



**SRI MANAKULA VINAYAGAR**  
ENGINEERING COLLEGE  
(AN AUTONOMOUS INSTITUTION)



**Department of Computer Science and Engineering and Business Systems**

**MINUTES OF EIGHTH BOS MEETING**

**Venue**

**Virtual Meeting**

Board Room II, Administrative Floor  
Sri Manakula Vinayagar Engineering College  
Madagadipet, Puducherry – 605 107

***Date & Time***

***28.09.24 & 10.30 A.M. to 12.30 P.M***





**Department of Computer Science and Engineering and Business Systems**

**Minutes of Board of Studies**

The Board of Studies Eighth meeting of Department of Computer Science and Engineering and Business Systems (CSEBS) was held on 28<sup>th</sup> Sep 2024 at 10:30 A.M in the Board Room II, Administrative Wing, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BOS meeting

Sl.No	Name of the Member with Designation and official Address	Members as Per UGC Norms
1	<b>Dr. N.Danapaquiame, B.E., M.E., Ph.D.,</b> Professor and Head, Department of CSBS, SMVEC Puducherry	-Chair Person
2	<b>Dr. S. R. Balasundaram, M.C.A., M.E., Ph.D.,</b> Professor and Head Department of Computer Applications, National Institute of Technology, Trichy Specialization: E-Learning, Assessment Technologies	Subject Expert (University Nominee)
3	<b>Dr. E. Ilavarasan, M.Tech., Ph.D.,</b> Professor/ Dept of CSE, Puducherry Technological University, Pillaichavady, Puducherry.	Subject Expert (Academic Council Nominee)
4	<b>Dr. S. Ganesh Kumar, M. Tech., Ph.D.,</b> 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)
5	<b>Dr. B. Jaison, M.E, Ph.D.,</b> Professor/ Computer Science and Engineering RMK Engineering College, RSMNagar, Gummidipoondi, Kavaraipettai, Tamilnadu-601206 Specialization: Image Processing, Data Mining.	Subject Expert (Academic Council Nominee)
6	<b>Mr.Asoke Das Sarma, B.E., M.B.A.,</b> Cognitive Business Operations , Tata Consultancy Services, Mumbai	Industry Expert (Nominated by the Principal)

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7	<b>Mr. Pasupathi Loganathan, B.Tech.,</b> Functional and Automation Tester, Accenture, Chennai.	Postgraduate Alumnus (nominated by the Principal)
8	<b>Dr. N.S.N. Cailassame, M.B.A., Ph.D.,</b> Dean Placement, Professor and Head, Department of Management Studies, SMVEC.	Internal Member
9	<b>Dr. G. Bala Sendhil Kumar, M.B.A., Ph.D.,</b> Professor, Department of Management Studies, SMVEC.	Internal Member
10	<b>Mr.T. Karthikeyan, M.E., (Ph.D)</b> Asst. Professor, Department of Computer Science and Engineering and Business Systems Sri Manakula Vinayagar Engineering College	Internal Member
11	<b>Mrs.K. Devika, M.E.,</b> Assistant Professor, Department of Computer Science and Engineering and Business Systems, SMVEC.	Internal Member
12	<b>Mrs. V. Sivasankari, M.Tech.,</b> Asst. Professor, Department of Computer Science and Engineering and Business Systems Sri Manakula Vinayagar Engineering College	Internal Member
13	<b>Mrs. M. Viji, M.E.,</b> Asst. Professor, Department of Computer Science and Engineering and Business Systems Sri Manakula Vinayagar Engineering College	Internal Member
14	<b>Ms. C. Jenitha Mary, M.E.,</b> Asst. Professor, Department of Computer Science and Engineering and Business Systems Sri Manakula Vinayagar Engineering College	Internal Member
15	<b>Mrs. E.Thamizharasi, M.Tech.,</b> Asst. Professor, Department of Computer Science and Engineering and Business Systems Sri Manakula Vinayagar Engineering College	Internal Member
16	<b>Mrs.N.Sakthipriya, M.Tech.,</b> Asst. Professor, Department of Computer Science and Engineering and Business Systems Sri Manakula Vinayagar Engineering College	Internal Member
17	<b>Dr. T. Gayathri., M.Sc., M.Phil., Ph.D</b> Professor and Head, Dept of Mathematics, Sri Manakula Vinayagar Engineering College	Internal Member

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18	<b>Dr. D. Jaichithra., M.A., M.Phil., Ph.D</b> Professor and Head, Dept. of English, Sri Manakula Vinayagar Engineering College	Internal Member
19	<b>Dr. T. Jayavarthan., M.Sc., M.Phil., Ph.D</b> Professor, Dept. of Physics, Sri Manakula Vinayagar Engineering College	Internal Member

### Agenda of the Meeting

<b>Agenda 1/BoS/8/2024/CSEBS/UG</b>	
	Welcome Address by Chair Person, Board of Studies (BoS).
<b>Agenda 2/BoS/8/2024/CSEBS/UG</b>	
	To confirm the minutes of the seventh Board of Studies Meeting held on 05.03.2024.
<b>Agenda 3/BoS/8/2024/CSEBS/UG</b>	
	To discuss and approve the B.Tech. Degree R-2023, Curriculum and syllabi of Fifth and Sixth Semester for the B. Tech Computer Science and Engineering and Business Systems students admitted from the academic year 2023-24.
<b>Agenda 4/BoS/8/2024/CSEBS/UG</b>	
	To consider and approve the professional elective / open elective / skill enhancement course / mandatory of the Fifth and Sixth Semester for R2023.
<b>Agenda 5/BoS/8/2024/CSEBS/UG</b>	
	To approve the Honours and Minor degree courses for B. Tech. students admitted from the academic year 2023-24
<b>Agenda 6/BoS/8/2024/CSEBS/UG</b>	
	To consider and approve the equivalence for the B.Tech. – Computer science and Engineering and business systems programme to facilitate the students for higher studies
<b>Agenda 7/BoS/8/2024/CSEBS/UG</b>	
	To discuss and approve the academic calendar for the odd semester 2024
<b>Agenda 8/BoS/8/2024/CSEBS/UG</b>	
	To discuss the department activities for the odd semester July 2024 of Nov 2024.
<b>Agenda 9/BoS/8/2024/CSEBS/UG</b>	
	To apprise the result analysis of End Semester Examination May / June 2024.
<b>Agenda 10/BoS/8/2024/CSEBS/UG</b>	
	Any other item with the permission of chair

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## Minutes of the 8th BoS Meeting

**Date:** 28<sup>th</sup> September 2024

**Time:** 10:30 AM - 12:30 PM

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

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

### **Agenda 1/BoS/8/2024/CSEBS/UG**

Welcome Address by Chair Person BoS

Feedback:

"The Chair Person's opening remarks were well received, as she highlighted the department's commitment to academic excellence and introduced the esteemed external and internal members of the Board of Studies."

### **Agenda 2/BoS/8/2024/CSEBS/UG**

To confirm the minutes of the seventh Board of Studies Meeting held on 05.03.2024.

Feedback:

"Members unanimously confirmed the minutes of the previous meeting with no revisions or amendments, acknowledging the incorporation of suggestions like updating course titles and improving references."

### **Agenda 3/BoS/8/2024/CSEBS/UG**

To discuss and approve the B.Tech. Degree R-2023 Curriculum and syllabi of Fifth and Sixth Semesters for the B. Tech Computer Science and Engineering and Business Systems students admitted from the academic year 2023-24.

The Curriculum of R-2023 was apprised in the meeting. (Annexure I)

The Fifth and Sixth-semester syllabi of R-2023 were approved in the meeting. (Annexure I)

### **Agenda 4/BoS/8/2024/CSEBS/UG**

To consider and approve the professional elective/open elective/skill enhancement course/mandatory courses for the Fifth and Sixth Semester for R2023.

Professional Elective / Open Elective / Ability Enhancement Courses / under R-2023 for the students admitted from the academic Year 2023-24 were apprised. (Annexure I)

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Semester	Course Name	Feedback by Expert Member
V	Professional Elective II - Business Intelligence and Application Course Code:U23CBE506	Unit III: Replace Classification and Clustering with advanced concepts. Avoid repetition with the Machine Learning course. Modification Incorporated.
V	Professional Elective II - Modern Web Application Course Code:U23CBE508	Course name can be changed to "Web Application.". Unit II should focus on architecture (e.g., MongoDB). Modification Incorporated.
V	Professional Elective II - Data Mining and Analytics Course Code:U23CBE509	Remove content beyond syllabus. Include linear and non-linear models in Unit III and Unit IV. Avoid repetition of decision trees. Modification Incorporated
VI	Advanced NLP Course Code: U23ADTC02	Rename to "Natural Language Processing (NLP)." Modification Incorporated – "U23ADTC02 :NLP and Chatbot" Course is floated from AIDS Department
VI	Information Security Course Code:U23CBT612	Include more recent textbooks (latest editions). Modification Incorporated.
VI	Computer Network Architecture and Protocols Course Code:U23CBE611	Remove Optical Networking concepts. Add 2-3 additional textbooks for references. Modification Incorporated.

#### **Agenda 5/BoS/8/2024/CSEBS/UG**

To approve the Honours and Minor degree courses for B. Tech. students admitted from the academic year 2023-24.

The Honours/Minors degree was apprised (Annexure I)

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Feedback:

- "The Board approved the Honours/Minors and Minor degree options with enthusiasm. The proposal to include NPTEL courses for credits was highly appreciated for promoting flexible learning pathways. Honours/Minors and Minors Degree Programs: Verified and approved by the board of members since it was also approved by other board members "

#### **Agenda 6/BoS/8/2024/CSEBS/UG**

To consider and approve the equivalence for the B.Tech. – Computer Science and Engineering and Business Systems programme to facilitate the students for higher studies.

Feedback:

Equivalence Proof Courses: Core and elective courses Syllabus content of CSE department in Various University should be analysed clearly in depth of each course content , we need some more time to analyse in depth and will be discussed with Board of members in next BoS meeting and ensures to submit relevant reports.

"The equivalency framework was applauded for making the program more adaptable to higher education requirements. The Board encouraged continued efforts to align the program with top institutions to enhance its global standing."

#### **Agenda 7/BoS/8/2024/CSEBS/UG**

To discuss and approve the academic calendar for the odd semester 2024.

Feedback:

"The academic calendar was approved without changes. The Board praised the department's efforts to balance academic and extracurricular activities, ensuring holistic student development."

#### **Agenda 8/BoS/8/2024/CSEBS/UG**

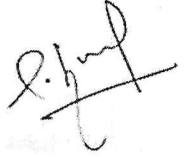
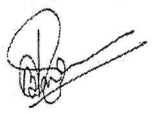
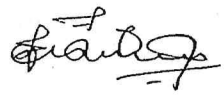






To discuss the department activities for the odd semester July 2024 to November 2024.

Feedback:

Achievements: Both students and faculty achievements are acknowledged and appreciated.

"Members were impressed with the department's initiatives, including student internships and collaborations with industry leaders. The Board encouraged continued focus on enhancing student exposure to real-world projects."

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4	<b>Dr. S. Ganesh Kumar, M. Tech., Ph.D.,</b> 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)	
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8	<b>Dr. G. Bala Sendhil Kumar, M.B.A., Ph.D.,</b> Professor, Department of Management Studies, SMVEC.	Internal Member	
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10	<b>Mrs.K. Devika, M.E.,</b> Assistant Professor, Department of Computer Science and Engineering and Business Systems, SMVEC.	Internal Member	
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12	<b>Mrs. M. Viji, M.E.,</b> Asst. Professor, Department of Computer Science and Engineering and Business Systems Sri Manakula Vinayagar Engineering College	Internal Member	

### **Agenda 9/BoS/8/2024/CSEBS/UG**

To apprise the result analysis of End Semester Examination May / June 2024.

Feedback:

"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 10/BoS/8/2024/CSEBS/UG**

Any other item with the permission of the chair.


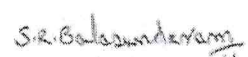

Feedback:

"Several members provided valuable insights during this open forum. Topics like expanding industry-academia partnerships and enhancing student innovation programs were discussed. The chair acknowledged these suggestions for future meetings."



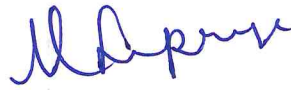
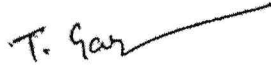


These minutes reflect the detailed course revisions and suggestions provided by the expert members in the board meeting, ensuring that the curriculum remains updated, relevant, and non-repetitive

The meeting was concluded at 12:30 PM with vote of thanks by **Dr. N. Danapaquame**, Chairman, Board of Studies, Department of Computer Science and Engineering and Business Systems.

#### **Members Present:**

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	<b>Dr. N. Danapaquame, B.E., M.E., Ph.D.,</b> Professor and Head, Department of CSBS, SMVEC Puducherry	Chairman	
2	<b>Dr. S. R. Balasundaram, M.C.A., M.E., Ph.D.,</b> Professor and Head Department of Computer Applications, National Institute of Technology, Trichy Specialization: E-Learning, Assessment Technologies	Subject Expert (University Nominee)	
3	<b>Dr. E. Ilavarasan, M.Tech., Ph.D.,</b> Professor/ Dept of CSE, Puducherry Technological University, Pillaichavady, Puducherry.	Subject Expert (Academic Council Nominee)	



13	<b>Ms. C. Jenitha Mary, M.E.,</b> Asst. Professor, Department of Computer Science and Engineering and Business Systems Sri Manakula Vinayagar Engineering College	Internal Member	
14	<b>Mrs. E.Thamizharasi, M.Tech.,</b> Asst. Professor, Department of Computer Science and Engineering and Business Systems Sri Manakula Vinayagar Engineering College.	Internal Member	
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16	<b>Dr. T. Gayathri., M.Sc., M.Phil., Ph.D</b> Professor and Head, Dept of Mathematics, Sri Manakula Vinayagar Engineering College	Internal Member	
17	<b>Dr. D. Jaichithra., M.A., M.Phil., Ph.D</b> Professor and Head, Dept. of English, Sri Manakula Vinayagar Engineering College	Internal Member	
18	<b>Dr. T. Jayavarthan., M.Sc., M.Phil., Ph.D</b> Professor, Dept. of Physics, Sri Manakula Vinayagar Engineering College	Internal Member	

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**SRI MANAKULA VINAYAGAR**

**ENGINEERING COLLEGE**

**(An Autonomous Institution)**

Puducherry

**B.TECH.**

**COMPUTER SCIENCE AND ENGINEERING AND BUSINESS  
SYSTEMS**

**ACADEMIC REGULATIONS 2023**

**(R-2023)**

**CURRICULUM AND SYLLABI**





THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

RECEIVED AT THE UNIVERSITY OF CHICAGO  
PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT



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## 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



## 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.

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## PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

**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

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**B.Tech. Computer Science and Engineering and Business Systems**

**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)	-
	<b>Total</b>	<b>172</b>

**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)*	-	-	-	-	-	-	-	-	-
	<b>Total</b>	<b>22</b>	<b>26</b>	<b>23</b>	<b>24</b>	<b>18</b>	<b>21</b>	<b>20</b>	<b>18</b>	<b>172</b>

\* 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**.

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SEMESTER-I										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
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
<b>Theory Cum Practical</b>										
6	U23ENB101	Business Communication & Value Science - I	HS	2	0	2	3	50	50	100
<b>Practical</b>										
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
<b>Ability Enhancement Course</b>										
10	U23CBC1XX	Certification Course-I **	AEC	0	0	4	-	100	-	100
<b>Mandatory Course</b>										
11	U23CBM101	Induction Programme	MC	2 Weeks			-	-	-	-
							<b>22</b>	<b>425</b>	<b>575</b>	<b>1000</b>

SEMESTER-II										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
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
<b>Theory Cum Practical</b>										
7	U23ENB202	Business Communication & Value Science - II	HS	2	0	2	3	50	50	100
<b>Practical</b>										
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
<b>Ability Enhancement Course</b>										
12	U23CBC2XX	Certification Course - II**	AEC	0	0	4	-	100	-	100
<b>Mandatory Course</b>										
13	U23CBM202	Sports Yoga and NSS	MC	0	0	2	-	100	-	100
							<b>26</b>	<b>600</b>	<b>700</b>	<b>1300</b>

\*\* 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
<b>Theory</b>										
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
<b>Theory Cum Practical</b>										
6	U23CBB301	Formal Languages and Automata Theory	PC	2	0	2	3	50	50	100
<b>Practical</b>										
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
<b>Ability Enhancement Course</b>										
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
<b>Mandatory Course</b>										
13	U23CBM303	Climate Change	MC	2	0	0	-	100	-	100
							<b>23</b>	<b>675</b>	<b>625</b>	<b>1300</b>

SEMESTER-IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
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
<b>Theory Cum Practical</b>										
7	U23ENB403	Business Communication & Value Science – III	HS	2	0	2	2	50	50	100
<b>Practical</b>										
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
<b>Ability Enhancement Course</b>										
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
<b>Mandatory Course</b>										
14	U23CBM404	Right To Information Law and Good Governance	MC	2	0	0	-	100	-	100
							<b>24</b>	<b>700</b>	<b>700</b>	<b>1400</b>

\*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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**SEMESTER-V**

Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
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
<b>Practical</b>										
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
<b>Ability Enhancement Course</b>										
11	U23CBC5XX	Certification Course-V**	AEC	0	0	4	-	100	-	100
<b>Mandatory Course</b>										
12	U23CBM505	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							<b>18</b>	<b>650</b>	<b>550</b>	<b>1200</b>

**SEMESTER-VI**

Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
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
<b>Theory Cum Practical</b>										
7	U23CBB602	Data Visualization and Analytical Techniques	PC	2	0	2	3	50	50	100
<b>Practical</b>										
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
<b>Ability Enhancement Course</b>										
11	U23CBC6XX	Certification Course - VI**	AEC	0	0	4	-	100	-	100
<b>Mandatory Course</b>										
12	U23CBM606	Gender Equality	MC	2	0	0	-	100	-	100
							<b>21</b>	<b>550</b>	<b>650</b>	<b>1200</b>

*\*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
<b>Theory</b>										
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	Foundation and Full Stack Web Development	PC	2	0	0	2	25	75	100
5	U23CBE7XX	Professional Elective IV#	PE	2	0	0	2	25	75	100
6	U23CBOCX	Open Elective III\$	OE	3	0	0	3	25	75	100
<b>Practical</b>										
7	U23CBP711	Artificial Intelligence and Applications Laboratory	PC	0	0	2	1	50	50	100
8	U23CBP712	Foundation and Full Stack Web Development Laboratory	PC	0	0	2	1	50	50	100
9	U23CBEP7X	Professional Elective IV# Laboratory	PE	0	0	2	1	50	50	100
<b>Project Work</b>										
10	U23CBW703	Project Phase I	PA	0	0	4	2	50	50	100
11	U23CBW704	Internship/ Industrial	PA	0	0	2	1	100	-	100
							<b>20</b>	<b>450</b>	<b>650</b>	<b>1100</b>

SEMESTER-VIII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
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
<b>Practical</b>										
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
<b>Project Work</b>										
6	U23CBW805	Project Phase II	PA	0	0	16	8	50	100	150
							<b>18</b>	<b>225</b>	<b>485</b>	<b>650</b>

*\*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)**

<b>Professional Elective – I (Offered in Semester IV)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
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
<b>Professional Elective – II (Offered in Semester V)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
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
<b>Professional Elective – III (Offered in Semester VI)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
1	U23CBE611	Human Resource Management
2	U23CBE612	TQM Tools, Techniques and Standards
3	U23CBE613	Digital Marketing
4	U23CBE614	Cognitive Science & Analytics
5	U23CBE615	Cryptology
<b>Professional Elective – IV (Offered in Semester VII)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
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
<b>Professional Elective – V (Offered in Semester VIII)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
1	U23CBE821	Behavioral Economics
2	U23CBE822	Computational Finance & Modeling
3	U23CBE823	Psychology
4	U23CBE824	Marketing Research & Marketing Management
5	U23CBE825	Smart Systems
<b>Professional Elective – VI (Offered in Semester VIII)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
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

