. Nair**, *Artificial Intelligence*, McGraw Hill, Third Edition, 2022.
5. **Stuart J. Russell**, *Human Compatible: Artificial Intelligence and the Problem of Control*, Penguin Books, 2021.

Reference Books

1. Ritch & Knight, "Artificial Intelligence", Third Edition, Tata McGraw Hill, 2023..
2. Patterson, "Introduction to Artificial Intelligence & Expert Systems", First Edition, Pearson, 2023.
3. Saroj Kaushik, "Logic & Prolog Programming", First Edition, New Age International, 2022..
4. **Reinforcement Learning: An Introduction"** – *Richard S. Sutton & Andrew G. Bart (2019)*
5. **Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow"** – *Aurélien Géron,2022*

Web references

1. https://levelup.gitconnected.com/mastering-tic-tac-toe-with-minimax-algorithm-3394d65fa88f
2. https://www.baeldung.com/java-a-star-pathfinding
3. https://www.geeksforgeeks.org/prolog-an-introductio
4. https://github.com/CoGian/Blocks_World
5. https://towardsdatascience.com/artificial-neural-network-implementation-using-numpy-and-classification-of-the-fruits360-image-3c56affa4491
6. https://www.section.io/engineering-education/k-means-from-scratch-r/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
2	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
3	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
4	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
5	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2.A.11.52

Department	COMPUTER SCIENCE AND BUSINESS SYSTEM	Programme: **B.Tech.**						
Semester	VII	Course Category: **PA**			*End Semester Exam Type **LE**			
Course Code	**U23CBW703**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Project Phase - I**	**0**	**0**	**4**	**2**	**50**	**50**	**100**

Course Outcome			BT Mapping (Highest Level)
	CO1	State the problem definition clearly.	**K3**
	CO2	Prepare SRS for projects.	**K3**
	CO3	Prepare SDS for projects.	**K3**
	CO4	Develop presentation skills.	**K2**
	CO5	Develop project management skills.	**K3**

Exercises

The project group is required to do the following

1. literature survey,
2. Problem formulation
3. Forming a methodology of arriving at the solution of the problem.
4. Documentation of each step

- Papers published in reputed journals, conferences related to the project

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. "Project Management: A Systems Approach to Planning, Scheduling, and Controlling" – Harold Kerzner (13th Edition, 2023)
2. "Fundamentals of Project Management" – Joseph Heagney (6th Edition, 2022)
3. "Project Management for Engineering, Business, and Technology" – John M. Nicholas & Herman Steyn (6th Edition, 2023)
4. "Information Technology Project Management" – Kathy Schwalbe (10th Edition, 2023)
5. "Project Management: Achieving Competitive Advantage" – Jeffrey K. Pinto (5th Edition, 2022)

Reference Books

1. "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radica Successful Businesses" – Eric Ries (2024)
2. "Agile Project Management for Dummies" – Mark C. Layton & David Morrow (3rd Edition, 2022)
3. "A Guide to the Project Management Body of Knowledge (PMBOK Guide)" – Project Management Institute (7 Edition, 2021)
4. "Scrum: The Art of Doing Twice the Work in Half the Time" – Jeff Sutherland (2023)
5. "Engineering Project Management" – Nigel J. Smith (2023)

* TE – Theory Exam, LE – Lab Exam

9.A.11.53

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
2	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
3	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
4	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
5	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

9.A.11.54

Department	COMPUTER SCIENCE AND BUSINESS SYSTEM	Programme: **B.Tech.**						
Semester	**VII**	Course Category: **PA**			*End Semester Exam Type: **LE**			
Course Code	**U23CBW704**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Internship/ Industrial**	**0**	**0**	**2**	**1**	**100**	**-**	**100**

In the course of study, during 6th semester holidays, each student is expected to undertake minimum of 2 weeks or one month of industry internship/industrial project (in a reputed concern). Based on the industrial internships / Projects, the student has to submit a report prior to the commencing of seventh semester highlighting the exposure he/she gained. The report will be evaluated by the departmental committee for 100 marks. The proofs for having undergone internship / training are to be enclosed along with report as enclosures.

* TE – Theory Exam, LE – Lab Exam

9.A.11.55

SEMESTER VIII

Q.A. 11. 57

Department	Computer Science and Business System	Programme: B.Tech.						
Semester	VIII	Course Category: HS			*End Semester Exam Type: TE			
Course Code	U23HST806	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	IT Project Management	2	0	0	2	25	75	100
Prerequisite	Software Development Methodologies, Basic Project Management Concepts							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Learn to effectively plan, and schedule projects within time and cost targets	K2
CO2	Have Knowledge in Cost Control, Scheduling and Management Features	K2
CO3	Be aware of different Agile Project Methodologies	K3
CO4	Know in detail about Scrum	K3
CO5	Obtain good knowledge in DevOps	K2

UNIT-I	PROJECT OVERVIEW AND PROJECT SCHEDULING	(9Hrs)	
Project Overview and Feasibility Studies- Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal. Project Scheduling concepts and methods, CMM, PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.			CO1

UNIT-II	COST CONTROL AND SCHEDULING AND MANAGEMENT FEATURES	(9Hrs)	
Project Cost Control (PERT/Cost), Resource Scheduling & Resource Leveling. Project Management Features: Risk Analysis, Project Control, Project Audit and Project Termination.			CO2

UNIT-III	AGILE PROJECT MANAGEMENT	(9Hrs)	
Agile Project Management: Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL). Other Agile Methodologies: Introduction to XP, FDD, DSDM, Crystal.			CO3

UNIT- IV	SCRUM	(9Hrs)	
Scrum: Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.			CO4

UNIT- V	DEVOPS	(9Hrs)	
DevOps: Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring, Case study.			CO5

Text Books

1. **Agile Processes in Software Engineering and Extreme Programming"** (2024) – Darja Šmite, Eduardo Guerra, Xiaofeng Wang, Michele Marchesi, Peggy Gregory
2. **"Software Project Management"** (2024) – Sumita Katkar Gawhale, Sunil Kumar Suvvari, Apurva Patil, Smita Chavan
3. **"Agile Practice Guide 2024"** (2023) – Nancy Barber
4. **"Agile Software Development"** (2023) – Susheela Hooda, Vandana Mohindru Sood, Yashwant Singh, Sandeep Dalal, Manu Sood
5. **"Agile Software Development with C# (4th Edition)"** (2023) – Lynn Smith

Reference Books

1. **Agile Processes in Software Engineering and Extreme Programming"** – Darja Šmite, Eduardo Guerra, Xiaofeng Wang (2024)
2. **"Software Project Management"** – Sumita Katkar Gawhale, Sunil Kumar Suvvari (2024)
3. **"Agile Practice Guide 2024"** – Nancy Barber (2023)

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4. **"Agile Software Development"** – Susheela Hooda, Vandana Mohindru Sood (2023)
5. **"Agile Software Development with C# (4th Edition)"** – Lynn Smith (2023)

Web References

1. https://www.investopedia.com/terms/p/pert-chart.asp
2. https://www.toptal.com/project-managers/agile/ultimate-introduction-to-agile-project-management
3. https://www.wrike.com/project-management-guide/faq/what-is-scheduling-in-project-management/
4. https://www.atlassian.com/agile/scrum
5. https://www.atlassian.com/devops

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	2	2	2	1	-	-	-	-	3	2	-	-	1	2	-
2	1	2	2	2	3	2	2	2	3	3	3	1	3	2	2
3	1	2	2	2	3	2	2	2	3	3	2	1	2	2	2
4	1	2	2	2	3	2	2	2	3	3	2	1	2	2	2
5	1	1	2	2	2	2	2	2	3	3	2	1	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.11.60

Department	**Computer Science and Business System**	Programme: **B.Tech.**						
Semester	**VIII**	Course Category: **PC**				*End Semester Exam Type: **LE**		
Course Code	**U23HSP801**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	Total
Course Name	**IT Project Management laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Perquisites	**IT and Software Development Fundamentals, Tools and Technologies**							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Learn to effectively plan, and schedule projects within time and cost targets.	**K2**
	CO2 Have Knowledge in Cost Control, Scheduling and Management Features.	**K2**
	CO3 Be aware of different Agile Project Methodologies.	**K3**
	CO4 Know in detail about Scrum.	**K3**
	CO5 Obtain good knowledge in DevOps.	**K3**

List of Experiment

1. Estimate the IT Project Cost and Control using open-source tools
2. Scheduling a Project with PERT and CPM
3. Estimation of the total time required to complete the project if no delay
4. The individual activities to meet the project completion time.
5. Identify the critical bottleneck activities where any delays must be avoided to prevent delaying project completion.
6. IT project risk analysis (includes planning during uncertainty) using open-source tools
7. Design IT Project Audit Template
8. Agile Project Management Tools (Open source)
9. Design IT Service Management (ITIL) Templates
10. Scrum: IT Project Management, DevOps and Automated Testing Tools

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. **Agile Processes in Software Engineering and Extreme Programming"** (2024) – Darja Šmite, Eduardo Guerra, Xiaofeng Wang, Michele Marchesi, Peggy Gregory
2. **"Project Management: A Socio-Technical Approach: 2024 Release"** (2024) – Erik W. Larson, Clifford F. Gray, Pinyarat Sirisomboonsuk
3. **"Software Project Management: Methods and Techniques"** (2024) – Lawrence J. Peters
4. **"Software Project Management: With PMI, IEEE-CS, and Agile-SCRUM"** (2023) – Moh'd A. Radaideh
5. **"Agile Software Development"** (2023) – Susheela Hooda, Vandana Mohindru Sood, Yashwant Singh, Sandeep Dalal, Manu Sood

Reference Books

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1. Roman Pichler, "Agile Product Management with Scrum: Creating Products that Customers Love", 2024, First edition, Addison-Wesley.
2. Ken Schwaber, Agile Project Management with Scrum", 2019,1st edition, Microsoft Press US.2023
3. **"Agile Project Management with Scrum"** – *Ken Schwaber,2023*
4. **Project Management for IT-Related Projects"** – *Bob Hughes,2022*
5. **"The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win"** – *Gene Kim, Kevin Behr & George Spafford,2023*