**PROFESSIONAL ELECTIVE PRACTICAL COURSES (3 CREDITS)**

<b>Professional Elective – II (Offered in Semester V)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
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
<b>Professional Elective – IV (Offered in Semester VII)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
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
<b>Professional Elective –VI (Offered in Semester VIII)</b>		
<b>Sl. No.</b>	<b>Course Code</b>	<b>Course Title</b>
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

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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 Equity	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

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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
<b>Open Elective – I / II (Offered in Semester V/VI)</b>				
1	U23CBOC01	Business Applications of Game Theory	CSEBS	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME, CCE
2	U23CBOC02	Cryptology and Analysis	CSEBS	EEE, MECH, CIVIL, ICE, Mechatronics, BME
<b>Open Elective – III (Offered in Semester VII)</b>				
1	U23CBOC03	Engineering Economics	CSEBS	EEE, ECE, CSE, IT, MECH, CIVIL, ICE, Mechatronics, BME, AIDS, CCE, FT
2	U23CBOC04	Conversational AI	CSEBS	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME

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# ANNEXURE I

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# SEMESTER V

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Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: HS			*End Semester Exam Type: TE			
Course Code	<b>U23HST503</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CAM	ESE
Course Name	<b>Fundamentals of Management Science</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	CO1	Understanding the evolution of management and management theories						<b>K2</b>	
	CO2	Illustrating the roles, skills and functions of management						<b>K3</b>	
	CO3	Assessing the role of organizational behaviour						<b>K2</b>	
	CO4	Develop an interpretation about how organizations function						<b>K5</b>	
	CO5	Understanding management ethics and leadership skills						<b>K2</b>	
<b>UNIT-I</b>	<b>Theories of Management</b>					<b>(6Hrs)</b>			
Concept and foundations of management - Evolution of management thoughts – Pre -scientific management era before (1880) – Classical management era (1880 – 1930) – Neo – classical management era (1930 – 1950) – Modern management era – (1950 onwards) – Contribution of management thinkers – Taylor, Fayol, Elton Mayo									<b>CO1</b>
<b>UNIT-II</b>	<b>Functions of Management</b>					<b>(6Hrs)</b>			
Planning – Organizing – Staffing – Directing – Controlling – Coordinating – Communication – Types, Process and Barriers – Decision Making – Concepts, Process, Techniques and Tools									<b>CO2</b>
<b>UNIT-III</b>	<b>Organizational Behaviour</b>					<b>(6Hrs)</b>			
Introduction – Personality – Perception - Learning and Reinforcement - Motivation - Group Dynamics - Power & Influence - Work Stress and Stress Management - Decision Making - Problems in Decision Making - Decision Making - Organizational Culture - Managing Cultural Diversity									<b>CO3</b>
<b>UNIT- IV</b>	<b>Organizational Design</b>					<b>(6Hrs)</b>			
Classical, Neoclassical and Contingency approaches to organizational design - Organizational theory and design - Organizational structure - (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure)									<b>CO4</b>
<b>UNIT- V</b>	<b>Managerial Ethics And Leadership</b>					<b>(6Hrs)</b>			
Ethics and Business - Ethics of Marketing & advertising - Ethics of Finance & Accounting - Decision making frameworks - Business and Social Responsibility - International Standards - Corporate Governance -Corporate Citizenship - Corporate Social Responsibility - Concept, Nature, Importance, Attributes of a leader - developing leaders across the organization Leadership Grid									<b>CO5</b>
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>1. Richard L. Daft, Understanding the Theory and Design of Organizations, 11th edition, 2020</li> <li>2. Fundamentals of Management by A.R. Aryasri, Mcgraw Hill India, 2018.</li> <li>3. Fundamentals Of Management: Essential Concepts and Applications, 9Th Edition by Stephen P Robbins and Mary Coulter, Pearson., 2021</li> <li>4. Principles of Management Essentials You Always Wanted To Know (English, Paperback, Daum Callie), Edition: 3rd, 2023</li> <li>5. Business Ethics: Ethical Decision Making and Cases" by O. C. Ferrell, John Fraedrich, Linda Ferrell, 13th Edition (2023) Cengage Learning</li> </ol>									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Fundamentals of Human resource management, 4<sup>th</sup> edition, by Gary dessler, Pearson 2017</li> <li>2. Principles of Management Essentials You Always Wanted to Know, 2<sup>nd</sup> Edition, by Callie daum, Vibrant publications 2020.</li> <li>3. Organizational Behaviour, 18<sup>th</sup> edition, by Stephen Robbins, Pearson 2018</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="http://www.shrm.org">www.shrm.org</a></li> <li>2. <a href="http://www.shrmindia.org">www.shrmindia.org</a></li> <li>3. <a href="http://nptel.ac.in/courses/122/108/122108038/">http://nptel.ac.in/courses/122/108/122108038/</a></li> </ol>									

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4. Journal of Human resources
5. www.obnetwork.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	-	-	-	-	-	2	1	-	-	3	2	1	1
2	2	1	-	-	-	-	-	2	1	-	-	3	2	1	1
3	2	1	-	-	-	-	-	2	1	3	-	3	2	1	-
4	2	1	-	-	-	-	-	2	1	3	-	3	2	-	1
5	2	1	-	-	-	-	-	2	1	3	-	3	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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBT509</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>CLOUD, MICROSERVICES AND APPLICATION</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models.						<b>(K3)</b>	
	<b>CO2</b>	Develop and design an application using various tools in cloud environment						<b>(K6)</b>	
	<b>CO3</b>	Acquire the basic and important design concepts and issues of web application development techniques in cloud.						<b>(K5)</b>	
	<b>CO4</b>	Structure simple python program for developing an application in cloud.						<b>(K3)</b>	
	<b>CO5</b>	Analyze the issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud monitoring.						<b>(K4)</b>	
<b>UNIT-I</b>	<b>INTRODUCTION</b>					<b>(9Hrs)</b>			
Cloud Fundamentals-Cloud Service Components-Cloud Service, Deployment Models-Cloud components-Guiding principle with respect to utilization, Security, Pricing- Application of Cloud Computing. Case Study: Design and Implementation of Public and Private Cloud Environments – Open Stack and AWS.									
<b>UNIT-II</b>	<b>CLOUD BASED APPLICATIONS DEVELOPMENT</b>					<b>(9Hrs)</b>			
Application Architectures-Monolithic & Distributed, Microservice Fundamental and Design Approach-Cloud Native Applications-12 Factors App-Application Integration Process and APIfication Process- API Fundamental-Microservice and API Management- Spring Boot Fundamental and Design of Microservice - API Tools - Developer Portal- Applications of Microservice and APIfication									
<b>UNIT-III</b>	<b>WEB DEVELOPMENT TECHNIQUES</b>					<b>(9Hrs)</b>			
Devops fundamentals - Devops Role and Responsibility-Tools and Applications- Containerization Process and Application-Evolution of APP Deployment- Docker Fundamentals - Docker Architecture- Docker Commands. Case study Orchestration, Kubernetes, Docker Container									
<b>UNIT- IV</b>	<b>CLOUD SECURITY AND MONITORING TOOL</b>					<b>(9Hrs)</b>			
Cloud Security-Cloud Security Shared Responsibility Architecture-Security By Design Principles-Identity And Access Management-Cloud Security Layers Illustration-Cloud Network, Host And Data Security Concepts-Security Operations and Major Cloud Service Provider Tools-Security Compliance and Regulations-Cloud Monitoring-Benefits of Cloud Monitoring-Overview of Cloud Monitoring Tools.									
<b>UNIT- V</b>	<b>BUILDING AN APPLICATION USING PYTHON</b>					<b>(9Hrs)</b>			
Developing and Deploying an Application in the Cloud- Building a python project based on Design-Development-Testing-Deployment of an application in the cloud using a development framework and deployment platform. Case Study: Python Use case and Python Framework.									
<b>Text Books</b>									
1.Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Ricardo Puttini, and Zaigham Mahmood, 2nd Edition (2023), Pearson.									
2.Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" by Tim Mather, Subra Kumaraswamy, and Shahed Latif,2nd Edition (2023),O'Reilly Media									
3.Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", Prentice Hall, 2013.									
4.Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press, 2012.									
5.Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.									
<b>Reference Books</b>									
1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.									
2. Michael J. Kavis "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)", 1st Edition, Wiley, 2014.									

3. Lizhe Wang, Rajiv Ranjan, Jinjun Chen, Boualem Benatallah, Cloud Computing, CRC Press, 2017

### Web References

1. <https://azure.microsoft.com/>
2. <https://aws.amazon.com/>
3. <https://nptel.ac.in/courses/106/105/106105167/>
4. Azure Virtual Machines <https://docs.microsoft.com/en-us/azure/virtual-machines/>
5. Google App Engine <https://cloud.google.com/appengine#all-features>
6. Google Kubernetes Engine <https://cloud.google.com/kubernetes-engine#all-features>
7. Docker Tutorial : <https://docker-curriculum.com>
8. Google Cloud Infrastructure security setup overview: <https://cloud.google.com/security/infrastructure/design>

\* 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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBT510</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>Machine Learning for Business Systems</b>		L	T	P	C	CAM	ESE	TM
			<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Distinguish between, supervised, unsupervised and semi-supervised learning.						<b>(K4)</b>	
	<b>CO2</b>	Modify existing machine learning algorithms to improve classification efficiency						<b>(K3)</b>	
	<b>CO3</b>	Construct a basic neural network for real-time data.						<b>(K6)</b>	
	<b>CO4</b>	Apply temporal models for classification						<b>(K3)</b>	
<b>CO5</b>	Apply unsupervised models for clustering data and design a system that uses the information mining models of machine learning						<b>(K3)</b>		
<b>UNIT-I</b>	<b>INTRODUCTION TO MACHINE LEARNING &amp; MongoDB</b>					<b>(6Hrs)</b>			
Introduction to Machine Learning (ML); Relationship between ML and human learning; A quick survey of major models of how machines learn; Example applications of ML. MongoDB : Data modeling in MongoDB - Advantages of MongoDB over RDBMS - Mongo Shell - Configuration file in MongoDB									<b>CO1</b>
<b>UNIT-II</b>	<b>SUPERVISED LEARNING ALGORITHMS</b>					<b>(6Hrs)</b>			
Supervised Learning; The problem of classification; Feature engineering; Training and testing classifier models; Cross-validation; Model evaluation (precision, recall, F1-measure, accuracy, area under curve); Statistical decision theory including discriminant functions and decision surfaces. <b>Application: Credit scoring and loan approval</b> – Using supervised learning to predict a customer's likelihood of defaulting on loans.									<b>CO2</b>
<b>UNIT-III</b>	<b>CLASSIFIERS TECHNIQUES</b>					<b>(6Hrs)</b>			
Naive Bayes classification; Bayesian networks; Decision Tree and Random Forests; k-Nearest neighbor classification; Support Vector Machines Artificial neural networks including back propagation; Applications of classifications; Ensembles of classifiers including bagging and boosting. <b>Application: Fraud detection in credit card transactions</b> – Use of classification models such as Decision Trees, Random Forests, and Neural Networks to identify fraudulent activities.									<b>CO3</b>
<b>UNIT-IV</b>	<b>HIDDEN MARKOV MODELS AND REGRESSION TECHNIQUES</b>					<b>(6Hrs)</b>			
Hidden Markov Models (HMM) with forward-backward and Viterbi algorithms; Sequence classification using HMM; Conditional random fields; Applications of sequence classification such as part-of-speech tagging Regression: Multi-variable regression; Model evaluation; Least squares regression; Regularization; LASSO; Applications of regression. <b>Application: Stock price prediction using regression</b> – How multi-variable regression and regularization techniques are used to forecast stock prices.									<b>CO4</b>
<b>UNIT-V</b>	<b>UNSUPERVISED LEARNING AND MINING ALGORITHMS</b>					<b>(6Hrs)</b>			
Clustering: Average linkage; Ward's algorithm; Minimum spanning tree clustering; K-nearest neighbours clustering; BIRCH; CURE; DBSCAN. Association rule mining algorithms including apriori - Expectation-Maximization (EM) Algorithm for unsupervised learning anomaly and outlier detection methods. <b>Application: Market basket analysis using association rule mining</b> – Discovering patterns in customer purchase behavior through unsupervised learning methods.									<b>CO5</b>
<b>Text Books</b>									
1. E. Alpaydin, "Introduction to Machine Learning", Third Edition, Prentice-Hall, 2014 2. Machine Learning for Fraud Detection: Use Python to Combat Financial Fraud" by Claus Wilke, 1st Edition (2023), Packt Publishing 3. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron, 3rd Edition (2022), O'Reilly Media.									

4. Rostamizadeh, A., Talwalkar, A., Mohri, M. *Foundations of Machine Learning* (Second Edition). MIT Press, 2018.
5. Burkov, A. *The Hundred-Page Machine Learning Book* (First Edition). Andriy Burkov, 2019.

#### Reference Books

1. R.O. Duda, P.E. Hart, D.G. Stork, "Pattern Classification", Second Edition, Wiley, 2001.
2. C. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
3. Webb, "Statistical Pattern Recognition", Third Edition, Wiley, 2011.

#### Web References

1. <https://www.javatpoint.com/machine-learning>
2. <https://www.geeksforgeeks.org/machine-learning/>
3. <https://www.kaggle.com/learn/intro-to-machine-learning>
4. <https://machinelearningmastery.com/start-here/>
5. <https://intellipaat.com/blog/tutorial/machine-learning-tutorial/>
6. <https://nptel.ac.in/courses/106/106/106106139/>.

\* 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	5	75	100

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



Department	Management Studies		Programme: B.Tech						
Semester	V		Course Category Code: HS			*End Semester Exam Type: TE			
Course Code	U23HSTC02		Periods/Week			Credit	Maximum Marks		
Course Name	RESEARCH METHODOLOGY		L	T	P	C	CAM	ESE	TM
			2	0	0	2	25	75	100
<b>Common to ALL Branches</b>									
Prerequisite	Nil								
Course Outcomes	<i>On completion of the course, the students will be able to</i>								BT Mapping (Highest Level)
	CO1	Interpret the different types of research and explain how research methods can be used to address engineering problems.							K2
	CO2	Discuss the research problems, conduct comprehensive literature reviews, and utilize tools and services for effective information retrieval.							K2
	CO3	Apply appropriate methods to design experiments, analyze data, and interpret results using both numerical and graphical techniques.							K3
	CO4	Analyze and apply ethical guidelines to structure and write research papers and dissertations, ensuring academic integrity and avoiding plagiarism.							K4
	CO5	Examine the fundamentals of intellectual property rights to protect and enforce them, with emphasis on their role in fostering innovation and entrepreneurship in engineering.							K3
UNIT-I	Introduction to Research					Periods: 6hrs			
Meaning and Importance of Research, Types of Research: Overview of Basic, Applied, and Developmental Research, Overview of the Research Process, Defining a Research Problem: Key Considerations, Setting Research Objectives and Research Questions, Introduction to Research Design: Basic Concepts, Approaches to Research: Quantitative vs. Qualitative.									CO1
UNIT-II	Problem Formulation and Literature Review					Periods: 6hrs			
Identifying and Formulating Research Problems, conducting a Literature Review: Essential Steps, Referencing and Citation Methods: Basic Techniques. Sources of Information: Overview of Libraries and Online Databases.									CO2
UNIT-III	Research Methods and Data Analysis					Periods: 6hrs			
Introduction to Experimental Research, Developing Hypotheses: Basic Approach. Data Collection Methods: Sampling and Surveys, Basics of Data Analysis: Numerical and Graphical Analysis, Introduction to Inferential Statistics.									CO3
UNIT-IV	Writing and Presenting Research					Periods: 6hrs			
Preparing a Research Report: Key Sections (Abstract, Introduction, Methodology, Results, Discussion, Conclusion). Referencing and Citation: Brief Overview.									CO4
UNIT-V	Ethics and Intellectual Property in Research					Periods: 6hrs			
Ethical Considerations in Research: Introduction to Scientific Misconduct. Basics of Intellectual Property Rights - Introduction to Patents, Copyrights, and Trademarks – Case studies on ethical dilemmas in research.									CO5
Lecture Periods: 30			Tutorial Periods:			Practical Periods:		Total Periods: 30	
<b>Text Books</b>									
1. Kumar, R. Research Methodology: A Step-by-Step Guide for Beginners, 5 <sup>th</sup> Edition, SAGE Publications, 2019.									
2. Ram Ahuja, <i>Research methods</i> , Rawat Publications, 2 <sup>nd</sup> edition, 2022									
3. Creswell, J. W., and Creswell, J. D. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5 <sup>th</sup> Edition, SAGE Publications, 2018.									
<b>Reference Books</b>									
1. Thiel DV. Research methods for engineers. Cambridge: Cambridge University Press; 2014.									
2. Ganesan R. Research methodology for engineers. Chennai: MJP Publishers; 2024.									

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3. Agarwal C, Sharma V. Research methodology in sociology. New Delhi: Commonwealth Publishers; 2012.
4. Thody A. Writing and presenting research. 2<sup>nd</sup> edition, London: SAGE Publications; 2006.
5. Kothari CR. Research methodology – methods and techniques. 5<sup>th</sup> edition, New Delhi: New Age International Publishers; 2023.

#### Web References

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2. [https://owl.purdue.edu/owl/research\\_and\\_citation/conducting\\_research/writing\\_a\\_literature\\_review.html](https://owl.purdue.edu/owl/research_and_citation/conducting_research/writing_a_literature_review.html)
3. <https://files.eric.ed.gov/fulltext/ED536788.pdf>
4. <https://researcheracademy.elsevier.com/>
5. <https://www.wipo.int/>
6. <https://www.scholastic.com/7-steps-to-successful-research-report.html>
7. <https://www.futurelearn.com/info/courses/business-research-methods-investigation>.
8. <https://articles.manupatra.com/article-details/Patent-Types-Laws-related-to-them-in-India>

#### COs/POs/PSOs Mapping

Course Outcomes (COs)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	Program Specific Outcomes (PSOs)		
													PSO 1	PSO 2	PSO 3
CO1	3	3	2	2	2	-	2	-	-	2	2	3			
CO2	3	1	1	3	1	-	2	-	-	1	2	-			
CO3	1	3	3	1	3	-	2	-	-	2	2	-			
CO4	-	-	1	2	-	-	2	3	2	2	-	2			
CO5	2	2	2	2	2	2	3	3	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	5	5	5	5	5	75	100

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

Department	English		Programme: B.Tech.						
Semester	V		Course Category Code: HS			*End Semester Exam Type:P			
Course Code	U23ENP501		Periods/Week			Credit	Maximum Marks		
Course Name	Business Communication & Value Science - IV		L	T	P	C	CAM	ESE	TM
			-	-	2	1	100	-	100
Prerequisite	Basics of English Language								
Course Outcome	On completion of the course, the students will be able to								BT Mapping (Highest Level)
	CO1	Understand the importance of diversity in workplace							K2
	CO2	Apply the technical contents with grammatically precise sentences							K2
	CO3	Remember the attributes needed to function and grow in a corporate environment							K1
	CO4	Recall the best practices to share and receive feedback							K3
	CO5	Comprehends how stress impacts life and work							K1
<b>UNIT- I</b>	<b>DIVERSITY IN WORK PLACE</b>					<b>Periods:9Hrs</b>			
Listening: Importance of diversity in workplace (IELTS based) Speaking: Submitting Video Recording self video on "How communication plays a major role in work place" , Tell a story with charts and graphs. Writing: Types-Formal and Business letters, Proposal - templates for writing proposal - create a business proposal, charts and graphs in communicative writing.									<b>CO1</b>
<b>UNIT- II</b>	<b>EMOTIONAL INTELLIGENCE</b>					<b>Periods:9Hrs</b>			
Listening: Swami Vivekananda's Chicago speech - Steve Jobs' first iPhone launch -Martin Luther King Jr (I have a dream...) Speaking: Importance of emotional intelligence in personal and professional lives. Group Discussion - sell your start-up ideas - group to pitch their start-up idea to a panel. Writing: importance of emotional intelligence in personal and professional lives.									<b>CO2</b>
<b>UNIT- III</b>	<b>CORPORATE SOCIAL RESPONSIBILITY</b>					<b>Periods:9Hrs</b>			
Listening: Ubuntu story , Tata Group CSR stories--- from Titan and Tata Chemicals Speaking: Attributes needed to function and grow in a corporate environment: Resilience - Flexibility - Strategic thinking and planning - Decision making -Resolving conflicts. Writing: Importance of CSR Activities in an organization.									<b>CO3</b>
<b>UNIT- IV</b>	<b>LEARNING STYLES IN INTERPERSONAL INTERACTIONS</b>					<b>Periods:9Hrs</b>			
Listening: Handling emotional intelligence at workplace. (IELTS based) Speaking: Role play on feedback - teachers discuss with students sharing their feedback on their reactions - tips to receive and give feedback. Writing: Essay writing on handling emotional intelligence at different level of age.									<b>CO4</b>
<b>UNIT-V</b>	<b>MULTIPLE INTELLIGENCE</b>					<b>Periods:9Hrs</b>			
Listening: Mock interview followed by discussions on corporate etiquettes. (IELTS based) Speaking: PPT Presentation and discussion on managing Stress - - impact of stress in life and work - The Long-term Effects of Stress (5 mins) - stress impacts health- Tips to manage stress - Time management - importance of time management - Managing your time better . Writing: Identify and list out the rocks, pebbles and sands in their life.									<b>CO5</b>
<b>Lecture Periods:45</b>		<b>Tutorial Periods:-</b>		<b>Practical Periods:45</b>			<b>Total Periods:45</b>		
<b>Reference Books</b>									
1. Daniel Goleman, Emotional Intelligence: Why it can Matter More Than IQ, Publisher: Kindle Edition, 27 September 2005									
2. Ryback David, Putting Emotional Intelligence to Work, Publisher: Kindle Edition, 2 December 1997									
3. Dale Carnegie, How to Develop Self Confidence and Improve Public Speaking - Time - Tested Methods of Persuasion, Publisher: Kindle Edition, 1 July 2017									
4. Chris Anderson, TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations, Nicholas Brealey Publishing, 4 January 2018.d									
<b>Web References</b>									
1. <a href="https://www.tata.com/about-us/tata-group-our-heritage">https://www.tata.com/about-us/tata-group-our-heritage</a>									
2. <a href="https://economictimes.indiatimes.com/tata-success-story-is-based-on-humanity-philanthropy-and-ethics/articleshow/41766592.cms">https://economictimes.indiatimes.com/tata-success-story-is-based-on-humanity-philanthropy-and-ethics/articleshow/41766592.cms</a> <a href="https://www.amazon.in/Putting-Emotional-Intelligence-Work-Successful/dp/075069956">https://www.amazon.in/Putting-Emotional-Intelligence-Work-Successful/dp/075069956</a>									
3. <a href="https://www.verywellmind.com/gardners-theory-of-multiple-intelligences-2795161">https://www.verywellmind.com/gardners-theory-of-multiple-intelligences-2795161</a>									
4. <a href="https://thecsrjournal.in/top-indian-companies-for-csr-in-2020/">https://thecsrjournal.in/top-indian-companies-for-csr-in-2020/</a>									

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Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23CBP508</b>		Periods / Week		Credit	Maximum Marks			
Course Name	<b>CLOUD, MICROSERVICES AND APPLICATION LABORATORY</b>		L	T	P	C	CAM	ESE	Total
			<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Demonstrate the procedure to create virtual machine instances.							<b>K3</b>
	<b>CO2</b>	Design and develop an PAAS application.							<b>K6</b>
	<b>CO3</b>	Setup a private cloud environment.							<b>K3</b>
	<b>CO4</b>	Demonstrate the procedure to develop a DevSecOps – Cloud (AWS, GCP, Azure)							<b>K3</b>
	<b>CO5</b>	Demonstrate the procedure to develop a DevSecOps – Cluster (Kubernetes).							<b>K2</b>
<b>List of Experiments</b>									
<ol style="list-style-type: none"> <li>Find procedure to run the virtual machine of different configuration using virtual-manager.</li> <li>Virtualize a machine and check how many virtual machines can be utilized at a particular time.</li> <li>Create a VM Clone and attach virtual block to the cloned virtual machine and check whether it holds the data even After the release of the virtual machine.</li> <li>Create a Snapshot of a VM at a given point in time and test the snapshot by restoring the VM to that time. (Note: Testing can be done by installing an application and then restore it.)</li> <li>Develop a simple application to understand the concept of PAAS using GAE/Amazon Elastic Beanstalk/IBM Blue Mix and launch it.</li> <li>Test how a SaaS applications scales in response to demand.</li> <li>Find the procedure to launch a Cloud instance using a Public IaaS cloud like AWS/GCP.</li> <li>Setup a Private Cloud by performing the procedure using a Single node OPENSTACK implementation.</li> <li>Find the procedure to develop a DevSecOps – Cloud (AWS, GCP, Azure).</li> <li>Find the procedure to develop a DevSecOps – Cluster (Kubernetes).</li> <li>Find the procedure to develop a Container (Docker).</li> <li>To Build and Test Your Docker Images in the Cloud with Docker commands.</li> </ol>									
<b>Lecture Periods:</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing Concepts, Technology &amp; Architecture" Prentice Hall, 2013.</li> <li>Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press, 2012.</li> <li>Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011</li> <li>Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.</li> <li>Michael J. Kavis "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)", 1st Edition, Wiley, 2014.</li> <li>Lizhe Wang, Rajiv Ranjan, Jinjun Chen, Boualem Benatallah, Cloud Computing, CRC Press, 2017</li> </ol>									
<b>Web references</b>									
<ol style="list-style-type: none"> <li><a href="https://azure.microsoft.com/">https://azure.microsoft.com/</a></li> <li><a href="https://aws.amazon.com/">https://aws.amazon.com/</a></li> <li><a href="https://nptel.ac.in/courses/106/105/106105167/">https://nptel.ac.in/courses/106/105/106105167/</a></li> <li>Azure Virtual Machines <a href="https://docs.microsoft.com/en-us/azure/virtual-machines/">https://docs.microsoft.com/en-us/azure/virtual-machines/</a></li> <li>Google App Engine <a href="https://cloud.google.com/appengine#all-features">https://cloud.google.com/appengine#all-features</a></li> <li>Google Kubernetes Engine <a href="https://cloud.google.com/kubernetes-engine#all-features">https://cloud.google.com/kubernetes-engine#all-features</a></li> <li>Docker Tutorial : <a href="https://docker-curriculum.com">https://docker-curriculum.com</a></li> </ol>									

8. Google Cloud Infrastructure security setup overview: <https://cloud.google.com/security/infrastructure/design>

\* 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	1	-
4	3	2	1	1	3	-	-	-	-	-	-	1	2	-	1
5	3	2	1	1	3	-	-	-	-	-	-	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
	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. 60

Department	<b>Computer Science and Engineering and Business Systems</b>	Programme: <b>B. Tech.</b>						
Semester	<b>V</b>	Course Category Code: <b>PA</b>			*End Semester Exam Type: -			
Course Code	<b>U23CBW501</b>	Periods / Week			Credit	Maximum Marks		
Course Name	<b>MICRO PROJECT</b>	L	T	P	C	CAM	ESE	TM
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>100</b>	<b>-</b>	<b>100</b>

Prerequisite -

Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)
	<b>CO1</b>	Identify the problem statement for the micro project work through the literature survey						<b>K2</b>
	<b>CO2</b>	Choose the proper components as per the requirements of the design/ system.						<b>K2</b>
	<b>CO3</b>	Apply the acquainted skills to develop final model/system						<b>K3</b>

There shall be a Micro Project, which the student shall pursue as a team consists of maximum 4 students during the third year, fifth semester. The aim of the micro project is that the student has to understand the real time hardware / software applications. The student should gain a thorough knowledge in the problem he/she has selected and in the hardware / software he/she using in the Project. The Micro-project is an application that should be formally initiated and should be developed and also to be implemented by the respective team.

The Micro Project shall be submitted in a report form along with the hardware model / software developed, duly approved by the department internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The department internal evaluation committee shall consist of faculty coordinator, supervisor of the project and a senior faculty member of the department. There shall be two reviews that will be considered for assessing a Micro Project work with weightage as indicated evaluation Methods.

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 30	Total Periods: 30
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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	PSO1	PSO2	PSO3
<b>1</b>	3	2	2	2	-	-	-	-	3	3	-	1	1	1	1
<b>2</b>	3	3	3	2	2	2	2	2	3	3	3	1	2	2	2
<b>3</b>	3	2	2	1	-	2	-	-	3	3	3	1	3	3	3

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

### Evaluation Method

Assessment	Review 1			Review 2				Total Marks
	Novelty	Presentation	Viva	Presentation	Demonstration	Viva	Report	
Marks	10	20	10	20	20	10	10	100

Q. A. 11.61

2. A. 11. 62



Department	<b>Computer Science and Engineering and Business Systems</b>	Programme: <b>B. Tech.</b>						
Semester	<b>V</b>	Course Category: <b>AEC</b>			End Semester Exam Type: -			
Course Code	<b>U23CBC5XX</b>	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>CERTIFICATION COURSE - V</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>
Prerequisite	-							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

- (i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.
- (ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as pass on satisfactory completion. A letter grade P is awarded to declare pass.
- (iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

### Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Attendance	MCQ Test	
Marks	10	90	100

2. A. 11. 64 . 8.

Department	Computer Science and Engineering and Business Systems		Programme: B.Tech.					
Semester	V		Course Category Code: MC			*End Semester Exam Type: -		
Course Code	U23CBM505		Periods/Week			Credit	Maximum Marks	
			L	T	P	C	CAM	ESE
Course Name	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE		2	0	0	-	100	100
Common to ALL Branches								
Prerequisite	-							
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)
	CO1	Familiarize with the philosophy of Indian culture						K2
	CO2	Distinguish the Indian languages and literature						K2
	CO3	Describe the philosophy of ancient, medieval and modern India						K2
	CO4	Illustrate the information about the fine arts in India						K2
CO5	Describe the contribution of scientists of different eras						K2	
<b>UNIT- I</b>	<b>Introduction To Culture</b>					<b>Periods:06hrs</b>		
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India								CO1
<b>UNIT- II</b>	<b>Indian Languages, Culture and Literature</b>					<b>Periods:06hrs</b>		
Indian Languages and Literature - I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India Indian Languages and Literature-II: Northern Indian languages & literature								CO2
<b>UNIT- III</b>	<b>Religion and Philosophy</b>					<b>Periods:06hrs</b>		
Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)								CO3
<b>UNIT- IV</b>	<b>Fine Arts in India (Art, Technology and Engineering)</b>					<b>Periods:06hrs</b>		
Indian Painting, Indian handicrafts, Music, divisions of Indian classical music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India								CO4
<b>UNIT-V</b>	<b>Education System in India</b>					<b>Periods:06hrs</b>		
Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India								
<b>Lecture Periods:30</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods:30hrs</b>		
<b>Reference Books</b>								
1. Kapil Kapoor, Text and Interpretation: The India Tradition, ISBN: 81246033375, 2005								
2. Science in Samskrit, Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007								
3. NCERT, Position paper on Arts, Music, Dance and Theatre, ISBN 81-7450 494-X, 200								
4. S. Narain, Examinations in ancient India, Arya Book Depot, 1993								
5. M. Hirianna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN 13: 978 - 8120810990, 2014								
<b>Web References</b>								
1. <a href="https://nptel.ac.in/courses/109/104/109104102/">https://nptel.ac.in/courses/109/104/109104102/</a>								
2. <a href="https://nptel.ac.in/courses/101/104/101104065/">https://nptel.ac.in/courses/101/104/101104065/</a>								
3. <a href="https://nptel.ac.in/courses/109/108/109108158/">https://nptel.ac.in/courses/109/108/109108158/</a>								
4. <a href="https://nptel.ac.in/courses/109/106/109106059/">https://nptel.ac.in/courses/109/106/109106059/</a>								
5. <a href="https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-ae01/">https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-ae01/</a>								

2. A. 11. 65

**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	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
2	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
4	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1

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

**Evaluation Methods**

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100

# PROFESSIONAL ELECTIVE II

2. A. 11. 67

10.1 - 2

2. A. 11. 68

Department	<b>Computer Science and Engineering and Business Systems</b>			Programme: <b>B.Tech.</b>						
Semester	<b>V</b>			Course Category: <b>PE</b>		*End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23CBE506</b>			Periods / Week		Credit	Maximum Marks			
				L	T	P	C	CAM	ESE	TM
Course Name	<b>BUSINESS INTELLIGENCE AND APPLICATIONS</b>			<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)		
	<b>CO1</b>	Describe business intelligence and decision support systems						<b>K3</b>		
	<b>CO2</b>	Use the mathematical models for decision making process						<b>K3</b>		
	<b>CO3</b>	Implement the techniques involving classification and clustering						<b>K5</b>		
	<b>CO4</b>	Summarize the various business intelligence applications						<b>K2</b>		
	<b>CO5</b>	Explain the context of knowledge management systems						<b>K2</b>		
<b>UNIT-I</b>	<b>INTRODUCTION TO BUSINESS INTELLIGENCE</b>				<b>(6Hrs)</b>					
Effective and timely Decisions-Data, information and knowledge-The role of mathematical models- Business Intelligence Architectures-Ethics and business Intelligence-Definition of System-Representation of the decision making Process-Evolution of information Systems-Definition of decision support System-Development of a decision support system								<b>CO1</b>		
<b>UNIT-II</b>	<b>DATA INTEGRATION</b>				<b>(6Hrs)</b>					
Information integration, Enterprise Application integration, Web services-Management Issues- Parallelism- Granularity-Dependence, Data Enhancement-Incremental Enhancement- Batch Enhancements-Standardization.								<b>CO2</b>		
<b>UNIT-III</b>	<b>EXTRACTION TRANSFORMATION LOADING</b>				<b>(6Hrs)</b>					
Introduction to ETL using SSIS, Data quality-Data Cleansing-data profiling -Knowledge Discovery and Data Mining- Public Data-Unstructured Data-Data Resources-Source data transformation-Reconciliation-ETL Testing.								<b>CO3</b>		
<b>UNIT-IV</b>	<b>BI APPLICATIONS, LOGISTIC &amp; PRODUCTION MODELS</b>				<b>(6Hrs)</b>					
Marketing models: Relational Marketing-Sales Force Management-Supply chain optimization- Optimization models for logistics Planning-Revenue management systems. -Efficiency Measures-Efficient frontier-The CCR Model- Identification of good operating practices.								<b>CO4</b>		
<b>UNIT-V</b>	<b>KNOWLEDGE MANAGEMENT</b>				<b>(6Hrs)</b>					
Introduction to Knowledge Management-Organizational Learning and Transformation-Knowledge Management Activities-Approaches to Knowledge Management-Information Technology (IT) In Knowledge Management- Knowledge Management Systems Implementation-Roles of People in Knowledge Management.								<b>CO5</b>		
<b>Text Books</b>										
1."Business Intelligence: The Savvy Manager's Guide" by David Loshin,2nd Edition (2022), Morgan Kaufmann 2."The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation" by Ikujiro Nonaka, Hirotaka Takeuchi,2nd Edition (2022),Oxford University Press 3. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for decision making", 1st Edition, Wiley, 2009. 4.Efraim Turban, Ramesh Sharda, Dursun Delen "Decision Support and Business Intelligence Systems", Pearson, 9 <sup>th</sup> Edition 2011. 5.Ramesh Sharda, Dursun Delen, Efraim Turban, & David King, "Business Intelligence: A Managerial Approach", Global Edition, November 2017										
<b>Reference Books</b>										
1. Grossmann W, Rinderle-Ma "Fundamental of Business Intelligence" Springer, 1 <sup>st</sup> Edition, 2015. 2. Galit Shmueli, Nitin R. Patel, Peter C. Bruce,"Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner",Wiley, November 2010										
<b>Web References</b>										
1. <a href="http://www.cio.com/article/2439504/business-intelligence-definition-and-solutions.html">www.cio.com/article/2439504/business-intelligence-definition-and-solutions.html</a> 2. <a href="https://data-flair.training/blogs/business-intelligence/">https://data-flair.training/blogs/business-intelligence/</a> 3. <a href="https://www.javatpoint.com/power-bi">https://www.javatpoint.com/power-bi</a> 4. <a href="https://www.datapine.com/blog/business-intelligence-concepts-and-bi-basics/">https://www.datapine.com/blog/business-intelligence-concepts-and-bi-basics/</a> 5. <a href="https://nptel.ac.in/courses/110/107/110107092/">https://nptel.ac.in/courses/110/107/110107092/</a>										

\* 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	1	-	3	1
2	3	2	1	-	3	-	-	-	-	-	3	1	-	3	1
3	3	2	1	-	3	-	-	-	-	-	3	1	-	3	1
4	2	1	-	-	3	-	-	-	-	-	3	1	-	3	1
5	2	1	-	-	-	-	-	-	-	-	3	1	-	3	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



Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBE507</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>ROBOTICS AND EMBEDDED SYSTEMS</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the key concepts of microcontrollers embedded processors and their applications.						<b>K3</b>	
	<b>CO2</b>	Know about the internal architecture and interfacing of different peripheral devices with Microcontrollers.						<b>K2</b>	
	<b>CO3</b>	Design embedded systems using modeling concepts.						<b>K5</b>	
	<b>CO4</b>	Use of real time operating system for various application.						<b>K3</b>	
	<b>CO5</b>	Design and engineer autonomous robots using various sensors.						<b>K5</b>	
<b>UNIT-I</b>	<b>INTRODUCTION TO EMBEDDED SYSTEM</b>					<b>(6Hrs)</b>			
Embedded system Vs General computing systems, History of Embedded systems, Purpose of Embedded systems, Microprocessor and Microcontroller, Hardware architecture of the real time systems.									<b>CO1</b>
<b>UNIT-II</b>	<b>DEVICES AND COMMUNICATION BUSES</b>					<b>(6Hrs)</b>			
I/O types, serial and parallel communication devices, wireless communication devices, timer and counting devices, watchdog timer, real time clock, serial bus communication protocols, parallel communication network using ISA, PCI, PCT-X, Intranet embedded system network protocols, USB, Bluetooth									<b>CO2</b>
<b>UNIT-III</b>	<b>PROGRAM MODELING CONCEPTS</b>					<b>(6Hrs)</b>			
Fundamental issues in Hardware software co-design, Unified Modelling Language(UML), Hardware Software trade-offs DFG model, state machine programming model, model for multiprocessor system.									<b>CO3</b>
<b>UNIT- IV</b>	<b>REAL TIME OPERATING SYSTEMS &amp; EXAMPLES OF EMBEDDED SYSTEM</b>					<b>(6Hrs)</b>			
Operating system basics, Tasks, Process and Threads, Multiprocessing and multitasking, task communication, task synchronization, qualities of good RTOS. Examples of Embedded System: Mobile phones, RFID, WISENET, Robotics, Biomedical Applications, Brain machine interface etc. Popular microcontrollers used in embedded systems, sensors, actuators									<b>CO4</b>
<b>UNIT- V</b>	<b>ROBOTICS AND KINEMATICS</b>					<b>(6Hrs)</b>			
Introduction to robotics, Elements of robots joints, links, actuators, and sensors ,Kinematics of serial robots, Kinematics of parallel robots, Motion planning and control, Sensing distance and direction, Line Following Algorithms, Feedback Systems, Recent trends and open challenges									<b>CO5</b>
<b>Text Books</b>									
1."Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers" by Jonathan W. Valvano,4th Edition (2023),CreateSpace 2."Designing Embedded Systems and the Internet of Things (IoT) with the ARM Cortex-M Microcontrollers" by Muhammad Ali Mazidi, Shujen Chen,2nd Edition (2022),Pearson 3.Shibu K. V , "Introduction to Embedded Systems", 2nd Edition, McGraw Hill, 2017 4.Ashitava Ghosal, "Robotics: Fundamental Concepts and Analysis", Oxford University Press, 2006 5.MAZIDI,"The 8051 Microcontroller and Embedded Systems: Using Assembly and C"Pearson,second Edition, January 2007									
<b>Reference Books</b>									
1. L. B. Das, "Embedded Systems: An Integrated Approach", 1st edition, Pearson Education India, 2012. 2. Raj Kamal, "Embedded Systems- Architecture, Programming and Design", 3rd Edition, McGraw Hill Education, 2017. 3. Frank Vahid and Tony Givargis,"Embedded System Design: A Unified Hardware/Software Introduction"John Wiley & Sons,2002									
<b>Web References</b>									
1. <a href="https://nptel.ac.in/courses/108/102/108102045/">https://nptel.ac.in/courses/108/102/108102045/</a> 2. <a href="https://www.embeddedrelated.com/tutorials.php">https://www.embeddedrelated.com/tutorials.php</a> 3. <a href="https://www.tutorialspoint.com/embedded_systems/index.htm">https://www.tutorialspoint.com/embedded_systems/index.htm</a> 4. <a href="https://www.javatpoint.com/robotics-tutorial">https://www.javatpoint.com/robotics-tutorial</a> 5. <a href="http://www.robotictutorials.com">http://www.robotictutorials.com</a>									