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1. https://www.tutorialspoint.com/top-10-tools-and-techniques-to-estimate-project-cost
2. https://www.scirp.org/journal/paperinformation.aspx?paperid=110980
3. https://www.projectmanager.com/training/project-management-audit
4. https://www.wrike.com/project-management-guide/agile-project-management-tools-techniques/
5. https://www.smartsheet.com/itil-templates

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	1	-	-	-	-	3	2	-	-	1	2	-
2	1	2	2	2	3	2	2	2	3	3	3	1	3	2	2
3	1	2	2	2	3	2	2	2	3	3	2	1	2	2	2
4	1	2	2	2	3	2	2	2	3	3	2	1	2	2	2
5	1	1	2	2	2	2	2	2	3	3	2	1	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

9.A.11.62

Department	COMPUTER SCIENCE AND BUSINESS SYSTEM	Programme: **B.Tech.**						
Semester	**VIII**	Course Category: **PA**			*End Semester Exam Type: **LE**			
Course Code	U23CBW805	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Project Phase II**	**0**	**0**	**16**	**8**	**50**	**100**	**150**

Course Outcome			BT Mapping (Highest Level)
	CO1	Detailed literature survey related to the problem definition.	**K3**
	CO2	Implementaion of Existing System	**K3**
	CO3	Implementation of Proposed Work	**K3**
	CO4	Comparion of Existing with the proposed system and quantification	**K3**
	CO5	Future work.	**K3**

List of Exercises

The project group is required to do the following

1. Detailed literature survey,
2. Problem Definition and Research model preparation (conceptual model)
3. Data Collection tool design
4. Data Collection
5. Data Analysis
6. Interpretation and Results
7. Scope for Future Work

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 240**	**Total Periods: 240**

Text Books

1. "Project Management: A Systems Approach to Planning, Scheduling, and Controlling" – Harold Kerzner (13th Edition, 2023)
2. "Fundamentals of Project Management" – Joseph Heagney (6th Edition, 2022)
3. "Project Management for Engineering, Business, and Technology" – John M. Nicholas & Herman Steyn (6th Edition, 2023)
4. "Information Technology Project Management" – Kathy Schwalbe (10th Edition, 2023)
5. "Project Management: Achieving Competitive Advantage" – Jeffrey K. Pinto (5th Edition, 2022)

Reference Books

1. "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" – Eric Ries (2024)
2. "Agile Project Management for Dummies" – Mark C. Layton & David Morrow (3rd Edition, 2022)
3. "A Guide to the Project Management Body of Knowledge (PMBOK Guide)" – Project Management Institute (7th Edition, 2021)
4. "Scrum: The Art of Doing Twice the Work in Half the Time" – Jeff Sutherland (2023)
5. "Engineering Project Management" – Nigel J. Smith (2023)

Web references

1. http://vlabs.iitkgp.ernet.in/se/
2. https://www.ibm.com/support/pages/ibm-rational-rose-enterprise-7004-ifix001l

* TE – Theory Exam, LE – Lab Exam

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
2	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
3	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
4	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
5	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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ANNEXURE II

9.A.11.65

PROFESSIONAL ELECTIVE – IV

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Department	Computer Science and Business System	Programme: B.Tech.						
Semester	VII	Course Category: PE			*End Semester Exam Type: TE			
Course Code	U23CBE716	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	QUANTUM COMPUTATION & QUANTUM INFORMATION	2	0	0	2	25	75	100
Prerequisite	Linear Algebra, Quantum Mechanics							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the basic concepts of quantum computing.	K2
CO2	Able to implement quantum algorithms for performing computations on quantum computers	K3
CO3	Generate perfectly unpredictable random numbers to ensure the strongest level of encryption.	K3
CO4	Ensure secure communication using the quantum key distribution method.	K3
CO5	Evaluate and standardize quantum-resistant public-key cryptographic algorithms.	K3

UNIT-I	INTRODUCTION TO QUANTUM INFORMATION	(6Hrs)	
States, Operators, Measurements, Quantum Entanglement: Quantum Teleportation, Super-dense coding, CHSH Game, Quantum gates and circuits.			CO1
UNIT-II	QUANTUM ALGORITHMS BASIC	(6Hrs)	
Deutsch-Jozsa, Simon, Grover, Shor, Implication of Grover's and Simon's algorithms towards classical symmetric key cryptosystems			CO2
UNIT-III	QUANTUM ALGORITHMS ADVANCED	(6Hrs)	
Implication of Shor's algorithm towards factorization and Discrete Logarithm based classical public-key cryptosystems			CO3
UNIT- IV	QUANTUM TRUE RANDOM NUMBER GENERATORS (QTRNG)	(6Hrs)	
Quantum True Random Number Generators (QTRNG): Detailed design and issues of quantumness, Commercial products and applications			CO4
UNIT- V	BASIC AND ADVANCED QUANTUM KEY DISTRIBUTION	(6Hrs)	
Quantum key distribution (QKD): BB84, Ekert, Semi-Quantum QKD protocols, Variations in Semi-Quantum QKD protocols, Issues of Device Independence, Commercial products			CO5

Lecture Periods:30	Tutorial Periods:	Practical periods:	Total Periods:30

Text Books

1. M. A. Nielsen and I. L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press. 2023.
2. Chris Bernhardt, Quantum Computing for Everyone, MIT Press 2020.
3. Parag K. Lala, Quantum Computing - A Beginners Introduction, Mc Graw Hill,2019
4. **Quantum Computing for Computer Scientists** by Noson S. Yanofsky and Mirco A. Mannucci
5. **An Introduction to Quantum Computing** by Phillip Kaye, Raymond Laflamme, and Michele Mosca

Reference Books

1. Jack D. Hidary, Quantum Computing: An Applied Approach 1st ed. Edition, Springer 2019
2. Robert Loredo, Learn Quantum Computing with Python and IBM Robert Loredo, Quantum Experience: A hands-on introduction to quantum computing and writing your quantum programs with Python, Packt Publishing,2020

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3. **Principles of Quantum Computation and Information: Basic Concepts** by Giuliano Benenti, Giulio Casati, and Giuliano Strini,2023
4. **Quantum Information Theory** by Mark M. Wilde,2024
5. **Quantum Computing Since Democritus** by Scott Aaronson,2024

Web References

1. Press kil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/
2. NIST Post Quantum Cryptography, Available online: https://csrc.nist.gov/projects/post-quantucryptography/
3. https://nptel.ac.in/noc/courses/noc21/SEM2/noc21-cs103/.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
2	2	2	1	1	-	-	-	-	-	-	-	-	2	1	1
3	3	2	2	2	-	-	-	-	-	-	-	-	2	2	2
4	3	2	2	2	2	-	-	-	-	-	-	-	2	3	2
5	3	2	2	2	2	-	-	-	-	-	-	-	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	**Computer Science and Business System**			Programme: **B.Tech.**				
Semester	**VII**			Course Category: PE		*End Semester Exam Type: **TE**		
Course Code	**U23CBE717**			Periods / Week		Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	**ADVANCED SOCIAL, TEXT AND MEDIA ANALYTICS**			**2**	**0**	**0**	**2**	**25**	**75**	**100**
Prerequisite	**Data Science and Machine Learning, Natural Language Processing (NLP)**									
Course Outcome	**On completion of the course, the students will be able to**								BT Mapping (Highest Level)	
	CO1	Interpret the contribution of text mining to generate new knowledge from natural language text.							**K3**	
	CO2	Extract useful information from the textual data using various classifiers and Predictors							**K2**	
	CO3	Identify the various components of a web that can be used for the mining process							**K3**	
	CO4	Analyse social media data using appropriate using various analytical techniques							**K3**	
	CO5	Provide solutions to the emerging problems of social media analytics with sentiment analysis and opinion mining							**K3**	

UNIT-I	**INTRODUCTION TO TEXT MINING**	**(6Hrs)**
Introduction to Text Mining - Text Representation - Core text mining operations - Text mining applications. Text mining Pre-processing techniques - Text Clustering, Text Classification, Topic Modelling, Probabilistic models for information extraction		**CO1**
UNIT-II		**(6Hrs)**
Web Analytics - Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval. Search engine optimization, Web crawling, Indexing, Ranking algorithms, Web traffic models		**CO2**
UNIT-III		**(6Hrs)**
Social network and web data and methods. Graphs and Matrices. Basic measures for individuals and networks. Information visualization.		**CO3**
UNIT- IV		**(6Hrs)**
Making connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis		**CO4**
UNIT- V		**(6Hrs)**
Content Analysis; Natural Language Processing; Clustering & Topic Detection; Simple Predictive Modelling; Sentiment Analysis; Sentiment Prediction.		**CO5**

Lecture Periods:30	**Tutorial Periods:**	**Practical periods:**	**Total Periods:30**

Text Books

1. Bing Liu, Web Data Mining-Exploring Hyperlinks, Contents, and Usage Data, Springer, Second Edition, 2023.
2. Reza Zafarani, Mohammad Ali Abbasi and Huan Liu, Social Media Mining-An Introduction, Cambridge University Press, 2023.
3. Bing Liu, Sentiment Analysis: Mining Opinions, Sentiments, and Emotions, Cambridge University Press, Second Edition, 2020.