\* TE – Theory Exam, LE – Lab Exam

2. A. 11. 71

### 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	-	-	-	-	-	-	-	-	2	1	1	
4	3	2	1	1	-	-	-	-	-	-	-	1	2	1	-	
5	2	1	-	-	-	-	-	-	-	-	-	1	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	5	75	100

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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBE508</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CAM	ESE
Course Name	<b>WEB APPLICATIONS</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Demonstrate the key concepts of internet						<b>K2</b>	
	<b>CO2</b>	Master jQuery, client validation, and AJAX.						<b>K5</b>	
	<b>CO3</b>	Build and test Angular-based Single Page Applications (SPAs).						<b>K5</b>	
	<b>CO4</b>	Create and debug Node.js-based web servers.						<b>K3</b>	
	<b>CO5</b>	Implement SEO best practices for enhanced web visibility.						<b>K6</b>	
<b>UNIT-I</b>	<b>Web Development Fundamentals: HTML, CSS, and JavaScript</b>					<b>(6Hrs)</b>			
Introduction to HTML5, Basic Structure for HTML, Basic HTML tags-Headings, Linking, Images, Special Characters and Horizontal Rules.									
Introduction to CSS, Block and Inline Elements, Inline Styles, Using internal CSS, Using external CSS, How CSS rules cascade, inheritance.									
How JavaScript makes the web pages more interactive, examples of JavaScript in browser, Basic JavaScript instructions: statements, comments, variable, data types, arrays, expressions, operators; functions methods and objects: function, anonymous function, variable scope, object, this, arrays are objects, browser object model, document object model, Global objects: string, number, math, date.									
<b>UNIT-II</b>	<b>Advanced Client side programming</b>					<b>(6Hrs)</b>			
Fundamentals of jQuery, Element Selector, Document ready function, Events, jQuery UI, Unobtrusive client validation, working with AJAX and jQuery. Feature detection: Browser detection, Feature detection, Modernizer. MongoDB : Data modelling in MongoDB -Advantages of MongoDB over RDBMS -Mongo Shell -Configuration file in MongoDB									
<b>UNIT-III</b>	<b>Introduction to AngularJS</b>					<b>(6Hrs)</b>			
Controllers, Models, Directives and Services, Single Page Applications, Angular User Interfaces: Angular Forms, Using Angular with Angular UI and Angular Bootstrap, Angular Services, Developing Custom Directives, Enhanced End-to-End Testing.									
<b>UNIT- IV</b>	<b>Introduction to Node JS</b>					<b>(6Hrs)</b>			
Node JS process model, Advantages, Traditional web server model. Setup Install Node.js on windows, REPL, Node JS console, Node JS modules, Events: Event Emitter class, inheriting events, Node Package Manager, Creating web server: handling http requests, sending requests, File System, Debugging Node JS application, Database Connectivity.									
<b>UNIT- V</b>	<b>Search engines</b>					<b>(6Hrs)</b>			
Searching techniques used by search engines, keywords, advertisements, Search engine optimization for individual web pages: header entries, tags, selection of URL, alt tags, Search engine optimization for entire website: Hyperlinks and link structure, page rank of Google, click rate, residence time of website, frames, scripts, content management system, cookies, robots, Pitfalls in Optimization: optimization and testing, keyword density, doorway pages, duplicate contents, quick change of topics, broken links, poor readability, rigid layouts, navigation styles.									
<b>Text Books</b>									
1."Web Development and Design Foundations with HTML5" by Terry Felke-Morris,10th Edition (2023),Pearson 2.Deitel, P.J., Deitel, H.M., & Deitel, A. <i>Internet and World Wide Web: How to Program</i> (5th ed.). Pearson Prentice Hall, 2012. 3.Chaffer, J., & Swedberg, K. <i>Learning jQuery</i> (4th ed.). Packt Publishing, 2016. 4.Seshadri, S. <i>AngularJS: Up and Running</i> (1st ed.). O'Reilly Media, 2014. 5.Cantelon, M. <i>Node.js in Action</i> (2nd ed.). Manning Publications, 2017. 6.Kent, P. <i>SEO for Dummies</i> (7th ed.). Wiley, 2020.									
<b>Reference Books</b>									
1. Sebesta, R. W., <i>Programming the World Wide Web</i> , 8th Edition, 2014. 2. Lindley, Cody, <i>jQuery Cookbook</i> , 1st Edition, 2009. 3. Kozlowski, Pawel and Peter Bacon Darwin, <i>Mastering Web Application Development with AngularJS</i> , 1st Edition, 2013. 4. Mead, Andrew, <i>Learning Node.js Development</i> , 1st Edition, 2016. 5. Enge, Eric, Stephan Spencer, and Jessie Stricchiola, <i>The Art of SEO</i> , 4th Edition, 2017.									

## Web References

1. <https://www.w3schools.com/>
2. [https://www.tutorialspoint.com/internet\\_technologies/websites\\_development.htm](https://www.tutorialspoint.com/internet_technologies/websites_development.htm)
3. <https://developer.mozilla.org/en-US/docs/Learn>
4. <https://nptel.ac.in/courses/106/105/106105084/>
5. <https://nptel.ac.in/courses/106/106/106106222/>

\* 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	5	75	100

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

Department	<b>Computer Science and Engineering and Business Systems</b>			Programme: <b>B.Tech.</b>						
Semester	<b>V</b>			Course Category: <b>PE</b>		*End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23CBE509</b>			Periods / Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	<b>DATA MINING AND ANALYTICS</b>			<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)		
	<b>CO1</b>	Understand the fundamentals of data mining and data representation.							<b>(K2)</b>	
	<b>CO2</b>	Perform preprocessing tasks for the data set.							<b>(K3)</b>	
	<b>CO3</b>	Apply association rules and predictive methods for data mining.							<b>(K3)</b>	
	<b>CO4</b>	Build data models using linear regression techniques.							<b>(K5)</b>	
	<b>CO5</b>	Gain knowledge on time series analysis and prescriptive analysis.							<b>(K3)</b>	
<b>UNIT-I</b>	<b>INTRODUCTION AND KNOWLEDGE REPRESENTATION</b>					<b>(6Hrs)</b>				
Introduction - Related technologies - Machine Learning, DBMS, OLAP, Statistics, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Task relevant data, Background knowledge, Representing input data and output knowledge, Visualization techniques, Applications.										<b>CO1</b>
<b>UNIT-II</b>	<b>DATA PREPROCESSING</b>					<b>(6Hrs)</b>				
Data preprocessing: Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies.										<b>CO2</b>
Attribute-oriented analysis: Attribute generalization, Attribute relevance, Class comparison, Statistical measures										
<b>UNIT-III</b>	<b>ASSOCIATION AND MINING METHODS</b>					<b>(9Hrs)</b>				
Association rules: Motivation and terminology, Basic idea: item sets, Generating itemsets and rules efficiently, Correlation analysis. Classification: Basic learning/mining tasks, Inferring rudimentary rules: 1R, algorithm, Decision trees, covering rules. Prediction: The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance based methods (nearest neighbor)										<b>CO3</b>
<b>UNIT-IV</b>	<b>REGRESSION MODELS</b>					<b>(6Hrs)</b>				
<b>Linear Models:</b> Introduction to Linear Models, Simple Linear Regression, Multiple Linear Regression, Regularization Techniques, Generalized Linear Models (GLM), Model Evaluation and Validation, Dimensionality Reduction, Application in Data Mining, Tools and Software for Linear Modeling										<b>CO4</b>
<b>Non-Linear Models:</b> Introduction to Non-Linear Models, Polynomial Regression, Logistic Regression, Decision Trees Support Vector Machines (SVM), Artificial Neural Networks (ANN), k-Nearest Neighbors (k-NN), Random Forests and Ensemble Methods, Model Evaluation, Applications and Tools										
<b>UNIT-V</b>	<b>TIME SERIES ANALYSIS</b>					<b>(6Hrs)</b>				
<b>Time Series Analysis:</b> Auto - Covariance, Auto-correlation and their properties. Exploratory time series analysis, Test for trend and seasonality, Exponential and moving average smoothing, Holt – Winter smoothing, forecasting based on smoothing.										<b>CO5</b>
<b>Linear time series models:</b> Autoregressive, Moving Average, Autoregressive Moving Average and Autoregressive Integrated Moving Average models; Estimation of ARIMA models such as Yule-Walker estimation for AR Processes Maximum likelihood and least squares estimation for ARIMA Processes, Forecasting using ARIMA models.										
<b>Prescriptive Analytics:</b> Mathematical optimization, Networks modeling-Multi-objective optimization-Stochastic modeling, Decision and Risk analysis, Decision trees.										
<b>Text Books</b>										
1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.										
2. Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010.										
3. Ian H. Witten, Eibe Frank and Mark A. Hall "Data Mining: Practical Machine Learning Tools and Techniques", Fourth Edition, Elsevier, 2017.										
<b>Reference Books</b>										
1. Box, G.E.P. and Jenkins, G.M., <i>Time Series Analysis, Forecasting and Control</i> , 5th Edition, 2015.										
2. Draper, N. R. and Smith, H., "Applied Regression Analysis", Third Edition, John Wiley, 1998.										
3. Hosmer, D. W. and Lemeshow, S., "Applied Logistic Regression", Third Edition, Wiley, 2003.										
<b>Web References</b>										
1. <a href="https://nptel.ac.in/courses/106/105/106105174/">https://nptel.ac.in/courses/106/105/106105174/</a>										
2. <a href="https://nptel.ac.in/courses/110/106/110106072/">https://nptel.ac.in/courses/110/106/110106072/</a>										

3. [https://www.tutorialspoint.com/data\\_mining/index.htm](https://www.tutorialspoint.com/data_mining/index.htm)
4. <https://www.javatpoint.com/data-mining>
5. <https://www.guru99.com/data-mining-tutorial.html>.

\* 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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBE510</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>E-COMMERCE AND E-PAYMENT SYSTEMS</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Learn how companies use e-commerce to gain competitive advantage.						<b>(K2)</b>	
	<b>CO2</b>	Learn different models of e-commerce.						<b>(K2)</b>	
	<b>CO3</b>	Understand about e-payment systems.						<b>(K3)</b>	
	<b>CO4</b>	Understand about the various retail and digital payment systems.						<b>(K3)</b>	
<b>CO5</b>	Gain knowledge of Security aspects in e-payment systems.						<b>(K2)</b>		
<b>UNIT-I</b>	<b>INTRODUCTION</b>					<b>(6Hrs)</b>			
<b>Introduction to e-Commerce:</b> Framework – Architecture - Benefits of e-Commerce - Anatomy of e-Commerce applications- e-Commerce applications, e-Commerce Applications - e-commerce in India.									
<b>UNIT-II</b>	<b>E-COMMERCE MODELS</b>					<b>(6Hrs)</b>			
Business-to-Business – Hubs - Market Places - Business-to-Business Exchange -Business-to-Consumer - Consumer-to-consumer - Business-to-Government - Government-to-Government.									
<b>UNIT-III</b>	<b>PAYMENT SYSTEMS</b>					<b>(6Hrs)</b>			
<b>Payment System – Background – Business Models – Technology Models - National Payments Corporation of India (NPCI) – Roles – Functions</b>									
<b>High value Payments - Automated clearing and settlement systems – Payment graphs. Real-time gross settlement: Fedwire. Check clearing. SWIFT, SFMS- Real Time Gross Settlement System (RTGS) - Securities Settlement System (SSS) -Electronic Clearing Service (ECS) – National Electronic Fund Transfer (NEFT) – Money Transfer Service Scheme (MTSS) - Electronic Bill Payment and Presentment</b>									
<b>UNIT- IV</b>	<b>RETAIL AND DIGITAL PAYMENT SYSTEMS</b>					<b>(6Hrs)</b>			
Automated Teller Machines (ATMs) - Electronic Funds Transfer – Immediate Payment Service (IMPS) - The Unified Payments Interface (UPI) - Bharat Bill Payment System (BBPS) – Card Payments - Mobile Payments - Aadhar Pay UPI Payments - Bharat QR Code - Digital Wallets – BankWallets – Private Wallets, RuPay card - Aadhar Payment Systems - Aadhaar Payments Bridge (APB) - Aadhaar Enabled Payment System (AEPS) – Micro Payments - micro ATM – Other Digital Payment Systems -Electoral bond - Digital Currencies - Blockchain technology – Bitcoin									
<b>UNIT- V</b>	<b>SECURITY IN E-COMMERCE</b>					<b>(6Hrs)</b>			
Securing the Business on Internet - Security Policy - Procedures and Practices - Transaction Security, Cryptology Digital Signatures - Security Protocols for Web Commerce, E-payment Security – AI and Machine Learning – Smart Payments – Future Payments Systems									
<b>Text Books</b>									
1. Jeffrey F.Rayport and Bernard J.Jaworski, Introduction to E-commerce, TMH, 2003.									
2. Kalakota and Winston, Frontiers of E-commerce, Pearson Education, Mumbai, 2002.									
3. Jaspal Singh , Digital Payments in India: Background, Trends and Opportunities, New Century Publications, November 2019.									
<b>Reference Books</b>									
1. Elias M.Awad, Electronic Commerce, Prentice-Hall India, New Delhi,.2007.									
2. Susanne Chishti, Tony Craddock, Robert Courtneidge, Markos Zachariadis,The PAYTECH Book: The Payment Technology Handbook for Investors, Entrepreneurs, and FinTech Visionaries, Wiley, December 2019.									
3. Skip Allums,Designing Mobile Payment Experiences: Principles and Best Practices for Mobile Commerce, O'Reilly, June 2019.									
<b>Web References</b>									
1. <a href="https://www.tutorialspoint.com/e_commerce/">https://www.tutorialspoint.com/e_commerce/</a>									
2. <a href="https://nptel.ac.in/content/storage2/courses/106108103/pdf/PPTs/mod13.pdf">https://nptel.ac.in/content/storage2/courses/106108103/pdf/PPTs/mod13.pdf</a>									
3. <a href="https://study.com/academy/course/e-commerce-help-tutorials.html">https://study.com/academy/course/e-commerce-help-tutorials.html</a> .									
* 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



Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23CBEP51</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>BUSINESS INTELLIGENCE AND APPLICATIONS LABORATORY</b>		L	T	P	C	CAM	ESE	TM
			0	0	2	1	50	50	100
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Demonstrate the handling of legacy data and migrate into BI platform						<b>K2</b>	
	<b>CO2</b>	Perform ETL Process						<b>K2</b>	
	<b>CO3</b>	Report data using suitable visualization techniques.						<b>K3</b>	
	<b>CO4</b>	Use supervised and unsupervised models for classification and clustering data.						<b>K3</b>	
	<b>CO5</b>	Apply linear and logistic regression techniques on given dataset						<b>K3</b>	
<b>List of Experiments</b>									
<ol style="list-style-type: none"> <li>1. Import the legacy data from different sources such as ( Excel , SqlServer, Oracle etc.) and load in the target system ( You can download sample database such as Adventureworks, Northwind, foodmart etc.)</li> <li>2. Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.</li> <li>3. a). Create the Data staging area for the selected database. b). Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model</li> <li>4. a). Create the ETL map and setup the schedule for execution. b). Execute the MDX queries to extract the data from the datawarehouse.</li> <li>5. a). Import the datawarehouse data in Microsoft Excel and create the Pivot table and Pivot Char b). Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.</li> <li>6. Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.</li> <li>7. Perform the data classification using classification algorithm.</li> <li>8. Perform the data clustering using clustering algorithm.</li> <li>9. Perform the Linear regression on the given data warehouse data.</li> <li>10. Perform the logistic regression on the given data warehouse data</li> </ol>									
<b>Lecture Periods:</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for decision making", 1st Edition, Wiley, 2009..</li> <li>2. Efraim Turban, Ramesh Sharda, Dursun Delen "Decision Support and Business Intelligence Systems", Pearson, 9 Edition 2011.</li> <li>3. Grossmann W, Rinderle-Ma "Fundamental of Business Intelligence" Springer, 1st Edition, 2015</li> </ol>									
<b>Web references</b>									
<ol style="list-style-type: none"> <li>1. <a href="http://www.microsoft.com/en-us/sql-server/sql-business-intelligence">www.microsoft.com/en-us/sql-server/sql-business-intelligence</a></li> <li>2. <a href="https://www.datapine.com/blog/business-intelligence-concepts-and-bi-basics/">https://www.datapine.com/blog/business-intelligence-concepts-and-bi-basics/</a></li> <li>3. <a href="http://www.cio.com/article/2439504/business-intelligence-definition-and-solutions.html">www.cio.com/article/2439504/business-intelligence-definition-and-solutions.html</a></li> <li>4. <a href="https://data-flair.training/blogs/business-intelligence">https://data-flair.training/blogs/business-intelligence</a></li> </ol>									
* 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	1	-
4	3	2	1	1	3	-	-	-	-	-	-	1	2	-	1
5	3	2	1	1	3	-	-	-	-	-	-	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
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	<b>Computer Science and Engineering and Business Systems</b>	Programme: <b>B.Tech.</b>						
Semester	<b>V</b>	Course Category: <b>PE</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23CBEP52</b>	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>ROBOTICS AND EMBEDDED SYSTEMS LABORATORY</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)
	<b>CO1</b>	Perform Arithmetic operation using 8051.						<b>K2</b>
	<b>CO2</b>	Interface ADC, DAC, LED and PWN.						<b>K2</b>
	<b>CO3</b>	Interface with real time clock, serial port, keyboard and LCD.						<b>K3</b>
	<b>CO4</b>	Build a Self-Driving Robot.						<b>K5</b>
	<b>CO5</b>	Build a basic obstacle-avoiding robot.						<b>K5</b>
<b>List of Experiments</b>								
<ol style="list-style-type: none"> <li>1. Arithmetic Operations using 8051</li> <li>2. Interfacing ADC and DAC</li> <li>3. Interfacing LED and PWM</li> <li>4. Interfacing real time clock and serial port</li> <li>5. Interfacing keyboard and LCD</li> <li>6. Flashing of LEDES</li> <li>7. Interfacing stepper motor and temperature sensor.</li> <li>8. Study of robotic arm and its configuration</li> <li>9. Study the robotic end effectors</li> <li>10. Build a Self-Driving Robot that can automatically follow a line</li> <li>11. Build a basic obstacle-avoiding robot and improve the design to help it avoid getting stuck</li> </ol>								
<b>Lecture Periods:</b>		<b>Tutorial Periods:</b>		<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>		
<b>Reference Books</b>								
<ol style="list-style-type: none"> <li>1. Introduction to Embedded Systems : Shibu K. V. (TMH)</li> <li>2. Embedded System Design – A unified hardware and software introduction: F. Vahid (John Wiley)</li> <li>3. Embedded Systems : Rajkamal (TMH)</li> <li>4. Embedded Systems : L. B. Das (Pearson)</li> <li>5. The 8051 Microcontroller and embedded systems by Muhammad Ali Mazidi, PHI.</li> <li>6. Robotics: Fundamental Concepts and Analysis, Oxford University Press</li> <li>7. Embedded System design : S. Heath (Elsevier)</li> <li>8. Embedded microcontroller and processor design: G. Osborn (Pearson)</li> <li>9. Embedded systems design by Steve Heath, Newnes.</li> </ol>								
<b>Web references</b>								
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/108/102/108102045/">https://nptel.ac.in/courses/108/102/108102045/</a></li> <li>2. <a href="https://www.embeddedrelated.com/tutorials.php">https://www.embeddedrelated.com/tutorials.php</a></li> <li>3. <a href="https://www.tutorialspoint.com/embedded_systems/index.htm">https://www.tutorialspoint.com/embedded_systems/index.htm</a></li> <li>4. <a href="https://www.javatpoint.com/robotics-tutorial">https://www.javatpoint.com/robotics-tutorial</a></li> <li>5. <a href="http://www.robotictutorials.com/">http://www.robotictutorials.com/</a></li> </ol>								
* 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	1	-
4	3	2	1	1	3	-	-	-	-	-	-	1	2	-	1
5	3	2	1	1	3	-	-	-	-	-	-	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
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	<b>Computer Science and Engineering and Business Systems</b>	Programme: <b>B.Tech.</b>						
Semester	<b>V</b>	Course Category: <b>PE</b>				*End Semester Exam Type: <b>LE</b>		
Course Code	<b>U23CBEP53</b>	Periods / Week			Credit	Maximum Marks		
Course Name	<b>WEB APPLICATIONS LABORATORY</b>	L	T	P	C	CAM	ESE	TM
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)
	<b>CO1</b>	Construct a basic website using HTML and Cascading Style Sheets.						<b>K3</b>
	<b>CO2</b>	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.						<b>K3</b>
	<b>CO3</b>	Construct simple web pages in PHP and to represent data in XML format.						<b>K3</b>
	<b>CO4</b>	Design and implement server side programs using PHP.						<b>K5</b>
	<b>CO5</b>	Design database manipulation using MySQL and authenticate data.						<b>K5</b>