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4. **Text Mining with R: A Tidy Approach** by Julia Silge and David Robinson,2024
5. **Speech and Language Processing** by Daniel Jurafsky and James H. Martin,2024

Reference Books

1. Ronen Feldman and James Sanger, The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data, Cambridge University Press, First Edition, 2020.
2. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics,2021.
3. Alex Gonçalves, Social Media Analytics Strategy: Using Data to Optimize Business Performance,2020
4. **Natural Language Processing with Python** by Steven Bird, Ewan Klein, and Edward Loper,2022
5. **Python Data Science Handbook** by Jake VanderPlas,2023

Web References

1. https://www.tutorialspoint.com/social_media_marketing/social_media_analysis.htm
2. https://onlinecourses.nptel.ac.in/noc21_cs74/preview
3. http://r-tutorials.com/social-media-analysis-in-r/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
2	2	2	1	1	-	-	-	-	-	-	-	-	2	1	1
3	3	2	2	2	-	-	-	-	-	-	-	-	2	2	2
4	3	2	2	2	2	-	-	-	-	-	-	-	2	3	2
5	3	2	2	2	2	-	-	-	-	-	-	-	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	**Computer Science and Business System**			Programme: **B.Tech.**				
Semester	**VII**			Course Category: PE		*End Semester Exam Type: **TE**		
Course Code	**U23CBT718**			Periods / Week		Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	**USABILITY DESIGN OF SOFTWARE APPLICATIONS**			**2**	**0**	**0**	**2**	**25**	**75**	**100**
Prerequisite	**Human-Computer Interaction (HCI), User Interface (UI) Design**									
Course Outcome	**On completion of the course, the students will be able to**									BT Mapping (Highest Level)
	CO1	Gain knowledge of the User Centered Design.								**K2**
	CO2	Familiarize User Centric Design to the facets of User Experience (UX) Design.								**K2**
	CO3	Design and develop applications with smart designs.								**K3**
	CO4	Familiarize with the research techniques of UX.								**K2**
	CO5	Analyze and identify the methods to offer a better UI experience.								**K3**
UNIT-I	**INTRODUCTION**						**(6Hrs)**			
Introduction to User Centered Design - Basics of User Centered Design. **Aspects of User Centered Design** - Product Appreciation Assignment – Evaluating the product from user centered design aspects such as functionality, ease of use, ergonomics, and aesthetics.										**CO1**
UNIT-II	**PRODUCT DESIGN LIFECYCLE**						**(6Hrs)**			
Redesign project through the design lifecycle – Discovery - Define – Design - Implement (Design Prototype) - Usability Testing										**CO2**
UNIT-III	**PERSONAS, SCENARIOS, DEVELOPMENT AND PROTOTYPING**						**(6Hrs)**			
Scenarios and Persona Technique – Overview of Design Thinking Technique - Discovery and Brainstorming. Concept Development - Task flow detailing for the Project – Prototyping Techniques - Paper, Electronic, and Prototyping Tools.										**CO3**
UNIT- IV	**UX RESEARCH**						**(6Hrs)**			
Understanding users, their goals, context of use, and environment of use. Research Techniques: Contextual Enquiry, User Interviews, Competitive Analysis for UX.										**CO4**
UNIT- V	**HEURISTIC EVALUATION**						**(6Hrs)**			
10 Heuristic Principles, Examples Heuristic Evaluation: Group Assignment initiation (Website and App)Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.										**CO5**
Lecture Periods:30	**Tutorial Periods:**			**Practical periods:**			**Total Periods:30**			

Text Books

1. Jennifer Preece, Helen Sharp, Yvonne Rogers, "Interaction Design: Beyond Human-Computer Interaction", 4th Edition, Wiley publications, 2023
2. Alan Cooper and Robert Riemann, "About Face The Essentials of Interaction Design", 4th Edition, Wiley Publications,2022.
3. Elizabeth Goodman, Mike Kuniavsky, Andrea Moed, "Observing the User Experience - A Practitioner's Guide to User Research", Second Edition, Morgan Kaufmann Publications,2022.
4. **Don't Make Me Think: A Common Sense Approach to Web Usability** by Steve Krug,2024
5. **About Face: The Essentials of Interaction Design** by Alan Cooper, Robert Reimann, David Cronin, and Christopher Noessel,2024

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Reference Books

1. Jesse James Garrett, "The Elements of User Experience: User-Centered Design for the Web and Beyond Voices That Matter" New Riders; 2nd edition, 2023
2. Jonny Schneide, Understanding Design Thinking, Lean, and Agile, O'Reilly Media, Inc. 2020
3. Everett N McKay, UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing or Effective Communication, 1st Edition, 2019
4. **Lean UX: Designing Great Products with Agile Teams** by Jeff Gothelf and Josh Seiden,2022
5. **Rocket Surgery Made Easy: The Do-It-Yourself Guide to Finding and Fixing Usability Problems** by Steve Krug,2023

Web References

1. https://nptel.ac.in/courses/124/107/124107008/
2. https://www.tutorialspoint.com/
3. cs.stir.ac.uk/courses/ITNP023/lectures/03-web.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	1	1	1	1	-	-	-	-	-	-	-	-	1	1	-
2	1	1	1	2	-	-	-	-	-	-	-	-	2	1	-
3	1	1	2	2	2	-	-	-	-	-	-	-	2	1	1
4	1	1	1	2	3	-	-	-	-	-	-	-	2	1	1
5	1	1	2	1	-	-	-	-	-	-	-	-	2	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	**Computer Science and Business System**			Programme: **B.Tech.**				
Semester	**VII**			Course Category: PE		*End Semester Exam Type: **TE**		
Course Code	**U23CBE719**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**IoT Systems and Architecture**	**2**	**0**	**0**	**2**	**25**	**75**	**100**
Prerequisite	**Networking and Communication Protocols**							

Course Outcome		BT Mapping (Highest Level)
	On completion of the course, the students will be able to	
	CO1 Understand basic principles and concepts of Internet-of-Things use cases, applications.	**K2**
	CO2 Understand basic concepts of the Architecture of IoT.	**K2**
	CO3 Describe Sensor and its applicability.	**K3**
	CO4 Understand Networking and communication for IoT.	**K2**
	CO5 Comprehend IoT data processing and storage.	**K3**

UNIT-I	**IoT System Overview and Architectural Principles**	**(6Hrs)**

Introduction to IoT: Definition, evolution from M2M, and key use cases ,Characteristics: Scalability, heterogeneity, intelligence, and context-awareness, IoT System Architecture: Layered architecture overview (Device, Network, Service, Application Layers) ,IoT Ecosystem: Components (devices, sensors, gateways), edge/fog/cloud integration ,Architectural Considerations: Scalability, interoperability, modularity, security. **Real-world IoT Use Cases and Trends**:Smart cities, healthcare, agriculture, industrial automation ,Trends like AIoT (AI + IoT), 5G IoT, and Digital Twins — **CO1**

UNIT-II	**IoT Reference Architectures and Frameworks**	**(6Hrs)**

Generalized IoT Architecture: Layered and service-oriented models-Industrial Internet Reference Architecture (IIRA): Components and domains -Cloud-Centric and Edge-Centric Architectures: When to use and trade-offs -IoT Middleware: Role of brokers, pub/sub systems, and message queues-Data Pipelines in IoT: Stream vs. batch processing, ETL for IoT — **CO2**

UNIT-III	**Sensor Networks and Embedded System Architecture**	**(6Hrs)**

Sensor Network Architecture: Topologies, design considerations, and integration - Embedded Systems in IoT: RTOS, lightweight computing platforms, and firmware design- IoT Edge Architectures: Distributed intelligence and decision-making- Industrial Data Acquisition and Control Systems: DAQs, SCADA, PLCs - Security in Embedded IoT Systems: Hardware-based encryption, secure boot, and TPM — **CO3**

UNIT- IV	**IoT Communication Architectures and Networking**	**(6Hrs)**

IoT Networking Layers: Mapping to OSI and TCP/IP models - Industrial IoT Communication Frameworks: Modbus, CANbus, OPC-UA, DDS - Low-Power Wireless Communication Architectures: ZigBee, LoRaWAN, NB-IoT, Bluetooth Low Energy (BLE)- IoT Cloud Integration Architectures: RESTful APIs, GraphQL, WebSockets, MQTT - Edge-to-Cloud Communication Patterns: Gateway-based, peer-to-peer, and fog architectures — **CO4**

UNIT- V	**IoT Data Architectures and Advanced Processing**	**(6Hrs)**

Time-Series Data Architecture: Strategies for storing, indexing, and retrieving sensor-generated time-series data ,Importance in real-time monitoring systems. **IoT Database Architectures:**SQL vs. NoSQL databases,Time-series databases: InfluxDB, TimeScaleDB, Cassandra. **.Cloud AI Pipelines for IoT :**Integration of cloud platforms (AWS IoT, Azure IoT Hub, Google Cloud IoT) ,Model deployment, lifecycle management, and data lake usage, **Industrial IoT (IIoT) Applications :**Real-world case studies: Smart manufacturing, predictive maintenance, energy optimization,Integration of SCADA, DAQs, PLCs with data analytics platforms — **CO5**

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Text Books

1. Samuel Greengard , The Internet of Things, MIT Press Essential Knowledge Series, 2023
2. Arsheep Bahga and Vijay Madisetti, Internet Of Things: A Hands-On Approach,2020
3. Prof. Satish Jain and Shashi Singh, Internet of Things and its Applications,bpb publications, 2020
4. **Internet of Things: A Hands-on Approach** by Arshdeep Bahga and Vijay Madisetti,2023
5. **Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry** by Maciej Kranz,2024

Reference Books

1. Ben Fry, Visualizing Data-Exploring and Explaining Data with the Processing Environment, O'Reilly Media, 2023.
2. Andrew K Dennis , Raspberry Pi Computer Architecture Essentials, Packt Publishing, 2022
3. Cuno Pfister, Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) 1st Edition,Orielly,2021
4. **IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things** by David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, and Jerome Henry,2021
5. **Designing the Internet of Things** by Adrian McEwen and Hakim Cassimally,2020

Web References

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-cs17/
3. https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-cs66/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
2	2	2	1	1	-	-	-	-	-	-	-	-	2	1	1
3	3	2	2	2	-	-	-	-	-	-	-	-	2	2	2
4	3	2	2	2	2	-	-	-	-	-	-	-	2	3	2
5	3	2	2	2	2	-	-	-	-	-	-	-	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.11.26