#### List of Experiments

1. Create a HTML page with frames, links, tables and other tags for highlighting the facilities in the Department in your College. State the assumptions you make (business logic you are taking into consideration).
2. Create a web page with the following using HTML:
  - a. To embed a map in a web page.
  - b. To fix the hot spots in that map.
  - c. Show all the related information when the hot spots are clicked.
 Embed an image map picture (India map) on a Web page that provides different links to other Web pages (different states) and show the all the related information depending on where a user clicks on the image.  
 Create a webpage to embed a human body image, identify and display all the related information about the human body parts (head, eye, nose, finger etc.) based on the user clicks on the human body image map.
3. Create a web page with the following:
  - a. Cascading style sheets.
  - b. Embedded style sheets.
  - c. Inline style sheets.
  - d. Use your college information for the web pages.
4. Create a User Registration form with First Name, Last name, Address, City, State, Country, Pincode, Username and Password fields for a General login webpage and satisfy the following criteria:
  - a. Create a validate() function that does the following:
  - b. Checks that the First Name, Last Name, City, Country, Username, and Password fields are filled out.
  - c. Checks that the Pincode is exactly 6 numeric.
  - d. Checks that the state is exactly two characters.
  - e. Checks that the email is a valid email address.
    - false if email has fewer than 6 characters
    - false if email does not contain an @ symbol
    - false if email does not contain a period (.)
    - true otherwise
5. Write a JavaScript to implement the following various events.
6. Write a program to create and Build a Password Strength Check using JQuery.
7. Write a program to create and Build a star rating system using JQuery.
8. Write A program for sending request to a server by usingAJAX.
9. Develop an Angular JS application that displays a list of shopping items. Allow users to add and remove items from the list using directives and controllers. Note: The default values of items may be included in the program.
10. Write a program to create a simple calculator Application using React JS.
11. Write a program to create a voting application using React JS.
12. Write a serverside program for Accessing MongoDB from Node.js.
13. Write a serverside program for Manipulating MongoDB from Node.js.

<b>Lecture Periods:</b>	<b>Tutorial Periods:</b>	<b>Practical Periods: 30</b>	<b>Total Periods: 30</b>
<b>Reference Books</b>			

2. A.11.83

1. Deitel P. J., Deitel H. M. and Deitel A., "Internet and World Wide Web: How to Program", Fifth Edition, Pearson Prentice Hall, 2012.
2. Jon Duckett, "HTML & CSS: Design and Build Websites", First Edition, John Wiley & Sons, 2011.
3. Naramore E., Gerner J., Scouarnec Y.L., et al., "Beginning PHP5, Apache, MySQL Web Development: Programmer Programmer", John Wiley & Sons Inc., 2005.
4. Sebesta R. W., "Programming the World Wide Web", Eight Edition, Pearson, 2014.
5. Pressman R. and Lowe D., "Web Engineering: a practitioner's approach", First Edition, Mc GrawHill, 2008.
6. Kappel G., et al., "Web Engineering: The Discipline of Systematic Development of Web Applications", First Edition, John Wiley & Sons, 2006.
7. Suh W., "Web Engineering: Principles and Techniques", Idea Group Inc., 2005.
8. Ullman L., "PHP for the Web: Visual Quickstart Guide", Fifth Edition, Peach pit Press, 2016

#### Web references

1. <https://www.w3schools.com/>
2. [https://www.tutorialspoint.com/internet\\_technologies/websites\\_development.htm](https://www.tutorialspoint.com/internet_technologies/websites_development.htm)
3. <https://developer.mozilla.org/en-US/docs/Learn>
4. <https://nptel.ac.in/courses/106/105/106105084/>
5. <https://nptel.ac.in/courses/106/106/106106222/>

\* 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	1	-
4	3	2	1	1	3	-	-	-	-	-	-	1	2	-	1
5	3	2	1	1	3	-	-	-	-	-	-	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
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23CBEP54</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>DATA MINING AND ANALYTICS LABORATORY</b>		L	T	P	C	CAM	ESE	TM
			<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Demonstrate the installation Weka and R - platform.							<b>K3</b>
	<b>CO2</b>	Perform loading and visualization of data.							<b>K3</b>
	<b>CO3</b>	Perform preprocessing tasks for the data set.							<b>K3</b>
	<b>CO4</b>	Develop applications using supervised and unsupervised algorithms.							<b>K5</b>
	<b>CO5</b>	Develop applications using linear and non-linear techniques.							<b>K5</b>
<b>List of Experiments</b>									
<ol style="list-style-type: none"> <li>1. Installing Weka and exploring a dataset.</li> <li>2. Loading a dataset and visualizing the Data</li> <li>3. Preprocessing a dataset from a real domain (Medical/Retail/Banking)</li> <li>4. Building a classifier- Run Decision Tree, Naïve Bayesian Classifier, KNN classifier and SVM.</li> <li>5. Mining Association Rules- Run Apriori Algorithm.</li> <li>6. Building a statistical model using a sample dataset – preprocessing, hypothesis building, model fitting, model validation and interpretation of results.</li> <li>7. Implementation of linear regression technique for statistical model building.</li> <li>8. Implementation of Non-linear regression technique for statistical model building.</li> </ol>									
<b>Lecture Periods:</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>	
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.</li> <li>2. Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010.</li> <li>3. Ian H. Witten, Eibe Frank and Mark A. Hall "Data Mining: Practical Machine Learning Tools and Techniques", Fourth Edition, Elsevier, 2017.</li> <li>4. Box, G.E.P and Jenkins G.M. (1970) Time Series Analysis, Forecasting and Control, Holden-Day.</li> <li>5. Draper, N. R. and Smith, H., "Applied Regression Analysis", Third Edition, John Wiley, 1998.</li> <li>6. Hosmer, D. W. and Lemeshow, S., "Applied Logistic Regression", Third Edition, Wiley, 2003.</li> </ol>									
<b>Web references</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/106/105/106105174/">https://nptel.ac.in/courses/106/105/106105174/</a></li> <li>2. <a href="https://nptel.ac.in/courses/110/106/110106072/">https://nptel.ac.in/courses/110/106/110106072/</a></li> <li>3. <a href="https://www.tutorialspoint.com/data_mining/index.htm">https://www.tutorialspoint.com/data_mining/index.htm</a></li> <li>4. <a href="https://www.javatpoint.com/data-mining">https://www.javatpoint.com/data-mining</a></li> <li>5. <a href="https://www.guru99.com/data-mining-tutorial.html">https://www.guru99.com/data-mining-tutorial.html</a></li> </ol>									
* 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
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100



Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>U23CBEP55</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>E-COMMERCE AND E-PAYMENT SYSTEMS LABORATORY</b>		L	T	P	C	CAM	ESE	TM
			<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Develop basic e-commerce portal.						<b>K5</b>	
	<b>CO2</b>	Perform validation on e-commerce portal.						<b>K3</b>	
	<b>CO3</b>	Include the search engine facility in e-commerce portal.						<b>K3</b>	
	<b>CO4</b>	Use of payment in e-commerce portals.						<b>K3</b>	
	<b>CO5</b>	Create online applications using e-commerce models .						<b>K3</b>	
<b>List of Experiments</b>									
<ol style="list-style-type: none"> <li>1. Create an E- Commerce website (Take your own concepts to develop the site.)</li> <li>2. Create and validate a form for E- Commerce website using Java script &amp; PHP</li> <li>3. Design and implementation of E-Commerce portal for product catalog</li> <li>4. Design and implementation of Search Engine for E- Commerce website</li> <li>5. Develop a Shopping Cart with an e-payment system.</li> <li>6. Create an Online e-learning platform</li> </ol>									
<b>Lecture Periods:</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>	
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Kalakota and Winston, Frontiers of E-commerce, Pearson Education, Mumbai, 2002.</li> <li>2. Jaspal Singh , Digital Payments in India: Background, Trends and Opportunities, New Century Publications, November 2019.</li> <li>3. Jeffrey F.Rayport and Bernard J.Jaworski, Introduction to E-commerce, TMH, 2003.</li> <li>4. Elias M.Awad, Electronic Commerce, Prentice-Hall India, New Delhi, 2007.</li> <li>5. Susanne Chishti, Tony Craddock, Robert Courtneidge, Markos Zachariadis, The PAYTECH Book: The Payment Technology Handbook for Investors, Entrepreneurs, and FinTech Visionaries, Wiley, December 2019.</li> <li>6. Skip Allums, Designing Mobile Payment Experiences: Principles and Best Practices for Mobile Commerce, O'Reilly, June 2019.</li> </ol>									
<b>Web references</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://www.tutorialspoint.com/e_commerce/">https://www.tutorialspoint.com/e_commerce/</a></li> <li>2. <a href="https://nptel.ac.in/content/storage2/courses/106108103/pdf/PPTs/mod13.pdf">https://nptel.ac.in/content/storage2/courses/106108103/pdf/PPTs/mod13.pdf</a></li> <li>3. <a href="https://study.com/academy/course/e-commerce-help-tutorials.html">https://study.com/academy/course/e-commerce-help-tutorials.html</a></li> </ol>									
* 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
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

# SEMESTER VI

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Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>HS</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23HST604</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>FINANCIAL AND COST ACCOUNTING</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the Fundamentals of Accounting and its processes.						<b>K2</b>	
	<b>CO2</b>	Understand accounting cycle and gain knowledge about final accounts preparation.						<b>K2</b>	
	<b>CO3</b>	Construct funds and cash flow statements and interpret them meaningfully.						<b>K3</b>	
	<b>CO4</b>	Understand the cost concepts and their application in costing estimates.						<b>K2</b>	
	<b>CO5</b>	Evaluate the financial statements given in an annual report of a corporate entity.						<b>K5</b>	
<b>UNIT-I</b>	<b>ACCOUNTING CONCEPTS AND PROCESS</b>					<b>(6Hrs)</b>			
Definition of Accounting – Accounting Principles- Accounting concepts and conventions – Accounting standards- Branches of Accounting - Book Keeping - Double Entry System- Accounting equation- Types of Accounts – Groups interested in Accounting information.									
<b>UNIT-II</b>	<b>ACCOUNTING CYCLE AND FINAL ACCOUNTS</b>					<b>(6Hrs)</b>			
Asset and Liability –Types - Accounting Cycle – Journal – Ledger - Trial Balance – Final Accounts - Trading, P & L - Balance sheet - (Simple Problem)- Annual Reports - Rectification of Errors - Subsidiary Books – Practical's using Tally									
<b>UNIT-III</b>	<b>FINANCIAL STATEMENT ANALYSIS</b>					<b>(6Hrs)</b>			
Financial Statements- Meaning- Types and Techniques- Comparative statement- Common size statement - Trend analysis – Ratio Analysis. Funds Flow Analysis – Concept of Funds and Flow – Statement of Changes in Working Capital – Funds From Operations – Funds Flow Statement – Uses and Limitations of Funds Flow Statements. Cash Flow Analysis – Meaning and Significance of Cash Flow Statements. Preparation of Cash Flow Statement as per Accounting Standard 3 – Format. Uses and Limitations of cash flow analysis (Practical Problems) – Application of Tally in Financial Statement Analysis.									
<b>UNIT- IV</b>	<b>COST ACCOUNTING</b>					<b>(6Hrs)</b>			
Definition and Meaning of Cost Accounting- Elements of Cost - Cost behaviour- Cost allocation- Over Head allocation- Types - Unit Costing- Job Costing- Process Costing-Marginal Costing- absorption Costing-Preparation of Cost Sheet (Simple Problems) - Application of Costing Concept in the Service Sector (Case Study) - ABC analysis.									
<b>UNIT- V</b>	<b>BUDGETS AND ANNUAL REPORTS</b>					<b>(6Hrs)</b>			
Definition of Budget - Need for Business Budgeting - Forecast and a Budget- Budgeting and budgetary Control- Meaning of Annual Reports- Statutory Requirements- Directors Report - Auditors Report - Notes to Accounts - Pitfalls in accounts.									
<b>Text Books</b>									
1. "Cost Accounting: A Managerial Emphasis" by Horngren, Datar, and Rajan, Pearson, 17th Edition, 2024 2. "Financial Statement Analysis and Security Valuation" by Penman, McGraw Hill, 6th Edition, 2023 3. Reddy, T.S., & Reddy, Y. Harim Prasad. <i>Financial and Management Accounting</i> . Margham Publications, 2021. 4. Iyengar, S.P. <i>Cost and Management Accounting</i> . S. Chand Publishing, 2020. 5. Ellet, W. <i>The Case Study Handbook, Revised Edition: A Student's Guide</i> . Harvard Business Review Press, 2018.									
<b>Reference Books</b>									
1. Libby, R., Libby, P., & Short, D. <i>Financial Accounting with Annual Report</i> . McGraw Hill Education, 2020. 2. Horngren, C.T., Sundem, G.L., Schatzberg, J.O., & Burgstahler, D. <i>Introduction to Management Accounting</i> . Pearson (Prentice Hall India), 2013. 3. Drury, C. <i>Management and Cost Accounting</i> . Cengage Learning (formerly International Thomson Business Press), 2018. 4. Williams, J. <i>Financial and Managerial Accounting: The Basis for Business Decisions</i> . Tata McGraw Hill Publishers, 2017. 5. Stice, E.K., & Stice, J.D. <i>Financial Accounting: Reporting and Analysis</i> . Cengage Learning, 2019. 6. Kishore, R.M. <i>Cost and Managerial Accounting</i> . Taxmann Publishers, 2018.									
<b>Web References</b>									
1. <a href="https://icmai.in/icmai/contact_us.php">https://icmai.in/icmai/contact_us.php</a>									

2. <https://home.kpmg/in/en/home/services/advisory/management-consulting/financial-management/cost-accounting-management.html>
3. <https://www.accounting.com/>
4. <https://www.erpgreat.com/general/case-study-financial-and-cost-accounting.htm>

\* 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	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-
2	1	2	1	-	-	-	1	-	-	-	-	-	1	1	-
3	1	2	1	1	-	-	1	-	-	-	1	-	1	1	-
4	1	2	2	1	-	-	1	-	-	1	-	-	1	1	-
5	1	2	1	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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBT611</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>COMPUTER NETWORKS ARCHITECTURES AND PROTOCOLS</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Explain SONET/SDH, DWDM, and ATM layers						<b>K2</b>	
	<b>CO2</b>	Analyze packet switching and TCP/IP protocol layers.						<b>K3</b>	
	<b>CO3</b>	Apply routing and traffic engineering concepts to networks.						<b>K4</b>	
	<b>CO4</b>	Implement network management and traffic sizing techniques.						<b>K5</b>	
	<b>CO5</b>	Explain multimedia transmission and Bluetooth architecture.						<b>K2</b>	
<b>UNIT-I</b>	<b>Introduction to Optical Networking and ATM Technology</b>					<b>(9Hrs)</b>			
Introduction to Optical Networking, SONET   SDH Standard, DWDM.									
ATM: The WAN Protocol: Introducing ATM Technology, Introducing Faces of ATM. Explaining the basic concepts of ATM Networking, Exploring the B-ISDN reference model, Explaining the Physical Layer, Explaining the ATM Layer, Explaining the ATM Adaptation Layer, Exploring ATM Physical interface, Choosing an Appropriate ATM Public Service								<b>CO1</b>	
<b>UNIT-II</b>	<b>Packet Switching, Virtual Circuits, and TCP/IP Protocols</b>					<b>(9Hrs)</b>			
Introduction to Packet Switching, Introduction to Virtual Circuit Packet Switching, Introduction to X.25, Introducing switched multimegabit data service.									
Introducing TCP/IP suite, Explaining Network Layer Protocols, Explaining Transport Layer Protocol, Explaining Application Layer Protocol								<b>CO2</b>	
<b>UNIT-III</b>	<b>Routing, Traffic Engineering, and IP over ATM</b>					<b>(9Hrs)</b>			
Routing in the Internet: Introduction to Intra-domain and inter-domain routings, Unicast Routing Protocols, Multicast Routing Protocols.									
Introduction to traffic Engineering, IP over ATM, Multiprotocol Label Switching, Storage Area Network.								<b>CO3</b>	
<b>UNIT- IV</b>	<b>Network Management and Traffic Engineering</b>					<b>(9Hrs)</b>			
Introduction to Network Management Standard Network Management Protocol.									
Introduction to traffic Engineering, Requirement Definition for Traffic Engineering, Traffic Sizing, Traffic Characteristics, Protocols. Time and Delay Consideration, Connectivity, Availability, Reliability, and Maintainability, Throughput Calculation.								<b>CO4</b>	
<b>UNIT- V</b>	<b>Multimedia Services and Bluetooth Technology</b>					<b>(9Hrs)</b>			
Introduction to Multimedia Services, Explaining Transmission of Multimedia over the Internet, Explaining IP Multicasting									
Explaining COIF In O 10 10 Bluetooth: Bluetooth Architecture, Bluetooth Applications, The Bluetooth Protocol Stack								<b>CO5</b>	
The Bluetooth Frame Structure									
<b>Text Books</b>									
1. "Advanced Computer Networks" by Achyut S. Gokhale, Cengage Learning, 5th Edition, 2023									
2. Dayan, Ambawade, Shah, D., & Mehra, M. <i>Advanced Computer Network</i> . Wiley India, 2012.									
3. Stallings, W. <i>High-Speed Networks and Internets: Performance and Quality of Service</i> (2nd ed.). Pearson, 2002.									
4. Forouzan, B.A. <i>TCP/IP Protocol Suite</i> (4th ed.). McGraw Hill, 2016.									
5. Tanenbaum, A.S., & Wetherall, D. <i>Computer Networks</i> (5th ed.). Pearson Education, 2011.									
<b>Reference Books</b>									
1. Ramaswami, R., Sivarajan, K., & Sasaki, G. <i>Optical Networks: A Practical Perspective</i> (3rd ed.). Morgan Kaufmann, 2009.									
2. Doyle, J., & Carroll, J. <i>Routing TCP/IP, Volume 1</i> (2nd ed.). Cisco Press, 2005.									
3. Huang, A.S., & Rudolph, L. <i>Bluetooth Essentials for Programmers</i> . Cambridge University Press, 2007.									
<b>Web References</b>									
1. <a href="https://www.sciencedirect.com/topics/computer-science/bluetooth">https://www.sciencedirect.com/topics/computer-science/bluetooth</a>									
2. <a href="https://archive.nptel.ac.in/courses/106/105/106105183/">https://archive.nptel.ac.in/courses/106/105/106105183/</a>									

\* 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	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
2	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1
3	3	2	1	1	-	-	-	-	-	-	-	-	2	1	1
4	3	2	1	1	-	-	-	-	-	-	-	1	2	1	-
5	2	1	-	-	-	-	-	-	-	-	-	1	2	-	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	5	75	100

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



Academic Curriculum and Syllabi R-2023

Department	<b>Artificial Intelligence and Data Science</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category Code: <b>PC</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ADTC02</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>NLP AND CHATBOT</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Common to AI & DS, CSE & BS									
Prerequisite	Machine Learning, Deep Learning and Programming in Python								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Interpret fundamental concepts of NLP and apply them for text processing							<b>K2</b>
	<b>CO2</b>	Apply different parsing techniques for syntactic and semantic analysis							<b>K3</b>
	<b>CO3</b>	Apply machine translation techniques for summarizing text and question answering.							<b>K3</b>
	<b>CO4</b>	Understand the structure and technology behind human-computer conversations for building chatbots							<b>K2</b>
	<b>CO5</b>	Determine various techniques to build a conversational interface							<b>K3</b>
<b>UNIT-I</b>	<b>Introduction</b>					<b>Periods: 9</b>			
Introduction to NLP – NLP preprocessing steps – NLP Feature Engineering - Words - Structure - spellcheck, morphology using FSTs - Semantics - Lexical Semantics, word count vector, WordNet and WordNet based similarity measures, Distributional measures of similarity, Concept Mining - Word Sense Disambiguation - supervised, unsupervised and semi-supervised approaches - Parts of Speech.									<b>CO1</b>
<b>UNIT-II</b>	<b>Language Modelling</b>					<b>Periods:9</b>			
Sentences - Basic ideas in compositional semantics, Classical Parsing – different types of parsing - Bottom up, top down, Dynamic Programming - Parsing using Probabilistic Context Free Grammars and Expectation - Maximization based approaches for learning PCFG parameters. Language Modelling.									<b>CO2</b>
<b>UNIT-III</b>	<b>Machine Translation</b>					<b>Periods:9</b>			
Machine Translation - rule-based techniques, Statistical Machine Translation, parameter learning using Expectation - Maximization - Information Extraction - Introduction to Named Entity Recognition and Relation Extraction - Natural Language Generation - the potential of using ML - Advanced Language Modelling – Applications - summarization, question answering.									<b>CO3</b>
<b>UNIT-IV</b>	<b>Chatbot</b>					<b>Periods:9</b>			
Chatbot – Design of a Chatbot - Introduction to Conversational Interface - Preliminaries, developing a speech based Conversational Interface, Conversational Interface and devices - Technology of Conversation: Introduction - Conversation as Action - The structure of Conversation - The language of Conversation.									<b>CO4</b>
<b>UNIT-V</b>	<b>Conversational Interface</b>					<b>Periods:9</b>			
Developing a Speech-Based Conversational Interface - Implementing Text to Speech - Text Analysis - Wave Synthesis - Implementing Speech Recognition - Language Model, Acoustic Model - Decoding - Speech Synthesis Mark-up Language - Advanced voice user interface design – Advanced Chatbots.									<b>CO5</b>
<b>Lecture Periods:45</b>			<b>Tutorial Periods:-</b>			<b>Practical Periods:-</b>		<b>TotalPeriods:45</b>	
<b>Text Books</b>									
1. R. James Allen, "Natural Language Understanding", 3rd Edition, Pearson Education, 2019.									
2. Srinu Janarthnam, "Hands-On Chatbots and Conversational UI Development: Build chatbots", Published by Packet Publishing Ltd., Second Edition, 2020.									
3. Daniel Jurafsky and James H Martin," Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 3rd Edition, 2024.									
4. Philipp Koehn "Neural Machine Translation" to Neural Machine Translation, Cambridge University Press, 1st edition, 2020.									

## Academic Curriculum and Syllabi R-2023

### Reference Books

1. Sohom Ghosh, Dwight Gunning, "Natural Language Processing Fundamentals", Packt Publishing Ltd., 1<sup>st</sup> edition, 2019.
2. Jacob Eisenstein, "Introduction to Natural Language Processing", MIT Press, 1st Edition, 2019.
3. Cathy Pearl, "Designing Voice User Interfaces: Principles of Conversational Experiences", Shroff/O'Reilly, First Edition, 2017.
4. Abhishek Singh, Karthik Ramasubramanian, Shrey Shivam, "Building an Enterprise Chatbot: Work with Protected Enterprise Data using Open-Source Frameworks", Apress, 2019.
5. Michael McTear, "Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots", Publishing Springer 1<sup>st</sup> Edition 2020.

### Web References

1. [https://onlinecourses.nptel.ac.in/noc23\\_cs45/preview](https://onlinecourses.nptel.ac.in/noc23_cs45/preview)
2. <https://towardsdatascience.com/>
3. <https://www.geeksforgeeks.org/natural-language-processing-nlp-tutorial/>
4. <https://www.analyticsvidhya.com/blog/2021/02/basics-of-natural-language-processing/>

### 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	3	3	2	-	-	-	-	-	-	2	2	2
2	2	3	3	3	2	1	-	-	-	-	-	-	2	2	1
3	2	3	3	2	1	-	-	-	-	-	-	-	2	2	1
4	2	2	3	2	3	2	-	-	-	-	-	-	2	3	1
5	3	2	2	3	3	1	-	-	-	-	-	-	2	2	2

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

### Evaluation Methods

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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBT612</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>INFORMATION SECURITY</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the fundamentals of computer security						<b>K2</b>	
	<b>CO2</b>	Describe the various access control models and security policies						<b>K2</b>	
	<b>CO3</b>	Apply the concepts of system design						<b>K3</b>	
	<b>CO4</b>	Use of logic based system to protect from intruders						<b>K3</b>	
	<b>CO5</b>	Understand about the operating system and database security						<b>K3</b>	
<b>UNIT-I</b>	<b>OVERVIEW OF INFORMATION SECURITY</b>					<b>(6Hrs)</b>			
Overview of Security Parameters: Confidentiality, integrity and availability; Security violation and threats; Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle.									
<b>UNIT-II</b>	<b>ACCESS CONTROL MODELS AND SECURITY POLICIES</b>					<b>(6Hrs)</b>			
Access Control Models: Discretionary, mandatory, roll-based and task-based models, unified models, access control algebra, temporal and spatio-temporal models.									
Security Policies: Confidentiality policies, integrity policies, hybrid policies, non-interference and policy composition, international standards									
<b>UNIT-III</b>	<b>SYSTEM DESIGN</b>					<b>(6Hrs)</b>			
Design principles, representing identity, control of access and information flow, confinement problem. Assurance: Building systems with assurance, formal methods, evaluating systems.									
<b>UNIT-IV</b>	<b>LOGIC-BASED SYSTEM</b>					<b>(6Hrs)</b>			
Malicious logic, vulnerability analysis, auditing, intrusion detection. Applications: Network security, operating system security, user security, program security. Special Topics: Data privacy, introduction to digital forensics, enterprise security specification.									
<b>UNIT-V</b>	<b>OPERATING SYSTEMS AND DATABASE SECURITY</b>					<b>(6Hrs)</b>			
Operating Systems Security: Security Architecture, Analysis of Security in Linux/Windows.									
Database Security: Security Architecture, Enterprise security, Database auditing.									
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>1. <i>Fundamentals of Information Systems Security</i> by David Kim and Michael G. Solomon (2023)</li> <li>2. <i>Cracking the Blockchain Code</i> by Dikla Barda, Roman Zaikin, and Oded Vanunu (2023)</li> <li>3. Ross Anderson, "Security Engineering: A Guide to Building Dependable Distributed Systems", Third Edition, Wiley, 2021.</li> <li>4. M. Bishop, "Computer Security: Art and Science", 2nd Edition, Pearson Education, 2019.</li> <li>5. M. Stamp, "Information Security: Principles and Practice", 2nd Edition, Wiley, 2011..</li> </ol>									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. C.P. Pfleeger, S.L. Pfleeger, J. Margulies, "Security in Computing", 5th Edition, Prentice Hall, 2015.</li> <li>2. David Wheeler, "Secure Programming HOW TO", v3.010 Edition, 2003.</li> <li>3. Michael Zalewski, "Browser Security Handbook", Google Inc., 2009.</li> <li>4. M. Gertz, S. Jajodia, "Handbook of Database Security", Springer, 2008.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/106/106/106106129/">https://nptel.ac.in/courses/106/106/106106129/</a></li> <li>2. <a href="https://www.omniseccu.com/security/index.php">https://www.omniseccu.com/security/index.php</a></li> <li>3. <a href="https://www.w3schools.com/cybersecurity/index.php">https://www.w3schools.com/cybersecurity/index.php</a></li> <li>4. <a href="http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Byte_Karma/index.html">http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Byte_Karma/index.html</a></li> <li>5. <a href="https://www.javatpoint.com/cyber-security-tutorial">https://www.javatpoint.com/cyber-security-tutorial</a></li> </ol>									

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\* 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	5	75	100

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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBB602</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>DATA VISUALIZATION AND ANALYTICAL TECHNIQUES</b>		L	T	P	C	CAM	ESE	TM
			<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Apply mathematics and basic science knowledge for designing information visualizing System.							<b>K2</b>
	<b>CO2</b>	Collect data ethically and solve engineering problem in visualizing the information							<b>K3</b>
	<b>CO3</b>	Implement algorithms and techniques for interactive information visualization							<b>K5</b>
	<b>CO4</b>	Conduct experiments by applying various modern visualization tool and solve the space layout problem.							<b>K3</b>
	<b>CO5</b>	Analyze and design system to visualize multidisciplinary multivariate Data individually or in teams.							<b>K6</b>
<b>UNIT-I</b>	<b>INTRODUCTION</b>					<b>(10Hrs)</b>			
Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools. Mapping - Time Series - Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs									<b>CO1</b>
<b>UNIT-II</b>	<b>VISUALIZATION TECHNIQUES FOR TIME-SERIES, TREES &amp; GRAPHS</b>					<b>(10Hrs)</b>			
Mapping - Time series - Connections and correlations – Indicator-Area chart-Pivot tableScatter charts, Scatter maps - Tree maps, Space filling and non-space filling methodsHierarchies and Recursion - Networks and Graphs- Displaying Arbitrary Graphs-node link graph-Matrix representation for graphs- Info graphics									<b>CO2</b>
<b>UNIT-III</b>	<b>TEXT AND DOCUMENT VISUALIZATION</b>					<b>(10Hrs)</b>			
Acquiring data, - Where to Find Data, Tools for Acquiring Data from the Internet, Locating Files for Use with Processing, Loading Text Data, Dealing with Files and Folders, Listing Files in a Folder ,Asynchronous Image Downloads, Web Techniques, Parsing data - Levels of Effort, Tools for Gathering Clues, Text Markup Languages, Regular Expressions, Grammars and BNF Notation, Compressed Data, Vectors and Geometry, Binary Data Formats, Advanced Detective Work.									<b>CO3</b>
<b>UNIT- IV</b>	<b>INTRODUCTION TO DATA VISUALIZATION AND TABLEAU BASICS</b>					<b>(15Hrs)</b>			
<b>List of Exercises:</b>									
1. Understanding Data: What is Data, Where to Find Data, Foundations for Building Data Visualizations, Creating Your First Visualization									
2. Getting Started with Tableau Software: Using Data File Formats, Connecting Your Data to Tableau, Creating Basic Charts (Line, Bar Charts, Tree Maps), Using the Show Me Panel									
3. Tableau Calculations: Overview of SUM, AVG, and Aggregate Features, Creating Custom Calculations and Fields									
4. Applying New Data Calculations to Your Visualizations: Formatting Visualizations, Formatting Tools and Menus, Formatting Specific Parts of the View									
5. Editing and Formatting Axes, Manipulating Data in Tableau, Pivoting Tableau Data									
<b>UNIT- V</b>	<b>ADVANCED VISUALIZATION AND DASHBOARD CREATION IN TABLEAU</b>					<b>(15Hrs)</b>			
<b>List of Exercises:</b>									
1. Structuring Your Data: Sorting and Filtering Tableau Data, Pivoting Tableau Data									
2. Advanced Visualization Tools: Using Filters, The Detail Panel, The Size Panel, Customizing Filters, Using and Customizing Tooltips, Formatting Data with Colors									
3. Creating Dashboards & Storytelling: Building Your First Dashboard and Story, Designing for Different Displays Adding Interactivity to Dashboards, Distributing & Publishing Your Visualization									
4. Tableau File Types: Publishing to Tableau Online, Sharing Your Visualizations, Printing, and Exporting									

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5. Creating Custom Charts: Cyclical Data and Circular Area Charts, Dual Axis Charts

**Text Books**

1. Robert Spence, "Information Visualization An Introduction", Third Edition, Pearson Education, 2014.
2. Colin Ware, "Information Visualization Perception for Design", Third edition, Morgan Kaufmann Publishers, 2012.
3. Robert Spence, "Information Visualization Design for Interaction", Second Edition, Pearson Education, 2006.

**Reference Books**

1. Benjamin B. Bederson and Ben shneiderman, "The Craft of Information Visualization", Morgan Kaufmann Publishers, 2003.
2. Thomas strothotte, "Computational Visualization: Graphics, Abstraction and Interactivity", Springer, 1998.
3. Matthew O. Ward, George Grinstein, Daniel Keim, "Interactive Data Visualization: Foundation, Techniques and Applications", Second Edition, A. K. Peters/CRC Press, 2015.
4. Joerg Osarek, "Virtual Reality Analytics", Gordon's Arcade, 2016.

\* 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 (Practical – Internal Evaluation)	End Semester Examination (ESE) Marks (Theory)	Total Marks
	Continuous Assessment (Theory)					Continuous Assessment (Practical)						
	CAT 1	CAT 2	Model	Attendance	Total	Conduct ion of Practica l	Rep ort	Viva	Tot al			
Marks	5	5	5	5	20*	15	10	5	30*	30	75**	-
<i>*To be weighted for 10 Marks</i>					10	<i>*To be weighted for 10 Marks</i>			10		<i>*To be weighted for 50 Marks</i>	100

Department	<b>Computer Science and Engineering and Business Systems</b>	Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>	Course Category: <b>PC</b>				*End Semester Exam Type: <b>LE</b>		
Course Code	<b>U23CBP609</b>	Periods / Week			Credit	Maximum Marks		
Course Name	<b>COMPUTER NETWORKS ARCHITECTURES AND PROTOCOLS LABORATORY</b>	L	T	P	C	CAM	ESE	TM
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>
Course Outcome	<i>After completion of the course, the students will be able to</i>							BT Mapping (Highest Level)
	<b>CO1</b>	Configure network using commands.						<b>K2</b>
	<b>CO2</b>	Implement subnet masking and setting up local area network						<b>K5</b>
	<b>CO3</b>	Implement socket programming using TCP and UDP protocols.						<b>K3</b>
	<b>CO4</b>	Simulate sliding window protocol.						<b>K4</b>
	<b>CO5</b>	Implement address resolution protocol.						<b>K5</b>
<b>List of Experiments</b>								
<ol style="list-style-type: none"> <li>Learn to use basic commands</li> <li>Configuration of Network in Linux Environment.</li> <li>Assignment of IP Address to computers.</li> <li>Implementation of Subnet mask in IP addressing.</li> <li>Implementation of setup of a Local Area Network (using Switches) – Minimum 3 nodes and Internet</li> <li>To capture, save, and analyse network traffic on TCP / UDP / IP / HTTP / ARP /DHCP /ICMP /DNS using Wireshark Tool.</li> <li>Write a socket PING program to test the server connectivity.</li> <li>Study of system administration and network administration</li> <li>Study of socket programming and client server model using TCP and UDP.</li> <li>Programs using TCP Sockets (like date and time server &amp; client, echo server &amp; client, chat etc.)</li> <li>Programs using UDP Sockets (like echo server, chat, simple DNS).</li> <li>Simulation of sliding window.</li> <li>Implementation of ARP.</li> </ol>								
<b>Lecture Periods:</b>		<b>Tutorial Periods:</b>		<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>		
<b>Web references</b>								
<ol style="list-style-type: none"> <li><a href="http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php">http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php</a></li> <li><a href="http://vlabs.iitkgp.ernet.in/ant/">http://vlabs.iitkgp.ernet.in/ant/</a></li> <li><a href="https://www.javatpoint.com/computer-network-tutorial">https://www.javatpoint.com/computer-network-tutorial</a> <a href="https://www.tutorialspoint.com/data_communication_computer_network/">https://www.tutorialspoint.com/data_communication_computer_network/</a></li> <li><a href="https://www.geeksforgeeks.org/computer-network-tutorials/">https://www.geeksforgeeks.org/computer-network-tutorials/</a></li> </ol>								
<b>Reference Books</b>								
<ol style="list-style-type: none"> <li>Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 5th edition, Pearson education, 2016.</li> <li>William Stallings, "Data and Computer Communication", 10th edition, Pearson education, 2017.</li> <li>Behrouz A .Forouzan, Data communication and Networking, 5thEdition, Mc Graw-Hill, India, 2014</li> <li>Kaufman, R. Perlman and M. Speciner, "Network Security", Pearson education, 2017.</li> <li>W. Richard Stevens, "UNIX Network Programming, Vol. 1,2 &amp; 3", Prentice-Hall of India, 2004..</li> <li>Davie Bruce S. and Peterson Larry L., "Computer Networks - A System Approach", 5th Edition, Morgan Kaufmann, 201. Elsevier Inc</li> </ol>								
* TE – Theory Exam, LE – Lab Exam								

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



Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>							
Semester	<b>VI</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>LE</b>				
Course Code	<b>U23CBP610</b>		Periods / Week			Credit	Maximum Marks			
Course Name	<b>INFORMATION SECURITY LABORATORY</b>		L	T	P	C	CAM	ESE	TM	
			<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>100</b>	
Course Outcome	<i>After completion of the course, the students will be able to</i>							BT Mapping (Highest Level)		
	<b>CO1</b>	Analysis the security in different operating systems.							<b>K3</b>	
	<b>CO2</b>	Administrate the different users, setting up privileges and roles.							<b>K3</b>	
	<b>CO3</b>	Implement IT audit, Malware analysis and perform vulnerability assessment.							<b>K5</b>	
	<b>CO4</b>	Implement mobile audit and digital forensics tools for disk imaging, data acquisition, data extraction and data analysis and recovery.							<b>K5</b>	
	<b>CO5</b>	Identify web vulnerabilities.							<b>K3</b>	
<b>List of Experiments</b>										
<ol style="list-style-type: none"> <li>1. Analysis of security in Unix/Linux.</li> <li>2. Administration of users, password policies, privileges and roles.</li> <li>3. Implementation of discretionary access control and mandatory access control.</li> <li>4. Demonstrate intrusion detection system (ids) using any tool Eg. Snort or any other software.</li> <li>5. Implementation of IT audit, malware analysis and vulnerability assessment and generate the report.</li> <li>6. Implementation of mobile audit and generate the report of the existing artifacts.</li> <li>7. Implementation of OS hardening and RAM dump analysis to collect the artifacts and other information.</li> <li>8. Implementation of digital forensics tools for disk imaging, data acquisition, data extraction and data analysis and recovery.</li> <li>9. Perform mobile analysis in the form of retrieving call logs, SMS log, all contacts list using the forensics tool like SAFT.</li> <li>10. Implementation to identify web vulnerabilities, using OWASP project.</li> </ol>										
<b>Lecture Periods:</b>			<b>Tutorial Periods:</b>			<b>Practical Periods: 30</b>		<b>Total Periods: 30</b>		
<b>Web references</b>										
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/106/106/106106129/">https://nptel.ac.in/courses/106/106/106106129/</a></li> <li>2. <a href="https://www.omniseclu.com/security/index.php">https://www.omniseclu.com/security/index.php</a></li> <li>3. <a href="https://www.w3schools.com/cybersecurity/index.php">https://www.w3schools.com/cybersecurity/index.php</a></li> <li>4. <a href="http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Byte_Karma/index.html">http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Byte_Karma/index.html</a></li> <li>5. <a href="https://www.javatpoint.com/cyber-security-tutorial">https://www.javatpoint.com/cyber-security-tutorial</a></li> </ol>										
<b>Reference Books</b>										
<ol style="list-style-type: none"> <li>1. Ross Anderson, "Security Engineering: A Guide to Building Dependable Distributed Systems", Third Edition, Wiley, 2021.</li> <li>2. M. Bishop, "Computer Security: Art and Science", 2nd Edition, Pearson Education, 2019.</li> <li>3. M. Stamp, "Information Security: Principles and Practice", 2nd Edition, Wiley, 2011..</li> <li>4. C.P. Pfleeger, S.L. Pfleeger, J. Margulies, "Security in Computing", 5th Edition, Prentice Hall, 2015.</li> <li>5. David Wheeler, "Secure Programming HOW TO", v3.010 Edition, 2003.</li> <li>6. Michael Zalewski, "Browser Security Handbook", Google Inc., 2009.</li> <li>7. M. Gertz, S. Jajodia, "Handbook of Database Security", Springer, 2008.</li> </ol>										

\* 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

Department	<b>Computer Science and Engineering and Business Systems</b>	Programme: <b>B. Tech.</b>						
Semester	<b>VI</b>	Course Category Code: <b>PA</b>			*End Semester Exam Type: -			
Course Code	<b>U23CBW602</b>	Periods / Week		Credit	Maximum Marks			
Course Name	<b>MINI PROJECT</b>	L	T	P	C	CAM	ESE	TM
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>100</b>	<b>-</b>	<b>100</b>

**EEE**

Prerequisite	Any Computer Programming							
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)
	<b>CO1</b>	Identify the problem statement for the mini project work through the literature survey						<b>K2</b>
	<b>CO2</b>	Choose the proper components as per the requirements of the design/ system.						<b>K2</b>
	<b>CO3</b>	Apply the acquainted skills to develop final model/system						<b>K3</b>

There shall be a Mini Project, which the student shall pursue as a team consists of maximum 4 students during the third year, fifth semester. The aim of the mini project is that the student has to understand the real time hardware / software applications. The student should gain a thorough knowledge in the problem he/she has selected and in the hardware / software he/she using in the Project. The Mini-project is an application that should be formally initiated and should be developed and also to be implemented by the respective team.