Department	Computer Science and Business System	Programme: B.Tech.						
Semester	VII	Course Category: PE			*End Semester Exam Type: TE			
Course Code	U23CBE720	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Virtual Reality Systems and Applications	2	0	0	2	25	75	100
Prerequisites	Image Processing concepts							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	To know basic concepts of virtual reality	K2
CO2	To understand visual computation in computer graphics	K3
CO3	To understand interaction between system and computer	K3
CO4	To know application of VR in Digital Entertainment	K3
CO5	To design, develop, and evaluate 3D user interfaces and demonstrating proficiency in the use of open-source toolkits	K3

UNIT-I	Introduction of Virtual Reality	(6Hrs)	
Fundamental Concept and Components of Virtual Reality - Primary Features and Present Development on Virtual Reality - Multiple Models of Input and Output Interface in Virtual Reality: Input - Tracker - Sensor - Digital Glove - Movement Capture - Video-based Input - 3D Menus & 3DScanner – Output - Visual /Auditory / Haptic Devices.			CO1
UNIT-II	**Visual Computation in Virtual Reality**	**(6Hrs)**	
Fundamentals of Computer Graphics - Software and Hardware Technology on Stereoscopic Display - Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering.			CO2
UNIT-III	**Interactive Techniques in Virtual Reality**	**(6Hrs)**	
Body Track - Hand Gesture - 3D Manus - Object Grasp. Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega - MultiGen - Virtools.			CO3
UNIT- IV	**Application of VR in Digital Entertainment**	**(6Hrs)**	
VR Technology in Film and TV Production - VR Technology in Physical Exercises and Games - Demonstration of Digital Entertainment by VR.			CO4
UNIT- V	**Designing Immersive 3D User Interfaces**	**(6Hrs)**	
Travel and Wayfinding in Virtual Environments, Strategies for Designing and Developing 3D UIs, Evaluation of 3D User Interfaces, Traditional and Emerging VR/AR applications. Case study on Construction of Geographic Virtual World. Group assignments on implementation of a Virtual/ Augmented Reality Application using open-source toolkits/ libraries such as Open Scene Graph, Vega, VRML.			CO5

Text Books

1. Virtual Reality Technology" by Grigore C. Burdea and Philippe Coiffet,2024
2. Computer Graphics: Principles and Practice" by John F. Hughes et al,2024
3. 3D User Interfaces: Theory and Practice" by Doug A. Bowman, Ernst Kruijff, Joseph J. LaViola Jr., and Ivan Poupyrev,2023
4. Virtual Reality Filmmaking: Techniques & Best Practices for VR Filmmakers" by Celine Tricart,2022
5. Designing Virtual Reality Systems: The Structured Approach" by Gerard Jounghyun Kim,2022

Reference Books

1. G.C. Burdea & P. Coiffet, "Virtual reality Technology, Second Ed.", Wiley-India.,2024
2. GJ Kim, "Designing VR Systems: The Structured Approach", Springer.2023
3. D.A. Bowman et al., "3D User Interfaces: Theory and Practice", Addison Wesley.2023
4. John Vince, "Virtual Reality Systems", Pearson Ed.2022
5. Rick Parent, "Computer Animation: Algorithms & Techniques", Morgan Kaufmann,2021

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1. http://www.openscenegraph.org/
2. https://www.iberdrola.com/innovation/virtual-reality
3. https://docs.unity3d.com/Manual/VROverview.html

COs/POs/PSOs Mapping

Co's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
2	2	2	1	1	-	-	-	-	-	-	-	-	2	1	1
3	3	2	2	2	-	-	-	-	-	-	-	-	2	2	2
4	3	2	2	2	2	-	-	-	-	-	-	-	2	3	2
5	3	2	2	2	2	-	-	-	-	-	-	-	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.11.18

Department	**Computer Science and Business System**	Programme: **B.Tech.**						
Semester	VII	Course Category: **PE**				*End Semester Exam Type: **LE**		
Course Code	U23CBEP71	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	Total
Course Name	Quantum Computation & Quantum Information Laboratory	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Perquisites	**Linear Algebra, Quantum Mechanics**							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the basic concepts of quantum computing.	**K2**
	CO2 Implement quantum algorithms.	**K3**
	CO3 Implement classical logic using quantum circuits.	**K3**
	CO4 Develop a program for Quantum optimization algorithms.	**K4**
	CO5 Perform quantum computations to solve simple problems.	**K3**

List of Experiment

1. Introduction of quantum Instruction Set Architecture for quantum computations.
2. Use of quantum instruction language such as Quil, etc. for performing any quantum Computations.
3. Programs using bits and qubits.
4. Implementation of quantum algorithms - Deutsch–Jozsa problem, Simon's algorithm and Shor's algorithm.
5. Implement classical logic using quantum circuits.
6. Program to implement Quantum counting.
7. Program for Quantum optimization algorithms.
8. Program for a quantum walk to solve problems include search and sampling without errors.
9. Implementation of Quantum algorithm for solving linear systems of equations.

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. **"Hands-On Quantum Machine Learning With Python"** by **Frank Zickert**, 2nd Edition, **2024**.
2. T.W. Anderson, "An Introduction to Multivariate Statistical Analysis", 2nd edition, 2024.
3. J.D. Jobson," Applied Multivariate Data Analysis", Vol I & II, 2nd edition,2023
   Magnus Lie Hetland," Beginning Python: From Novice to Professional", 9th. Edition, 2022
4. **Quantum Computing for Computer Scientists** by Noson S. Yanofsky and Mirco A. Mannucci,2021
5. **An Introduction to Quantum Computing** by Phillip Kaye, Raymond Laflamme, and Michele Mosca,2020

Reference Books

1. Multivariate Statistical Analysis: Theory and Practice" by George A. Marcoulides and Tenko Raykov, 2024.
2. D.A. Belsey, E. Kuh and R.E. Welsch, "Regression Diagnostics, Identifying Influential Data and Sources of Collinearety", New York, 2023.
3. D.C. Montgomery and E.A. Peck, "Introduction to Linear Regression Analysis", 5th edition, 2019.

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D.F. Morrison, "Multivariate Statistical Analysis", 2023.
4.Principles of Quantum Computation and Information: Basic Concepts by Giuliano Benenti, Giulio Casati,and Giuliano Strini,2022
5.Quantum Computing Since Democritus by Scott Aaronson,2021

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1. https://www.edx.org/course/statistical-modeling-and-regression-analysis
2. https://www.cin.ufpe.br/~embat/Python%20for%20Data%20Analysis.pdf
3. https://www.kdnuggets.com/2016/07/statistical-data-analysis-python.html
4. https://people.duke.edu/~ccc14/sta-663/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	2	1	1
2	3	2	1	1	3	-	-	-	-	-	-	-	2	1	1
3	3	2	1	1	3	-	-	-	-	-	-	1	2	2	1
4	3	2	1	1	3	-	-	-	-	-	-	1	2	2	2
5	3	2	1	1	3	-	-	-	-	-	-	1	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	**Computer Science and Business System**	Programme: **B.Tech.**						
Semester	VII	Course Category: **PC**				*End Semester Exam Type: **LE**		
Course Code	U23CBEP72	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	Total
Course Name	Advanced Social, Text And Media Analytics Laboratory	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Perquisites	**Mathematics and Statistics ,Programming Skills**							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Interpret knowledge from natural language text.	**K3**
	CO2 Extract useful information from the textual data.	**K2**
	CO3 Analyse social media data using web mining techniques.	**K4**
	CO4 Discover interesting patterns from Social Media Networks. **(K5)**	**K5**
	CO5 Analyse social media using sentiment analysis and opinion mining. **(K4)**	**K4**

List of Experiment

1. Text analysis - Facebook post comments/Youtube comments - using R/PYTHON.
2. Scrape data from Facebook page posts for statistical analysis - using Python.
3. Mining Twitter Data with Python (Collecting data).
4. Perform link analysis on any social media platform.
5. Users Influential on Social media platforms
6. Implement an analytic application for Facebook/Twitter data to demonstrate Sentiment Analysis and Entity Recognitio

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. Bing Liu, Web Data Mining-Exploring Hyperlinks, Contents, and Usage Data, Springer, Second Edition, 2023.
2. Reza Zafarani, Mohammad Ali Abbasi and Huan Liu, Social Media Mining-An Introduction, Cambridge University Press, 2020.
3. Bing Liu, Sentiment Analysis: Mining Opinions, Sentiments, and Emotions, Cambridge University Press, Second Edition, 2020.
4. "Speech and Language Processing" by Daniel Jurafsky and James H. Martin,2022
5. "Text Mining with R: A Tidy Approach" by Julia Silge and David Robinson,2022

Reference Books

1. Ronen Feldman and James Sanger, The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data, Cambridge University Press, First Edition, 2023.
2. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics,2022.
3. Alex Gonçalves, Social Media Analytics Strategy: Using Data to Optimize Business Performance,2022

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4 "Introduction to Information Retrieval" by Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze,2022
5 "Social Media Mining: An Introduction" by Reza Zafarani, Mohammad Ali Abbasi, and Huan Liu,2021

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1. https://www.tutorialspoint.com/social_media_marketing/social_media_analysis.htm
2. https://onlinecourses.nptel.ac.in/noc21_cs74/preview
3. http://r-tutorials.com/social-media-analysis-in-r/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	2	1	1
2	3	2	1	1	3	-	-	-	-	-	-	-	2	1	1
3	3	2	1	1	3	-	-	-	-	-	-	1	2	2	1
4	3	2	1	1	3	-	-	-	-	-	-	1	2	2	2
5	3	2	1	1	3	-	-	-	-	-	-	1	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2.11.82

Department	**Computer Science and Business System**	Programme: **B.Tech.**						
Semester	**VII**	Course Category: **PC**				*End Semester Exam Type: **LE**		
Course Code	**U23CBEP73**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	Total
Course Name	**USABILITY DESIGN OF SOFTWARE APPLICATIONS LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Perquisites	**Human-Computer Interaction (HCI), User Interface (UI) Design**							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Redesigning an existing Application or website for better user experience.	**K3**
	CO2 Analyze the mobile app or the website through the design and development life cycle.	**K4**
	CO3 Analyze and identify the methods to offer a better UI experience.	**K4**
	CO4 Develop concept and task flow detail.	**K3**
	CO5 Test and demonstrate the application.	**K4**

List of Experiment

1. Identify a website or an App to redesign, with justification.
2. Analysis of the mobile app or the website through the design life cycle.
3. Identifying Personas and Scenarios for the App or the website.
4. Concept development and task flow detailing.
5. Prototype development with Iterations and justification.
6. Usability testing and demonstration.