The Mini Project shall be submitted in a report form along with the hardware model / software developed, duly approved by the department internal evaluation committee. It shall be evaluated for 100 marks as Continuous Assessment. The department internal evaluation committee shall consist of faculty coordinator, supervisor of the project and a senior faculty member of the department. There shall be two reviews that will be considered for assessing a Mini Project work with weightage as indicated evaluation Methods.

<b>Lecture Periods: -</b>	<b>Tutorial Periods: -</b>	<b>Practical Periods: 30</b>	<b>Total Periods: 30</b>
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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	PSO1	PSO2	PSO3
<b>1</b>	3	2	2	2	-	-	-	-	3	3	-	1	1	1	1
<b>2</b>	3	3	3	2	2	2	2	2	3	3	3	1	2	2	2
<b>3</b>	3	2	2	1	-	2	-	-	3	3	3	1	2	2	2

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

### Evaluation Method

Assessment	Review 1			Review 2				Total Marks
	Novelty	Presentation	Viva	Presentation	Demonstration	Viva	Report	
Marks	10	20	10	20	20	10	10	100

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Department	<b>Computer Science and Engineering and Business Systems</b>	Programme: <b>B. Tech.</b>						
Semester	<b>VI</b>	Course Category: <b>AEC</b>			End Semester Exam Type: -			
Course Code	<b>U23CBC6XX</b>	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>CERTIFICATION COURSE - VI</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>
<b>EEE</b>								
Prerequisite	-							

Students shall choose an International / Reputed organization certification course of 40-50 hours duration specified in the curriculum (It is mandatory to do a minimum of six courses) which will be offered through the Centre of Excellence. These courses have no credit and will not be considered for CGPA calculation.

(i) Certification Courses are required to be completed to fulfil the degree requirements. All Certification courses are assessed internally for 100 marks.

(ii) The Course coordinator handling the course will assess the student through attendance and MCQ test, and declare the student as pass on satisfactory completion. A letter grade P is awarded to declare pass.

(iii) The marks scored in these courses will not be taken into consideration for the SGPA / CGPA calculations in the grade sheet.

**Evaluation Method**

Assessment	Continuous Assessment Marks (CAM)		Total Marks
	Attendance	MCQ Test	
Marks	10	90	100

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Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B. Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>MC</b>		End Semester Exam Type :				
Course Code	<b>U23CBM606</b>		Periods/Week		Credit	Maximum Marks			
Course Name	<b>GENDER EQUALITY</b>		L	T	P	C	CAM	ESE	TM
			<b>2</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>
Prerequisite	-								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Describe the general identity, social construction of gender roles.							<b>K2</b>
	<b>CO2</b>	Illustrate the causes and issues of gender discrimination in Indian society.							<b>K2</b>
	<b>CO3</b>	Describe the workplace discrimination, media influences on gender and culture.							<b>K2</b>
	<b>CO4</b>	Familiarize with international and Indian frameworks on gender equality.							<b>K2</b>
	<b>CO5</b>	Illustrate the current challenges in gender equality, including the glass ceiling and the role of technology.							<b>K2</b>
<b>UNIT I</b>	<b>Introduction to Gender Equality</b>					<b>Periods:06</b>			
Gender equality exploring gender identity and expression, Understanding the social construction of general roles and norms, historical perspectives on gender roles, Analyzing key milestones in the fight for gender equality.									<b>CO1</b>
<b>UNIT II</b>	<b>Gender Inequality and Its Manifestations</b>					<b>Periods:06</b>			
Gender discrimination in Indian society causes of gender inequality Illiteracy, patriarchal set up, lack of awareness, social beliefs, practice and custom Issues of gender discrimination Child marriage, child domestic work, poor education and health, violence and exploitation in workplace.									<b>CO2</b>
<b>UNIT III</b>	<b>Gender and Culture</b>					<b>Periods:06</b>			
Workplace discrimination, Media influences on gender and culture, Gender and power dynamics in society. Strategies for promoting gender equality and cultural understanding.									<b>CO3</b>
<b>UNIT IV</b>	<b>Promoting Gender Equality</b>					<b>Periods:06</b>			
Gender Equality and Human Rights International frameworks and Conventions on Gender Equality Equality under the Indian Constitution Policies and initiatives for gender mainstreaming Strategies for promoting Gender Equality in various contexts.									<b>CO4</b>
<b>UNIT V</b>	<b>Contemporary Challenges and Future Directions</b>					<b>Periods:06</b>			
Current challenges and emerging issues in gender equality Glass ceiling role of technology in continuing or challenging gender inequality Exploring possibilities for transformative change and envisioning a gender-equal future.									<b>CO5</b>
<b>Lecture Periods: 30</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 30</b>			
<b>Text Books</b>									
1. "Gender and Society" by Raewyn Connell This book provides a comprehensive overview of gender roles, power dynamics, and the social construction of gender.									
2. "The Second Sex" by Simone de Beauvoir A historical and philosophical examination of women's oppression and gender inequality.									
3. "Women and Gender in the Indian Society" by Neera Desai and Usha Thakkar Focuses on the context of gender roles, inequality, and feminist movements in India.									
<b>Reference Books</b>									
1. Woman in early Indian societies, New Delhi: Manohar Publications. Sita A. Raman (2009).									
2. A social and Cultural history, Volume1. Connecticut: Oxford: Praeger. Sita Raman (2009).									
3. A social and Cultural history, Volume2. Connecticut: Oxford: Praeger.									
4. Iftikhar R. (2016). Indian Feminism: Class, Gender and Identity in Medieval Ages. Chennai: Notion Press. Iftikhar, R. (2012).									
<b>Web References</b>									
1. <a href="https://www.unwomen.org">https://www.unwomen.org</a>									
2. <a href="https://ncw.nic.in">https://ncw.nic.in</a>									
3. <a href="https://en.unesco.org/themes/gender-equality">https://en.unesco.org/themes/gender-equality</a>									
4. <a href="https://www.weforum.org/reports">https://www.weforum.org/reports</a>									

**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	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
2	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
3	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
4	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1
5	1	-	-	-	-	-	-	-	-	3	-	1	1	-	1

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

**Evaluation Methods**

Assessment	Continuous Assessment Marks (CAM)			Total Marks
	Attendance	MCQ Test	Presentation / Activity / Assignment	
Marks	10	30	60	100



# PROFESSIONAL ELECTIVE III

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Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBE611</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>HUMAN RESOURCE MANAGEMENT</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the basic concepts of HRM.						<b>K2</b>	
	<b>CO2</b>	Understand the HR functions and activities in organizations.						<b>K2</b>	
	<b>CO3</b>	Align HRM activities with a real-time organizational environment.						<b>K1</b>	
	<b>CO4</b>	Comprehend Strategic Management of Human Resources and HR activities.						<b>K3</b>	
	<b>CO5</b>	Understand the impact of HR activities on the Service Sector.						<b>K3</b>	
<b>UNIT-I</b>	<b>HUMAN RESOURCE MANAGEMENT</b>					<b>(6Hrs)</b>			
Concept and Challenges, HR Philosophy, Policies, Procedures and Practices. Human Resource System Design: HR Profession, and HR Department, Line Management Responsibility in HRM, Human resources accounting and audit.									<b>CO1</b>
<b>UNIT-II</b>	<b>FUNCTIONAL AREAS OF HRM</b>					<b>(6Hrs)</b>			
recruitment and staffing, benefits, compensation, employee relations, HR compliance, training and development, human resource information systems (H.R.I.S.), and payroll.									<b>CO2</b>
<b>UNIT-III</b>	<b>HUMAN RESOURCE PLANNING</b>					<b>(6Hrs)</b>			
Demand Forecasting, Practical Applications using SPSS software, Action Plans– Retention, Training, Redeployment & Staffing, Succession Planning									<b>CO3</b>
<b>UNIT- IV</b>	<b>STRATEGIC MANAGEMENT OF HUMAN RESOURCES</b>					<b>(6Hrs)</b>			
SHRM, the relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace.									<b>CO4</b>
<b>UNIT- V</b>	<b>HUMAN RESOURCE MANAGEMENT IN SERVICE SECTOR</b>					<b>(6Hrs)</b>			
Special considerations for Service Sector including									<b>CO5</b>
<ul style="list-style-type: none"> <li>• Managing the Customer – Employee Interaction</li> <li>• Employee Empowerment and Customer Satisfaction</li> <li>• Service Failure and Customer Recovery – the Role of Communication and Training</li> <li>• Similarities and Differences in Nature of Work for the Frontline Workers and the Backend</li> <li>• Support Services - Impact on HR Practices Stressing Mainly on Performance</li> <li>• Flexible Working Practices – Implications for HR</li> </ul>									
<b>Text Books</b>									
1. "Fundamentals of Human Resource Management" by Raymond Noe, John Hollenbeck, Barry Gerhart, and Patrick Wright, McGraw-Hill Education, 9th Edition, 2021.									
2. "Human Resource Management: An Applied Approach" by Jean M. Phillips, SAGE Publications, Inc., 3rd Edition, 2021.									
3. Dessler G, Varkey B. Human Resource Management, 16th edition. Pearson Education India, 2020.									
4. Joseph J. Martocchio, Human Resource Management, 15th edition, Pearson Education Champaign, 2019.									
5. Mathis RL, Jackson JH. Human resource management, 15th edition, Jakarta: Salemba Empat, 2021.									
<b>Reference Books</b>									
1. Armstrong, M., & Taylor, S. Armstrong's handbook of human resource management practice. 15 <sup>th</sup> Edition, Kogan Page Publishers, 2020.									
2. Raymond A. Noe, John R. Hollenbeck, Gerhart, B., & Patrick M. Wright. Fundamentals of human resource management. 6 <sup>th</sup> Edition, McGraw-Hill Higher Education, 2015.									
3. Gary Dessler, Human Resource Management, 15th edition, Pearson, 2017.									
<b>Web References</b>									
1. <a href="https://www.journals.elsevier.com/human-resource-management-review">https://www.journals.elsevier.com/human-resource-management-review</a>									
2. <a href="https://swayam.gov.in/nd1_noc20_mg15/preview">https://swayam.gov.in/nd1_noc20_mg15/preview</a>									

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3. <http://www.sciencepublishinggroup.com/i/jhrm>
4. <https://journals.sagepub.com/home/hrm>
5. <https://www.hrdguru.com/>
6. <https://www.citehr.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	1	1	-	-	-	-	-	2	3	-	1	-	1	1	-
2	1	1	-	-	-	-	-	2	3	-	1	-	1	1	-
3	1	1	1	-	1	-	1	2	3	1	1	-	1	1	-
4	1	1	-	-	-	-	1	2	3	1	1	-	1	1	-
5	1	1	-	-	-	-	1	2	3	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	5	75	100

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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBE612</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>TQM Tools, Techniques and Standards</b>		L	T	P	C	CAM	ESE	TM
			<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Define Total Quality Management (TQM) and explain its basic concepts						<b>K2</b>	
	<b>CO2</b>	Analyze the role of leadership and employee involvement						<b>K3</b>	
	<b>CO3</b>	Apply traditional and advanced quality management tools						<b>K4</b>	
	<b>CO4</b>	Utilize advanced techniques like QFD, TPM, and the Taguchi Loss Function						<b>K3</b>	
	<b>CO5</b>	Implement the benefits of ISO 9001 and ISO 14001 standards						<b>K5s</b>	
<b>UNIT-I</b>	<b>INTRODUCTION</b>						<b>(6Hrs)</b>		
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Definition of TQM-- Basic concepts of TQM - Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM - Benefits of TQM								<b>CO1</b>	
<b>UNIT-II</b>	<b>TQM PRINCIPLES</b>						<b>(6Hrs)</b>		
Leadership - Deming Philosophy, Quality Council, Quality statements and Strategic planning Customer Satisfaction - Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal-- Continuous process improvement -Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership - Partnering, 197 Supplier selection, Supplier Rating and Relationship development.								<b>CO2</b>	
<b>UNIT-III</b>	<b>TQM TOOLS &amp; TECHNIQUES I</b>						<b>(6Hrs)</b>		
The seven traditional tools of quality - New management tools - Six-sigma Process Capability Bench marking - Reasons to benchmark, Benchmarking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Benchmarking - FMEA - Intent , Documentation, Stages: Design FMEA and Process FMEA.								<b>CO3</b>	
<b>UNIT- IV</b>	<b>TQM TOOLS &amp; TECHNIQUES II</b>						<b>(6Hrs)</b>		
Quality circles - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures- Cost of Quality - BPR.								<b>CO4</b>	
<b>UNIT- V</b>	<b>QUALITY MANAGEMENT SYSTEM</b>						<b>(6Hrs)</b>		
Introduction-Benefits of ISO Registration-ISO 9000 Series of Standards-Sector-Specific Standards - AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements-Implementation-Documentation Internal Audits-Registration- ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction--ISO 14000 Series Standards--Concepts of ISO 14001-- Requirements of ISO 14001-Benefits of EMS.								<b>CO5</b>	
<b>Text Books</b>									
1. "Total Quality Management" by Elizabeth Jimenez, Independently Published, 1st Edition, 2023									
2. "Total Quality Management" (Quality Management and Risk Series) by David Hoyle, Routledge, 1st Edition, 2022									
3. Dale H.Besterfield, Carol B.Michna,Glen H. Bester field,MaryB.Sacre, HemantUrdhwareshe and RashmiUrdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression,2013.									
4. Joel.E. Ross, "Total Quality Management - Text and Cases",Routledge.,2017									
5. Kiran.D.R, "Total Quality Management: Key concepts and case studies, Butterworth - 198 Heinemann Ltd, 2016.									
<b>Reference Books</b>									
1. Oakland, J.S. "TQM - Text with Cases", Butterworth - Heinemann Ltd., Oxford, Third Edition,2003.									
2. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.									
<b>Web References</b>									
1. <a href="https://asq.org/training/introduction-to-quality-management-itqm">https://asq.org/training/introduction-to-quality-management-itqm</a>									
2. <a href="https://www.juran.com/blog/quality-management-system/#:~:text=Juran%20has%20a%20well%2Ddeserved,quality%20control%2C%20and%20quality%20improvement.">https://www.juran.com/blog/quality-management-system/#:~:text=Juran%20has%20a%20well%2Ddeserved,quality%20control%2C%20and%20quality%20improvement.</a>									
3. <a href="https://asq.org/quality-resources/seven-basic-quality-tools">https://asq.org/quality-resources/seven-basic-quality-tools</a>									
4. <a href="https://uk.indeed.com/career-advice/career-development/what-are-quality-circles#:~:text=A%20quality%20circle%20is%20a,and%20devise%20solutions%20to%20these.">https://uk.indeed.com/career-advice/career-development/what-are-quality-circles#:~:text=A%20quality%20circle%20is%20a,and%20devise%20solutions%20to%20these.</a>									

\* 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	-	-	-	-	-	-	-	-	-	3	3	2	3
2	-	-	-	-	-	3	-	-	-	-	-	3	3	-	-
3	-	-	-	-	3	-	-	-	3	-	-	-	-	-	3
4	-	2	-	-	3	2	3	2	-	-	-	3	3	3	-
5	-	-	3	-	-	3	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	5	75	100