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. Jesse James Garrett, "The Elements of User Experience: User-Centered Design for the Web and Beyond", 2nd edition, 2023.
2. Jonny Schneider, "Understanding Design Thinking, Lean, and Agile", O'Reilly Media, 2023.
3. Jaime Levy, "UX Strategy: How to Devise Innovative Digital Products that Drive Business Success", 3rd edition, 2024.
4. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interfaces: Patterns for Effective Interaction Design", 2024.
5. Irene Pereyra, "Universal Principles of UX: 100 Timeless Strategies to Create Positive Interactions between People and Technology", 2024.

Reference Books

1. Jesse James Garrett, "The Elements of User Experience: User-Centered Design for the Web and Beyond - Voices That Matter" New Riders; 2nd edition, 2023.
2. Jonny Schneide,n Understanding Design Thinking, Lean, and Agile, O'Reilly Media, Inc. 2023.
3. Everett N McKay, UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing on Effective Communication, 1st Edition, 2022.
4. Lean UX: Designing Great Products with Agile Teams by Jeff Gothelf and Josh Seiden,2022
5. Rocket Surgery Made Easy: The Do-It-Yourself Guide to Finding and Fixing Usability Problems by Steve Krug,2021

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1. https://nptel.ac.in/courses/124/107/124107008/
2. https://www.tutorialspoint.com/
3. cs.stir.ac.uk/courses/ITNP023/lectures/03-web.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
2	3	2	1	1	3	-	-	-	-	-	-	-	3	1	2
3	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
4	3	2	1	1	3	-	-	-	-	-	-	-	3	1	2
5	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	Computer Science and Business System	Programme: B.Tech.						
Semester	VII	Course Category: PC				*End Semester Exam Type: LE		
Course Code	U23CBEP74	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	Total
Course Name	IoT Systems and Architecture Laboratory	0	0	2	1	50	50	100
Prequisites	Nil							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Explain IoT system components, architectures, and design considerations.	K3
CO2	Develop and integrate IoT devices using communication protocols like MQTT, HTTP, and LoRaWAN.	K4
CO3	Process and analyze real-time sensor data using cloud platforms, databases, and AI techniques.	K4
CO4	Implement security measures such as encryption, authentication, and secure communication.	K3
CO5	Build practical IoT solutions for industrial and consumer applications using embedded systems and cloud integration.	K4

List of Experiment

1. Configure an ESP32/Arduino device to send sensor data to a cloud platform (AWS, Azure, or Firebase).
2. Interface a temperature/humidity sensor (DHT11/DHT22) with an ESP8266/ESP32 and log data to an SD card.
3. Implement a publisher-subscriber model using MQTT with Mosquitto Broker and NodeMCU.
4. Develop a RESTful API in Flask to collect and visualize IoT data from sensors.
5. Implement edge data processing on a Raspberry Pi to filter and analyze real-time sensor data before sending it to the cloud.
6. Control appliances (LED/Bulb/Fan) using a mobile app or voice commands with Google Assistant via Blynk.
7. Implement SSL/TLS encryption for MQTT communication between an IoT device and a broker.
8. Set up a LoRaWAN-based communication system to transmit environmental sensor data over a long distance.
9. Use machine learning (Python & TensorFlow) to analyze IoT sensor data for anomaly detection and predictive maintenance.
10. Store time-series data in InfluxDB and visualize it using Grafana dashboards.

Lecture Periods:	Tutorial Periods:	Practical Periods: 30	Total Periods: 30

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Text Books

1. Pethuru Raj, Anupama C. Raman, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases*, CRC Press, 2023.
2. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2023.
3. Rajkumar Buyya, Amir Vahid Dastjerdi, *Internet of Things: Principles and Paradigms*, Morgan Kaufmann, 2023.
4. Benny Akesson, Abdelrahman Amin, *Embedded Systems and IoT: A Hardware-Software Partnership*, Springer, 2024.
5. Adrian McEwen, Hakim Cassimally, *Designing the Internet of Things*, Wiley, 2023.

Reference Books

1. Joseph L. Bambenek, IoT Security Issues and Solutions: A Practical Guide, CRC Press, 2024.
2. Jan Höller, David Boyle, Catherine Mulligan, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Academic Press, 2023.
3. Mahmoud Aly, Ramy El-Sayed, Edge Computing for IoT Applications: Principles and Practices, Elsevier, 2024.
4. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, Wiley, 2023.
5. Charles Bell, Beginning Sensor Networks with Arduino and Raspberry Pi, Apress, 2023.

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1. https://www.linkedin.com/pulse/iot-architecture-dr-kaushik-selvaraj-qqm6c
2. https://www.compunnel.com/blogs/edge-computing-in-2024-accelerating-data-processing-capabilities/
3. https://www.researchgate.net/publication/388195225_Real-Time_Data_Processing_Architectures_for_IoT_Applications
4. https://iot-analytics.com/iot-2024-review/
5. https://amela.tech/10-stunning-used-iot-protocols-and-standards-in-2024-you-need-to-know/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
2	3	2	1	1	3	-	-	-	-	-	-	-	3	1	2
3	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-
4	3	2	1	1	3	-	-	-	-	-	-	-	3	1	2
5	3	2	1	1	3	-	-	-	-	-	-	-	3	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 – Hig

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Mark	15	5	5	15	10	50	100

2.A.11.86

Department	**Computer Science and Business System**	Programme: **B.Tech.**						
Semester	VII	Course Category: **PC**				*End Semester Exam Type: **LE**		
Course Code	U23CBEP75	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	Total
Course Name	VIRTUAL REALITY LABORATORY	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Perquisites	**Designing Immersive 3D User Interfaces**							

Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explore the installation process of VR Software.	**K4**
	CO2 Understand the physical principles of VR.	**K2**
	CO3 Create a comfortable, high-performance VR application using Unity.	**K4**
	CO4 Identify techniques for the design and deployment of VR experiences.	**K2**
	CO5 Create gaming application using VR.	**K3**

List of Experiment

1. Installation of Unity and Visual Studio, setting up Unity for VR development, understanding documentation of the same.
2. Demonstration of the working of HTC Vive, Google Cardboard, Google Daydream, and Samsung Gear VR.
3. Develop a scene in Unity that includes:
   I. A cube, plane, and sphere, apply transformations on the 3 game objects.
   II. Add a video and audio source.
4. Develop a scene in Unity that includes a cube, plane, and sphere. Create a new material and texture separately for three Game objects. Change the color, material, and texture of each Game object separately in the scene. Write a C# program in Visual Studio to change the game objects' color and material/texture dynamically on button click.
5. Develop a scene in Unity that includes a sphere and plane. Apply rigid body components, material, and Box collider to the game Objects. Write a C# program to grab and throw the sphere using a VR controller.
6. Develop a simple UI(User interface) menu with images, canvas, sprites, and buttons. write a C# program to interact with the UI menu through the VR trigger button such that each successful trigger interaction display a score on the scene.
7. Create an immersive environment (living room/ battlefield/ tennis court) with only static game objects. 3D game objects can be created using Blender or use available3D models.

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Text Books

1. StevanM.LaValle, "Virtual Reality", Cambridge University Press, 2023.
2. Burdea, "Virtual Reality Technology", Wiley India, 2nd edition, 2020.
3. John Vince, "Virtual Reality Systems", Pearson Edition, 2019.
4. 3D User Interfaces: Theory and Practice" by Doug A. Bowman, Ernst Kruijff, Joseph J. LaViola Jr., and Ivan Poupyrev
5. Virtual Reality Filmmaking: Techniques & Best Practices for VR Filmmakers" by Celine Tricart

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1. Jonathan Linowes, "Unity Virtual Reality Projects", Packt publications, Second Edition, 2020.
2. Woodrow Barfield, Marc J. Blitz, "Research Handbook on the Law of Virtual Reality and Augmented Reality", Edward Elgar Publishing, 2021.
3. Jeff W Murray, "Building Virtual Reality with Unity and SteamVR", CRC Press, 2nd edition, 2020.
4. Erin Pangilinan, Steve Lukas, VasanthMohan, "Creating Augmented and Virtual Realities: Theory and Practice for Next-Generation Spatial Computing", O'Reilly Media, 1st edition, 2019.
5. Jason Jerald, "The VR Book: Human-Centered Design for Virtual Reality", Morgan & Claypool Publishers, 2019

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2. https://www.iberdrola.com/innovation/virtual-reality
3. https://www.marxentlabs.com/what-is-virtual-reality
4. https://www.vrs.org.uk/virtual-reality/what-is-virtual-reality.html
5. https://arvr.google.com/vr

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	2	1	1
2	3	2	1	1	3	-	-	-	-	-	-	-	2	1	1
3	3	2	1	1	3	-	-	-	-	-	-	1	2	2	1
4	3	2	1	1	3	-	-	-	-	-	-	1	2	2	2
5	3	2	1	1	3	-	-	-	-	-	-	1	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

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Department	**Computer Science and Business System**			Programme: **B.Tech.**					
Semester	**VIII**			Course Category: PE			*End Semester Exam Type: **TE**		
Course Code	**U23CBE821**			Periods / Week			Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	**Behavioral Economics**			**2**	**0**	**0**	**2**	**25**	**75**	**100**
Prerequisite	**Statistics and Probability, Microeconomics**								
Course Outcome	**On completion of the course, the students will be able to**								BT Mapping (Highest Level)
	CO1	Understand and apply various concepts in traditional and modern Microeconomic							**K2**
	CO2	Focus on decision making, and develop a holistic understanding of these concepts and their interconnections							**K2**
	CO3	Explore the knowledge on behavioural science perspective in Economics							**K3**
	CO4	Understand current ideas and concepts regarding decision making in Economics							**K3**
	CO5	Students will be able to understand the inter temporal choice in Economics							**K3**
UNIT-I	**Introduction**						**(6Hrs)**		
The neoclassical/standard model and behavioral economics in contrast; historical background; behavioral economics and other social sciences; theory and evidence in the social sciences and in behavioral economics; applications – gains and losses, money illusion, charitable donation.									**CO1**
UNIT-II	**Basics of choice theory**						**(6Hrs)**		
Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing, valuation, public goods, choice anomalies									**CO2**
UNIT-III	**Beliefs, heuristics and biases**						**(6Hrs)**		
Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and self-projection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behavior, trade in memorabilia, policy analysis – norms and markets, labor markets, market clearing, public goods; applications – logic and knowledge, voluntary contribution, compensation design.									**CO3**
UNIT- IV	**Choice under uncertainty**						**(6Hrs)**		
Background and expected utility theory; prospect theory and other theories; reference points; loss aversion; marginal utility; decision and probability weighting; applications – ownership and trade, income and consumption, performance in sports. **Strategic choice:** . Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and mixed strategies, iterated games, bargaining, signaling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry									**CO4**
UNIT- V	**Intertemporal choice**						**(6Hrs)**		
Geometric discounting; preferences over time; anomalies of inter-temporal decisions; hyperbolic discounting; instantaneous utility; alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings, clubs and membership, consumption planning. Individual preferences; choice anomalies and inconsistencies; social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention; demographic and cultural aspects; social norms; compliance and punishment; inequity aversion;									**CO5**
Lecture Periods:30	**Tutorial Periods:**			**Practical periods:**			**Total Periods:30**		

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Text Books

1. Philip Corr, Anke Plagnol, "Behavioral Economics: The Basic", Routledge; 1st edition, 2024
2. N. Wilkinson and M. Klaes, "An Introduction to Behavioral Economics ", 2023.
3. Robert H. Frank, "Microeconomics and Behaviour", McGraw-Hill, 9th Edition, 2022.
4. Paul A. Samuelson, William D. Nordhaus, Sudip Chaudhuri and AnindyaSen, "Economics", 19th edition,Tata McGraw Hill, 2022
5. M.L.Trivedi, "Managerial Economics:Theory & Applications", Tata McGraw-Hill Education, 4th Edition, 2022.

Reference Books

1. William Boyes and Michael Melvin, "Textbook of Economics", DTECH, 6th Edition, 2024
2. N. Gregory Mankiw, "Principles of Economics", Thomson learning, 3rd Edition, 2023.
3. Richard Lipsey and Alec Charystal, "Economics", Oxford, University Press, 12th Edition, 2022
4. **Nudge: Improving Decisions About Health, Wealth, and Happiness** by Richard H. Thaler and Cass R. Sunstein,2022
5. **The Undoing Project: A Friendship That Changed Our Minds** by Michael Lewis,2022

Web References

1. https://www.behavioraleconomics.com/resources/introduction-behavioral-economics/
2. https://wglasser.com/quickstart-guide-to-choice-theory/
3. https://wglasser.com/quickstart-guide-to-choice-theory/
4. https://www.youtube.com/watch?v=kPQcZgjHYtU
5. https://www.investopedia.com/terms/i/intertemporalchoice.asp

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	2	1	3	2	3	1	3	3	2	2	2	3	-	1	2
2	2	1	2	2	2	1	2	1	2	2	3	3	-	1	2
3	1	2	1	2	2	2	3	3	3	3	2	3	-	1	2
4	2	2	3	3	3	2	3	3	1	1	2	2	-	1	2
5	1	2	3	3	3	3	2	3	2	2	2	2	-	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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Department	**Computer Science and Business System**			Programme: **B.Tech.**				
Semester	VIII			Course Category: PE		*End Semester Exam Type: **TE**		
Course Code	U23CBE822			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Computational Finance & Modeling**			***2***	***0***	***0***	***2***	***25***	***75***	***100***
Prerequisite	**Mathematics, Finance Fundamentals**									
Course Outcome	**On completion of the course, the students will be able to**									BT Mapping (Highest Level)
	CO1	Understand existing financial models in a quantitative and mathematical way.								**(K2)**
	CO2	Apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering.								**(K4)**
	CO3	Explain the approaches required to calculate the price of options.								**(K3)**
	CO4	Identify the methods required to analyse information from financial data and trading systems.								**(K2)**
	CO5	Understand the various statistical methods to analyse the financial data.								**(K2).**

UNIT-I	**Introduction**	**(6Hrs)**	
Numerical methods relevant to integration, differentiation and solving the partial differential equations of mathematical finance: examples of exact solutions including Black Scholes and its relatives, finite difference methods including algorithms and question of stability and convergence, treatment of near and far boundary conditions, the connection with binomial models, interest rate models, early exercise, and the corresponding free boundary problems, and a brief introduction to numerical methods for solving multi-factor models.			**CO1**
UNIT-II	**Black-Scholes framework: Black-Scholes PDE**	**(6Hrs)**	
simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. The Greeks: theta, delta, gamma, vega & rho and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local vol and volatility surfaces.			**CO2**
UNIT-III	**Financial Products and Markets**	**(6Hrs)**	
Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging.			**CO3**
UNIT- IV		**(6Hrs)**	
Application areas include the pricing of American options, pricing interest rate dependent claims, and credit risk. The use of importance sampling for Monte Carlo simulation of VaR for portfolios of options.			**CO4**
UNIT- V	**Statistical Analysis of Financial Returns**	**(6Hrs)**	
Fat-tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data. Copulas, Hedging in incomplete markets, American Options, Exotic options, Electronic trading, Jump Diffusion Processes, High-dimensional covariance matrices, Extreme value theory, Statistical Arbitrage.			**CO5**

Text Books

1. R. Seydel, "Tools for Computational Finance", 2nd edition, Springer-Verlag, New York, 2024
2. P.Glasserman, "Monte Carlo Methods in Financial Engineering", Springer-Verlag, New York, 2024
3. A.Lewis, " Option Valuation under Stochastic Volatility", Finance Press, Newport Beach,

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California, 2023
4. A.Pelsser, "Efficient Methods for Valuing Interest Rate Derivatives", Springer-Verlag, New York, 2023
5. W.Press, S. Teukolsky, W. Vetterling and B. Flannery, "Numerical Recipes in C: The Art of Scientific Computing", Cambridge University Press, Cambridge, UK. Available on-line at: http://www.nr.com/, 2023

Reference Books

1. D. Ruppert and David S. Matteson, "Statistics and Data Analysis for Financial Engineering",2024
2. R. Carmona, "Statistical Analysis of Financial Data in S-Plus", 2024
3. N. H. Chan, "Time Series: Applications to Finance", 2023
4. R. S. Tsay, "Analysis of Financial Time Series", 2022.
5. J. Franke, W. K. Härdle and C. M. Hafner, "Statistics of Financial Markets: An Introduction", 2021

Web References

1. http://www.nr.com/
2. https://en.wikipedia.org/wiki/Computational_finance
3. https://www.investopedia.com/terms/f/financial-market.asp
4. https://www.investopedia.com/terms/b/blackscholes.asp

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	1	2	3	2	-	2	2	-	-	-	-	-	-	-
2	3	3	3	3	2	1	2	3	-	-	-	-	-	-	-
3	2	3	2	3	2	2	1	3	-	-	-	-	-	-	-
4	3	2	2	3	1	2	2	3	-	-	-	-	-	-	-
5	1	2	1	2	3	3	2	3	-	-	-	-	-	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.11.94

Department	**Computer Science and Business System**			Programme: **B.Tech.**				
Semester	**VIII**			Course Category: HS		*End Semester Exam Type: **TE**		
Course Code	**U23CBE823**			Periods / Week		Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	**PSYCHOLOGY**			**2**	**1**	**0**	**3**	**25**	**75**	**100**
Prerequisite	**Nil**									
Course Outcome	**On completion of the course, the students will be able to**								BT Mapping (Highest Level)	
	CO1	Become conversant about the major content areas of Industrial Psychology (i.e., job analysis, recruitment, selection, employment law, training, performance management, and health/well-being issues in the workplace).							**K2**	
	CO2	Gain further comfort with statistical concepts in the context of making personnel decisions to Reinforce content learned in PSY203 or an equivalent introductory statistics course.							**K3**	
	CO3	Gain practical experience by completing a series of hands-on projects involving job analysis, selection decisions, training programs and employee well-being.							**K3**	
	CO4	Deepen your understanding of tests and measurements so that you can collect accurate information and make sound data-based decisions.							**K3**	
	CO5	Prepare for other focused seminar courses in Industrial/Organizational Psychology or Human Resource Management.							**K3**	
UNIT-I							**(9Hrs)**			
What is I/O Psychology? Research Methods, Statistics, and Evidence-based Practice, Introduction & Legal Context of Industrial Psychology, Job Analysis & Competency Modeling, Job Evaluation & Compensation, Job Design & Employee Well-Being, Recruitment										**CO1**
UNIT-II							**(9Hrs)**			
Identifying Criteria & Validating Tests and Measures, Screening Methods, Intensive Methods										**CO2**
UNIT-III							**(9Hrs)**			
Performance Goals and Feedback, Performance Coaching and Evaluation, Evaluating Employee Performance										**CO3**
UNIT- IV							**(9Hrs)**			
Employee Motivation, Satisfaction and Commitment, Fairness and Diversity										**CO4**
UNIT- V							**(9Hrs)**			
Leadership, Organizational Climate, Culture, and Development, Teams in Organizations, The Organization of Work Behavior, Stress Management: Demands of Life and Work										**CO5**

Text Books

1. Stephen Robbins, Tim Judge, Neharika Vohra, "Organizational Behaviour", Pearson, 18th Edition, 2024
2. TV.Rao, "Performance Management towards Organizational Excellence", Sage, 2nd Edition, 2024
3. Pratibha Goyal , Alok Chakrawal , "Stress Management", Studera Press, 1st Edition, 2023
4. Landy, F. J. and Conte, J. M. " Work in the 21st Century" (4th Edition). Oxford: Blackwell Publishing, 2022
5. Imes, D., Kantowitz, B., & Roediger, H, "Research methods in psychology", Cengage Learning, 9th Edition, 2022

Reference Books

1. Breakwell, G.M., Smith, J.A., &Wright, D.B, "Research methods in psychology", Sage, 4th Edition, 2024.
2. Charles Stangor and Jennifer Walinga, "Introduction to Psychology" 1st Canadian Edition, 2023
3. Dr. Dan Ariely , "Predictably Irrational, Revised and Expanded Edition: The Hidden Forces That Shape Our

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Decisions", kindle Edition, 2022
4. Daniel Goleman, "Emotional Intelligence: Why It Can Matter More Than IQ ", kindle edition,2022.

Web References

1. https://en.wikipedia.org/wiki/Industrial_and_organizational_psychology
2. https://ip2012.blogspot.com/2012/02/job-analysis.html
3. https://opentextbc.ca/researchmethods/chapter/practical-strategies-for-psychological-measurement/
4. https://www.inc.com/encyclopedia/employee-motivation.html
5. https://positivepsychology.com/psychology-teamwork/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	-	1	-	-	-	-	1	3	2	-	-	-	-	1	-
2	1	2	-	-	-	-	2	3	2	-	-	-	1	2	-
3	-	3	-	-	-	-	2	3	2	-	-	-	-	3	-
4	1	2	-	-	-	-	1	2	2	-	-	-	1	1	-
5	-	1	-	-	-	-	1	1	1	-	-	-	-	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

2.A.11.96

Department	**Computer Science and Business System**			Programme: **B.Tech.**				
Semester	**VIII**			Course Category: HS		*End Semester Exam Type: **TE**		
Course Code	**U23CBE824**			Periods / Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	**Marketing Research & Marketing Management**			**2**	**0**	**1**	**3**	**25**	**75**	**100**
Prerequisite	**Basic Economics and Consumer Behavior, Statistics and Data Analysis**									
Course Outcome	**On completion of the course, the students will be able to**									BT Mapping (Highest Level)
	CO1	Understand basic marketing concepts								**K2**
	CO2	Comprehend the dynamics of marketing and analyse how its various components interact with each other in the real world								**K3**
	CO3	Leverage marketing concepts for effective decision making								**K2**
	CO4	Understand basic concepts and application of statistical tools in Marketing research								**K2**
	CO5	Understand internet marketing, Business to Business marketing, Promotion in business markets, CRM and Strategies adopted in B2B markets.								**K3**

UNIT-I	**Marketing Concepts**	**(9Hrs)**
Marketing Concepts and Applications: Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector. **Marketing Planning & Environment:** Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social. **Understanding the consumer:** Determinants of consumer behavior, Factors influencing consumer behaviour. **Market Segmentation:** Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning.		**CO1**
UNIT-II	**Product Management**	**(9Hrs)**
Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging		**CO2**
UNIT-III	**Pricing, Promotion and Distribution Strategy**	**(9Hrs)**
Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5 M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising		**CO3**
UNIT- IV	**Marketing Research**	**(9Hrs)**
Introduction, Type of Market Research, Scope, Objectives & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research **Data Analysis**: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis		**CO4**
UNIT- V	**Internet Marketing**	**(9Hrs)**
Introduction to Internet Marketing. Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing. **Business to Business Marketing:** Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationship, networks and customer relationship management. Business to Business marketing strategy.		**CO5**

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Marketing of software products, ITIL functions and processes.

Text Books

1. **"Essentials of Modern Marketing"** – Philip Kotler & Tuhin Mukherjee (2024)
2. **"Marketing Management"** – Dr. K. Karunakaran (4th Edition, 2024)
3. **"Marketing Management"** – Philip Kotler, Kevin Lane Keller, Alexander Chernev, Jagdish N. Sheth, and G. Shainesh (16th Edition, 2024)
4. **"Principles of Marketing"** – Prof. (Dr) Kavita Sharma & Dr. Swati Aggarwal (3rd Edition, 2024)
5. **"A Textbook of Marketing and Sales (Skill Education - Code 412)"** – Dr. Pawan Kumar Thakur, Anjana Virmani, & Shalini Harisukh (2024)

Reference Books

1. **"Marketing Research: An Applied Orientation"** – Naresh K. Malhotra (7th Edition, 2024)
2. **"Consumer Behavior"** – Leon G. Schiffman, Joseph Wisenblit, & S. Ramesh Kumar (12th Edition, 2024)
3. **"Marketing Metrics: The Manager's Guide to Measuring Marketing Performance"** – Paul Farris, Neil Bendle, Phillip Pfeifer, & David Reibstein (4th Edition, 2024)
4. **"Digital Marketing: Strategy, Implementation, and Practice"** – Dave Chaffey & Fiona Ellis-Chadwick (8th Edition, 2024)
5. **"Marketing Analytics: Data-Driven Techniques with Microsoft Excel"** – Wayne L. Winston (2024)

Web References

1. https://www.questionpro.com/blog/what-is-market-research/
2. https://www.productplan.com/learn/what-is-product-management/
3. https://www.sheerid.com/business/resources/promotional_pricing/
4. https://en.wikipedia.org/wiki/Marketing_research
5. https://blog.hubspot.com/marketing/internet-marketing

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	2	1	1	-	-	2	1	-	1	-	2	2	2	2	2
2	2	1	1	-	-	2	1	-	1	-	2	2	2	2	2
3	2	1	-	-	-	2	1	-	1	-	2	2	1	1	1
4	2	1	-	-	-	2	1	-	1	-	2	2	1	1	1
5	2	1	-	-	-	2	1	-	1	-	2	2	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

9.A.11.98

Department	Computer Science and Business System	Programme: B.Tech.						
Semester	VIII	Course Category: HS			*End Semester Exam Type: TE			
Course Code	U23CBE825	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	SMART SYSTEMS	2	0	1	3	25	75	100
Prerequisite	Artificial Intelligence (AI) and Machine Learning (ML)							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Show an understanding of Smart Systems, their implementation and applications	K2
CO2	Interpret and explain the impact of Smart Systems, ethical, legal, social, environmental implications.	K3
CO3	Explain concepts used in Smart Systems and associated architectures.	K2
CO4	Explain the major Smart Systems application areas and techniques used within them	K2
CO5	Discuss examples of Smart Systems used in real life situations	K3

UNIT-I	Deep Learning	(9Hrs)	
Basics of Neural Networks-Basic Concept of Neurons – Perceptron Algorithm – Feed Forward and Backpropagation Networks- CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning – Recurrent and Recursive Nets – Recurrent Neural Networks – Deep Recurrent Networks – Recursive Neural Networks – Applications.			CO1
UNIT-II	**IOT 8-bit embedded processor**	**(9Hrs)**	
8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.			CO2
UNIT-III	**IOT and Arduino Programming**	**(9Hrs)**	
ARM Processor – Introduction to the Concept of IOT Devices – IOT Devices Versus Computers – IOT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Pins -Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino			CO3
UNIT- IV	**Introduction of Cryptography and Block chain**	**(9Hrs)**	
Blockchain Technology Overview: Origin, Objectives, and Architecture, Key Blockchain Components: Transactions, Blocks, P2P Systems, Identity Keys Cryptographic Techniques: Hashing, Digital Signatures, Public vs. Private Keys,Neural Networks in Blockchain Security,Smart Controllers for Secure Transactions and Automation, Integration of Smart Contracts in IoT with Blockchain.Case Study: Securing Agricultural Sensor Data using Blockchain.			CO4
UNIT- V	**Solidity Programming**	**(9Hrs)**	
Solidity – Language of Smart Contracts, Installing Solidity & Ethereum Wallet, Basics of Solidity, Layout of a Solidity Source File & Structure of Smart Contracts, General Value Types (Int, Real, String, Bytes, Arrays, Mapping, Enum, address).**Case Studies**: Supply Chain Traceability using Smart Contracts, Healthcare Data Integrity ,Energy Trading with Smart Contracts			CO5

Text Books

1. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2024
2. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2024
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies", 2023
4. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, Second Edition, 2022

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5. Adrian McEwen, Hakim Cassimally "Designing the Internet of Things", John Wiley and Sons, 2022

Reference Books

1. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2024
2. Andreas M. Antonopoulos,"Mastering Bitcoin", 2024
3. Michael J. Pont, "Embedded C", Pearson Education, 2023
4. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2022

Web References

1. https://nptel.ac.in/courses/106/104/106104220/#
2. https://onlinecourses.nptel.ac.in/noc22_cs53/preview
3. https://nptel.ac.in/courses/200/204/306104564/#

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	1	1	2	2	2	1	1	1	1	2	1	2	2	2	2
2	1	1	2	2	2	1	1	1	1	2	1	2	2	2	2
3	1	1	2	2	2	1	1	1	1	2	1	2	2	2	2
4	1	1	2	2	2	1	1	1	1	2	2	2	2	2	2
5	1	1	2	2	2	1	1	1	1	2	2	2	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

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PROFESSIONAL ELECTIVE – VI

Department	Computer Science and Business System	Programme: B.Tech.						
Semester	VIII	Course Category: HS			*End Semester Exam Type: TE			
Course Code	U23CBE826	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	ENTERPRISE SYSTEMS	2	0	0	2	25	75	100
Prerequisite	**Enterprise Systems** are large-scale software solutions (e.g., ERP, CRM, SCM) that integrate and manage core business processes across an organization.							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Introduction to Modern Enterprise Systems	**(K2)**
	CO2 Enterprise Systems Architecture, Key Characteristics, Applications	**(K3)**
	CO3 Architecture Patterns, Integration Techniques	**(K2)**
	CO4 Cloud Computing in Enterprise Systems	**(K3)**
	CO5 Cloud Application Development and Deployment	**(K2)**

UNIT-I	**Introduction**	(9Hrs)

Introduction to Modern Enterprise Systems: Introduction to enterprise systems. Elements of enterprise systems – Business Information system, Decision support systems, Knowledge management systems, Financial and human resource systems. Kinds of Enterprise systems- B2C and B2B models. **Components of Enterprise systems:** Channels (Mobile, web, desktop, partner integration), Data management, workflow, Controlling and Auditing, Accounting etc. **Sample Enterprise systems:** ERP, SCM, CRM, Product Life cycle management (PLM), HR Systems (HRM), GL systems. **CO1**

UNIT-II	**Enterprise Systems Architecture, Key Characteristics, Applications**	(9Hrs)

Key characteristics Enterprise systems: Distributivity, Managed redundancy, Exception processing, Collaboration, Data transformation. **Enterprise System architectures:** Batch processing, Monolithic, client server, ecommerce, service oriented, micro service, and cloud architectures. **Introduction to Enterprise Application architectures:** Layer Architecture, Event driven Architecture, Service oriented Architecture, Micro service architecture, Plug-in architecture **CO2**

UNIT-III	**Architecture Patterns, Integration Techniques**	(9Hrs)

Application architecture Patterns: Layering, Organizing domain logic, Mapping to database, Web Presentation, Concurrency. **Enterprise Application Integration:** Introduction to Enterprise Integration, different integration styles. Elements of messaging-based Integration. **Enterprise Integration patterns:** Modern service integration techniques. Introduction to WSDL, SOAP. Introduction RESTful web services integration. Differences between SOAP and REST. **CO3**

UNIT- IV	**Cloud Computing in Enterprise Systems**	(9Hrs)

Deployment of Enterprise applications: Key requirements in deployment - Stability, capacity, Security, availability, Network, Availability, and Transparency (Basic Introduction only). Concepts of Cloud computing, cloud platforms and their role in Enterprise systems: Core Concepts – Types of Cloud: Private, public, and Hybrid clouds. Advantage of cloud computing – Scaling, Availability, and cost. Disadvantages – Technology overload, Security, Monitoring and troubleshooting, Testing, Latency etc. Cloud service models: - Infrastructure, platform, Software as a Service in Cloud Computing. Major public clouds: Google cloud, AWS, Azure. **CO4**

UNIT- V	**Cloud Application Development and Deployment**	(9Hrs)

Application development and deployment in cloud – Dockers, micro services, Kubernetes, Serverless. Continuous Integration/Continuous Delivery Introduction to Enterprise Architecture: Importance of Enterprise Architecture. Enterprise architecture models. Zachman Framework, TOGAF Framework. **Enterprise Architecture Case study**: Implementing EA in secret service systems, Health care organization, Manufacturing Company, case study of University, case study of midsized municipal government. **CO5**

2. A. 11. 103

Text Books

1. Martin Fowler et al, "Pattern of Enterprise Application Architecture", Addison-Wesley, 2024
2. Gregor Hohpe, Bobby Woolf, Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions,
3. Mark Richards, "Software Architecture patterns", 2023, O'Reilly.
4. Sam Newman, "Building Microservices", O'Reilly.0, 2019.
5. Enterprise Systems for Management" – Luvai Motiwalla & Jeff Thompson

Reference Books

1. Ravi Shankar & S. Jaiswal, Galgotia, "Enterprise Resource Planning", 1st Edition, 2023.
2. Alexis Leon, "Enterprise Resource Planning", Tata McGraw Hill, 3rd Edition, 2022.
3. ERP: Making It Happen – The Implementers' Guide to Success with Enterprise Resource Planning" – Thomas F. Wallace & Michael H. Kremzar
4. Enterprise Integration and Information Architecture: A Systems Perspective on Industrial Information Integration" – Li Da Xu
5. Enterprise Architecture as Strategy: Creating a Foundation for Business Execution" – Jeanne W. Ross, Peter Weill & David Robertson

Web References

1. https://www.classcentral.com/course/enterprise-systems-12165
2. https://nptel.ac.in/courses/124/107/124107008/
3. https://www.tutorialspoint.com/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	2	3	1	3	3	2	2	2	3	-	1	2
2	2	1	2	2	2	1	2	1	2	2	3	3	-	1	2
3	1	2	1	2	2	2	3	3	3	3	2	3	-	1	2
4	2	2	3	3	3	2	3	3	1	1	2	2	-	1	2
5	1	2	3	3	3	3	2	3	2	2	2	2	-	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

9.A.11.104

Department	**Computer Science and Business System**	Programme: **B.Tech.**						
Semester	**VIII**	Course Category: HS			*End Semester Exam Type: **TE**			
Course Code	**U23CBE827**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Services Science & Service Operational Management**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Prerequisite	It is an interdisciplinary field that studies the design, delivery, and improvement of services by combining technology, business, and human factors.							

Course Outcome		**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1	Introduction to Services	**(K2)**
	CO2	Service Design	**(K2)**
	CO3	Service Guarantee & Service Recovery	**(K3)**
	CO4	Forecasting, Managing capacity and Facilities	**(K2)**
	CO5	Service Innovation and Case studies	**(K2)**

UNIT-I	**Introduction to Services**	**(9Hrs)**	
Introduction: Introduction to the course, Introduction to service operations, Role of service in economy and society, Introduction to Indian service sector. **Nature of Services and Service Encounters:** Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters **Service-Dominant Logic:** From Goods-Dominant logic to Service-Dominant logic, Value Co-creation			**CO1**

UNIT-II	**Service Design**	**(9Hrs)**	
Key characteristics Enterprise systems: Distributivity, Managed redundancy, Exception processing, Collaboration, Data transformation. **Enterprise System architectures:** Batch processing, Monolithic, client server, ecommerce, service oriented, micro service, and cloud architectures. **Introduction to Enterprise Application architectures:** Layer Architecture, Event driven Architecture, Service oriented Architecture, Micro service architecture, Plug-in architecture			**CO2**

UNIT-III	**Service Guarantee & Service Recovery**	**(9Hrs)**	
Service Strategy and Competitiveness: Development of Strategic Service Vision (SSV), Data Envelopment Analysis. **New Service Development**: NSD cycle, Service Blueprinting, Elements of service delivery system. **Service Design:** Customer Journey and Service Design, Design Thinking methods to aid Service Design. **Locating facilities and designing their layout:** models of facility locations (Huff's retail model), Role of service-scape in layout design. **Service Quality:** SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools			**CO3**

UNIT- IV	**Forecasting, Managing capacity and Facilities**	**(9Hrs)**	
Forecasting Demand for Services: A review of different types of forecasting methods for demand forecasting. **Managing Capacity and Demand**: Strategies for matching capacity and demand,Psychology of waiting, Application of various tools used in managing waiting line in services. **Managing Facilitating Goods**: Review of inventory models, Role of inventory in services. **Managing service supply relationship:** Understanding the supply chain/hub of service, Strategies for managing suppliers of service. **Vehicle Routing Problem:** Managing after sales service, understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes			**CO4**

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UNIT- V	Service Innovation and Case studies	(9Hrs)

Service Innovation: Services Productivity, Need for Services Innovation.

Student Project:

Choose any two different service organization and present the report from the perspective of: nature of service, classification of service, blueprint or service design analysis, service quality, and any additional perspective you would like to add. **CO5**

Text Books

1. Fitzsimmons & Fitzsimmons, "Service Management: Operations, Strategy, Information Technology", McGraw Hill publications (7th Edition),2024
2. Service Science" – Mark S. Daskin,2024
3. Chesbrough, H, "Open services innovation: Rethinking your business to grow and compete in a new era", John Wiley & Sons, 2023
4. "Service Management: Operations, Strategy, Information Technology" – James A. Fitzsimmons & Mona J. Fitzsimmons,2022
5. "Managing Services: Competence, Strategy, and Value Innovation" – Kathryn J. Hayes & Robert Johnston,2022

Reference Books

1. Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D," Services marketing: Integrating customer focus across the firm", McGraw Hill, 2024
2. Lovelock, C, "Services Marketing", 7/e. Pearson Education India, 2023.
3. Reason, Ben, and Lovlie, Lavrans, "Service Design for Business: A Practical Guide to Optimizing the Customer Experience", Pan Macmillan India, 2023
4. Chesbrough, H, "Open services innovation: Rethinking your business to grow and compete in a new era", John Wiley & Sons, 2022
5. Robert Johnson, Graham clark, "Service Operations Management", Pearson Education, 2nd Edition, 2021

Web References

1. https://en.wikipedia.org/wiki/Operations_management_for_services
2. https://archive.nptel.ac.in/courses/110/106/110106046/
3. https://en.wikipedia.org/wiki/Service_innovation
4. https://careerfoundry.com/en/blog/ux-design/what-is-service-design-how-to-implement-service-design-processes/
5. https://www.youtube.com/watch?v=DYkwTBrpBtE

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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1	-	1	1	1	1	1	1	-	1	1	3	2	-	1	2
2	1	1	1	1	3	1	1	1	1	1	2	2	-	1	2
3	2	1	1	1	1	1	2	1	1	1	2	2	-	1	2
4	1	1	1	2	1	1	1	2	1	1	2	1	-	1	2
5	1	1	2	1	2	2	1	1	1	1	2	2	-	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester	Total Marks
	CAT	CAT	Model	Assignment*	Attendance		

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