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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBE613</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>DIGITAL MARKETING</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the concepts digital marketing and its channels						<b>K2</b>	
	<b>CO2</b>	Gain knowledge about the types of digital marketing.						<b>K2</b>	
	<b>CO3</b>	Use of social media for digital marketing.						<b>K3</b>	
	<b>CO4</b>	Perform competitor analysis.						<b>K3</b>	
	<b>CO5</b>	Explore the concepts of CRM.						<b>K2</b>	
<b>UNIT-I</b>	<b>INTRODUCTION</b>					<b>(6Hrs)</b>			
<p>Digital Marketing Foundation: Introduction to marketing – Concepts - Theories Difference between traditional, inbound, and outbound marketing methodologies - Digital vs. Real Marketing - Digital Marketing Channels - Creating an initial digital marketing plan.</p> <p>Introduction of the digital marketing - Digital vs. Real Marketing - Digital Marketing Channels - Creating initial digital marketing plan - Content management - SWOT analysis - Target group analysis</p>									<b>CO1</b>
<b>UNIT-II</b>	<b>DIGITAL MARKETING</b>					<b>(6Hrs)</b>			
<p>Resource planning - cost estimating - cost budgeting - cost control- E-mail marketing -E-mail marketing campaign analysis - Mobile Marketing – Content Marketing – App store Optimization – Affiliate Marketing – Adwords – Online display.</p>									<b>CO2</b>
<b>UNIT-III</b>	<b>SOCIAL MEDIA MARKETING</b>					<b>(6Hrs)</b>			
<p>Understanding social media – Marketing Tools- Internet marketing – Facebook- LinkedIn – Twitter advertising and publishing - Blogging- Freelancing-Video Marketing Platform Specific Tools Strategies- Social Media Marketing architecture. Business opportunities and Instagram options - Optimization of Instagram profiles - Integrating Instagram with a Web Site and other social networks - Keeping up with posts - Business tools on LinkedIn - Creating campaigns on LinkedIn - Analyzing visitation on LinkedIn - Creating business accounts on YouTube - YouTube Advertising - YouTube Analytics, Facebook Ads - Creating Facebook Ads - Ads Visibility</p>									<b>CO3</b>
<b>UNIT- IV</b>	<b>COMPETITOR AND WEBSITE ANALYSIS</b>					<b>(6Hrs)</b>			
<p>Competitor Research Tools- Website Analysis Tools – Web analytics - Levels – Keyword Research Tools- Back Analysis Tools- Search Engine Optimization (SEO) – Tools – On-Page and Off-page SEO – Google analytics</p>									<b>CO4</b>
<b>UNIT- V</b>	<b>CRM</b>					<b>(6Hrs)</b>			
<p>CRM platform - CRM models – Exercise - CRM strategy - Customer Development Process Customer Retention- Customer satisfaction - Customer Retention Strategies - Relationship Management- CRM process for B2B markets - Technological Applications in CRM - Customer Databases and Information Systems - Emerging Trend in CRM - e-CRM in Service Marketing, e-CRM strategies, e-CRM architecture</p>									<b>CO5</b>
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>"Digital Marketing: Strategy, Implementation and Practice" by Dave Chaffey and Fiona Ellis-Chadwick, Pearson, 8th Edition, 2024</li> <li>"Digital Marketing For Dummies" by Ryan Deiss and Russ Henneberry, For Dummies, 2nd Edition, 2023</li> <li>Ryan, D. . Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited,2014</li> <li>Romuald Andrade ,Beginners Guide to Digital Marketing: How to Flood Your Website With Traffic in 30 Days,2015</li> <li>Digital Marketer. Pulizzi, J. Epic Content Marketing, Mcgraw Hill Education,2014</li> </ol>									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>Puneet Singh Bhatia ,Fundamentals of Digital Marketing , Pearson– 2017</li> <li>Ryan Deiss, Russ Henneberry ,Digital Marketing For Dummies, 2020</li> <li>Seema Gupta,Digital Marketing, Second Edition,2020</li> <li>Kingsnorth, Simon. Digital marketing strategy: an integrated approach to online marketing. Kogan Page Publishers, 2019.</li> </ol>									

### Web References

1. [https://www.tutorialspoint.com/digital\\_marketing/index.htm](https://www.tutorialspoint.com/digital_marketing/index.htm)
2. <https://www.simplilearn.com/tutorials/digital-marketing-tutorial>
3. <https://www.javatpoint.com/digital-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	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	2	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	5	75	100

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



Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBE614</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>COGNITIVE SCIENCE &amp; ANALYTICS</b>		L	T	P	C	CAM	ESE	TM
			<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the basic principles and process of cognitive science.						<b>K2</b>	
	<b>CO2</b>	Understand the memory and learning model and apply the same to appropriate real-world applications						<b>K2</b>	
	<b>CO3</b>	Demonstrate qualitative and quantitative skills and critical thinking in cognitive science by applying a suitable methodology to real-world applications						<b>K5</b>	
	<b>CO4</b>	Analyse the usage of memory models and sensory information fusion techniques.						<b>K5</b>	
	<b>CO5</b>	Envisage the concept of cognitive learning.						<b>K3</b>	
<b>UNIT-I</b>	<b>INTRODUCTION TO COGNITIVE SCIENCE</b>					<b>(6Hrs)</b>			
Introduction to the study of cognitive sciences. Neural Network Models- language: definition Affordances Categories and concepts; Concept learning: Linguistic knowledge: Syntax, semantics, (and pragmatics) Direct perception, Logic; Machine learning									
<b>UNIT-II</b>	<b>CONCEPT HIERARCHIES</b>					<b>(6Hrs)</b>			
A brief history of cognitive science. Processing of sensory information in the brain, Linguistic knowledge: Syntax, semantics, (and pragmatics), Ecological Psychology, Constructing memories Methodological concerns in philosophy, Discretization and generating concept hierarchies, Data Mining System, Generative linguistic, Affordance learning in robotics, Explicit vs. implicit memory									
<b>UNIT-III</b>	<b>ANATOMY OF BRAIN</b>					<b>(6Hrs)</b>			
Artificial intelligence and psychology, Brain Imaging, Brain and language, Affordance learning in robotics, Information processing (three-boxes) model of memory Structure and constituents of the brain fMRI, MEG, Language disorders, Development Information processing (three-boxes) model of memory									
<b>UNIT-IV</b>	<b>MEMORY MODELS AND SENSORY INFORMATION FUSION</b>					<b>(6Hrs)</b>			
Brief history of neuroscience, PET, EEG Lateralization Child and robotic development Sensory memory; Short term memory Mathematical models, Multisensory integration in cortex, Lateralization, Attention and related concepts, long term memory; Rationality Mathematical models Information fusion, the great past tense debate, Human visual attention, Bounded rationality; Prospect theory; Heuristics and biases Looking at brain signals.									
<b>UNIT- V</b>	<b>MODELLING AND INFORMATION PROCESSING</b>					<b>(6Hrs)</b>			
From sensation to cognition, The great past tense debate, Computational models of attention, Reasoning in computers Cybernetics, Cognitivist and emergent stand points, Computational models of attention, Key points in social cognition Processing of sensory information in the brain. From physics to meaning, Analog vs. Digital: Code duality. A robotic perspective, Applications of computational models of attentional Context and social judgment; Schemas; Social signals									
<b>Text Books</b>									
1. "Cognitive Science: An Introduction to the Science of the Mind" by José Luis Bermúdez, Cambridge University Press, 4th Edition, 2024									
2. "Language and Cognitive Processing: From Neural Networks to Natural Language" by Ethan Wilcox and Roger Levy, MIT Press, 1st Edition, 2023									
3. Pradeep Kumar Mallick, Samarjeet Borah, " Emerging Trends and Applications in Cognitive Computing", IGI Global Publishers,2019.									
4. Jose Luis Bermudez, "Cognitive Science: An Introduction to the Science of the Mind", Cambridge University Press, New York,2020.									
5. Keith Frankish and William Ramsey, The Cambridge Handbook of Cognitive Science, 2012									

**Reference Books**

1. José Luis Bermúdez, Cognitive Science: An Introduction to the Science of the Mind, 2nd edition, 2014
2. Smith/Kosslyn, Cognitive Psychology: Mind and Brain, Pearson, 2015
- Judith S. Hurwitz and Marcia Kaufman, Cognitive Computing and Big Data Analytics, 1st edition, 2015

**Web References**

1. <https://nptel.ac.in/courses/109/103/109103134/>
2. <https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-hs24/>
3. <https://academicconnections.ucsd.edu/onlinecourses/intro-cogsci.html>
4. <https://libguides.gatech.edu/c.php?g=53981&p=348459>

\* 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	2	1	1	-	-	-	-	-	-	-	-	2	1	1
3	3	2	2	2	-	-	-	-	-	-	-	-	2	1	1
4	3	2	2	2	2	-	-	-	-	-	-	-	2	2	2
5	3	2	2	2	2	-	-	-	-	-	-	-	2	3	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

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VI</b>		Course Category: <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBE615</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>CRYPTOLOGY</b>		L	T	P	C	CAM	ESE	TM
			<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Apply concepts of cryptography to provide security services.						<b>K3</b>	
	<b>CO2</b>	Understand the use of symmetric key cryptosystems.						<b>K2</b>	
	<b>CO3</b>	Gain knowledge about the various block ciphers and public-key cryptosystems.						<b>K2</b>	
	<b>CO4</b>	Analyze the applications of cryptosystems.						<b>K4</b>	
	<b>CO5</b>	Explore the concepts of post-quantum cryptography						<b>K3</b>	
<b>UNIT-I</b>	<b>INTRODUCTION TO CRYPTOGRAPHY</b>					<b>(6Hrs)</b>			
Introduction to Cryptography: Elementary number theory, Pseudo-random bit generation, Elementary cryptosystems.								<b>CO1</b>	
Basic security services: confidentiality, integrity, availability, non-repudiation, privacy									
<b>UNIT-II</b>	<b>SYMMETRIC KEY CRYPTOSYSTEMS</b>					<b>(6Hrs)</b>			
Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC;								<b>CO2</b>	
<b>UNIT-III</b>	<b>BLOCK CIPHERS</b>					<b>(6Hrs)</b>			
Block Ciphers: DES, AES, Modes of Operation; Hash Functions; Authentication								<b>CO3</b>	
Public Key Cryptosystems: RSA, ECC; Digital signatures									
<b>UNIT-IV</b>	<b>SECURITY APPLICATIONS</b>					<b>(6Hrs)</b>			
Electronic commerce (anonymous cash, micro-payments), Key management, Zero-knowledge protocols, Cryptology in Contact Tracing Applications, Issues related to Quantum Cryptanalysis								<b>CO4</b>	
<b>UNIT-V</b>	<b>POST-QUANTUM CRYPTOGRAPHY</b>					<b>(6Hrs)</b>			
Post-Quantum Cryptography, Public-Key Post-Quantum Cryptographic Algorithms, Stateful Hash-Based Signatures, Threshold Cryptography.								<b>CO5</b>	
<b>Text Books</b>									
1. "Understanding Cryptography" by Christof Paar, Jan Pelzl, Tim Güneysu, Springer, 2nd Edition, 2024									
2. "Introduction to Modern Cryptography" by Jonathan Katz, Yehuda Lindell, Chapman and Hall/CRC, 3rd Edition, 2020									
3. Stinson, D. R., <i>Cryptography: Theory and Practice</i> , 4th Edition, 2018, CRC Press.									
4. Stallings, W., <i>Cryptography and Network Security</i> , 8th Edition, 2020, Prentice Hall.									
5. Menezes, A. J., van Oorschot, P. C., and Vanstone, S. A., <i>Handbook of Applied Cryptography</i> , 1st Edition, 1996, CRC Press.									
<b>Reference Books</b>									
1. N. Koblitz, <i>A course in number theory and cryptography</i> , GTM, Springer.									
2. G. Paul and S. Maitra, <i>RC4 Stream Cipher and Its Variants</i> , CRC Press, Taylor & Francis Group, A Chapman & Hall Book, 2012									
3. C. S. Mukherjee, D. Roy, S. Maitra, <i>Design &amp; Cryptanalysis of ZUC - A Stream Cipher in Mobile Telephony</i> , Springer 2020									
4. P. Chakraborty, S. Maitra, M. Nandi, S. Talnikar, <i>Contact Tracing in Post-Covid World - A Cryptologic Approach</i> , Springer 2020									
<b>Web References</b>									
1. <a href="http://www.theory.caltech.edu/~preskill/ph229/">www.theory.caltech.edu/~preskill/ph229/</a>									
2. <a href="https://nptel.ac.in/courses/106/107/106107155/">https://nptel.ac.in/courses/106/107/106107155/</a>									
3. <a href="https://www.tutorialspoint.com/cryptography/index.htm">https://www.tutorialspoint.com/cryptography/index.htm</a>									
4. <a href="https://www.khanacademy.org/computing/computer-science/cryptography">https://www.khanacademy.org/computing/computer-science/cryptography</a>									
* 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	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	5	75	100

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

# Open Elective

2.4.11.22

Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V / VI</b>		Course Category: <b>OE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBOC01</b>		Periods			Credit	Maximum Marks		
Course Name	<b>BUSINESS APPLICATIONS OF GAME THEORY</b>		L	T	P	C	CAM	ESE	TM
			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
Course Outcome	<b>On Completion of the Course ,students can able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	To identify strategic games, analyze payoffs, apply minimax strategies, and understand weak and strong domination in two-player games.							<b>K2</b>
	<b>CO2</b>	To identify Nash Equilibria in different games, distinguish between cooperative and competitive games, and analyze multi Nash equilibria scenarios.							<b>K3</b>
	<b>CO3</b>	To analyze complex games, identify winning and losing positions, and apply strategies in combinatorial settings like subtraction games.							<b>K4</b>
	<b>CO4</b>	To apply game theory to economic scenarios, understand the strategic behavior of firms, and analyze decision-making under uncertainty.							<b>K3</b>
	<b>CO5</b>	Students will develop skills to analyze mixed strategy equilibria, understand repeated interactions in games, and apply game theory concepts to real-world scenarios like voting and committee decision-making.							<b>K5</b>
<b>UNIT-I</b>	<b>Foundations of Game Theory</b>					<b>(9Hrs)</b>			
Elements of Game theory - Examples and Strategic Games - 2 Player Strategy Games and Payoffs - Minimax - Weak and Strong Domination - Saddle Points									<b>CO1</b>
<b>UNIT-II</b>	<b>Nash Equilibrium and Strategic Interaction</b>					<b>(9Hrs)</b>			
Nash Equilibrium (NE) : Prisoner's Dilemma - Stag Hunt - Matching Pennies - Battle of the Sexes (BOS) - Multi Nash Equilibria - Cooperative and Competitive Games									<b>CO2</b>
<b>UNIT-III</b>	<b>Advanced Strategic Concepts</b>					<b>(9Hrs)</b>			
Strict and Non-Strict Nash Equilibrium - Best Response Functions for NE - Combinatorial Games - Winning and Losing Positions - Subtraction Game - 3-Pile and K-Pile Games									<b>CO3</b>
<b>UNIT- IV</b>	<b>Applications of Game Theory in Economics</b>					<b>(9Hrs)</b>			
Cournot's Oligopoly - Bertrand's Oligopoly - Electoral Competition - Median Voter Theorem - Auctions and the Role of Knowledge - Decision Making and Utility Theory									<b>CO4</b>
<b>UNIT- V</b>	<b>Mixed Strategies and Extensive Games</b>					<b>(9Hrs)</b>			
Mixed Strategy Equilibrium - Extensive Games with Perfect Information - Stackelberg's Model of Duopoly - Buying Votes and Committee Decision Making - Repeated Games and Prisoner's Dilemma - Supermodular Games and Potential Games									<b>CO5</b>
<b>Text Books</b>									
1. Osborne, M.J. <i>An Introduction to Game Theory</i> . Oxford University Press, latest edition, 2004.									
2. Ferguson, T.S. <i>Game Theory</i> . World Scientific, latest edition, 2018.									
<b>Reference Books</b>									
1. Tijs, S. <i>Introduction to Game Theory</i> . Hindustan Book Agency, latest edition, 2003.									
2. MacKenzie, A. <i>Game Theory for Wireless Engineers</i> . Synthesis Lectures on Communications, Morgan & Claypool Publishers, latest edition, 2006.									
<b>Web References</b>									
1. <a href="https://plato.stanford.edu/entries/game-theory/">https://plato.stanford.edu/entries/game-theory/</a>									
2. <a href="https://plato.stanford.edu/entries/nash-equilibrium/">https://plato.stanford.edu/entries/nash-equilibrium/</a>									
3. <a href="https://math.stackexchange.com/questions/1051897/what-is-the-difference-between-strict-and-non-strict-nash-equilibrium">https://math.stackexchange.com/questions/1051897/what-is-the-difference-between-strict-and-non-strict-nash-equilibrium</a>									
4. <a href="https://plato.stanford.edu/entries/decision-theory/">https://plato.stanford.edu/entries/decision-theory/</a>									
5. <a href="https://plato.stanford.edu/entries/game-theory/#ExtGam">https://plato.stanford.edu/entries/game-theory/#ExtGam</a>									
* 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	-	-	-	-	-	-	-	-	2	1	1
4	3	2	1	1	-	-	-	-	-	-	-	1	2	1	-
5	2	1	-	-	-	-	-	-	-	-	-	1	2	-	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. 24



Department	<b>Computer Science and Engineering and Business Systems</b>		Programme: <b>B.Tech.</b>						
Semester	<b>V / VI</b>		Course Category: <b>OE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CBOC02</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>Cryptology and Analysis</b>		L	T	P	C	CAM	ESE	TM
			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
<b>Course Outcome</b>	<b>On Completion of the Course, Students can able</b>								BT Mapping (Highest Level)
	<b>CO1</b>	To understand the basic concepts of cryptography and cryptanalysis, including classical ciphers and the foundational theories of security.							<b>K2</b>
	<b>CO2</b>	To gain a deep understanding of the DES algorithm, IDEA, and the application of shift registers in cryptography.							<b>K3</b>
	<b>CO3</b>	To understand the principles of public key cryptography, including RSA and other systems, and learn about the cryptographic uses of elliptic curves.							<b>K3</b>
	<b>CO4</b>	To analyze various protocols and methods to ensure data integrity and authenticate entities, focusing on digital signatures and zero-knowledge techniques.							<b>K4</b>
	<b>CO5</b>	To comprehend the aspects of key management in cryptographic systems, focusing on key distribution methods for both symmetrical and asymmetrical systems.							<b>K3</b>
<b>UNIT-I</b>	<b>Introduction to Cryptology</b>					<b>(9Hrs)</b>			
	Cryptography and cryptanalysis, aspects of security. Cryptanalytic attacks. Classical cipher systems, transposition ciphers, substitution ciphers, Hagelin machine, statistics and cryptanalysis. The Information Theoretical approach, information measure and absolute security, unicity distance, error probability and security.								<b>CO1</b>
<b>UNIT-II</b>	<b>DES Algorithm and Shift Registers</b>					<b>(9Hrs)</b>			
	DES algorithm Characteristics, Alternative descriptions, Analysis of the DES, DES modes. IDEA (International Data Encryption Algorithm). Shift Registers: Stream and block enciphering, The theory of finite state machines, shift Registers, random properties of shift register sequences, generating function, cryptanalysis of LFSRs, nonlinear shift registers.								<b>CO2</b>
<b>UNIT-III</b>	<b>Public Key Systems</b>					<b>(9Hrs)</b>			
	Introduction, RSA system. Knapsack system, Cracking the knapsack system. Public key systems based on elliptic curves.								<b>CO3</b>
<b>UNIT- IV</b>	<b>Authentication and Integrity</b>					<b>(9Hrs)</b>			
	Protocols, message integrity. Entity authentication with symmetric algorithm, message authentication with a message authentication code (MAC), message authentication with digital signatures, zero knowledge techniques. Kerberos								<b>CO4</b>
<b>UNIT- V</b>	<b>Key Management</b>					<b>(9Hrs)</b>			
	General aspects of key management, key distribution for asymmetrical systems, key distribution for symmetrical algorithms, network security, fair cryptosystems								<b>CO5</b>
<b>Text Books</b>									
1. Stallings, W. <i>Cryptography and Network Security: Principles and Practice</i> (8th ed.). Pearson, 2023.									
2. Kahate, A. <i>Cryptography and Network Security</i> . Tata McGraw-Hill (TMH), 2013.									
3. Forouzan, B.A. <i>Data Communications and Networking</i> (5th ed.). McGraw Hill, 2013.									
<b>Reference Books</b>									
1. Rittinghouse, J.W., & Hancock, W.M. <i>Cyber Security Operations Handbook</i> . Elsevier, 2003.									
<b>Web References</b>									
1. <a href="https://www.coursera.org/learn/crypto">https://www.coursera.org/learn/crypto</a>									
2. <a href="https://crypto.stackexchange.com/questions/15670/lfsr-linear-feedback-shift-register">https://crypto.stackexchange.com/questions/15670/lfsr-linear-feedback-shift-register</a>									

3. [https://en.wikipedia.org/wiki/Public-key\\_cryptography](https://en.wikipedia.org/wiki/Public-key_cryptography)  
 4. <https://www.sciencedirect.com/topics/computer-science/key-management>

\* 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	5	75	100

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

# ANNEXURE -II

2.A.11.127

2. A. 11. 128

**HONOURS/MINORS  
DEGREE  
PROGRAMME  
SYLLABUS**

2 . A . 11 . 129

2. A. 11. 130

**Name of Honours Degree offered by the AIDS Department**

**Honours in Artificial Intelligence and Machine Learning**

Semester	Course Title	Periods			Credits
		L	T	P	
IV	<u>Parallel Programming and High Performance Computing</u>	3	1	0	4
V	<u>Advanced Deep Learning</u>	3	1	0	4
VI	<u>Reinforcement Learning</u>	3	1	0	4
VII	<u>Image and Video Analytics</u>	3	1	0	4
VIII	<u>Prompt Engineering</u>	3	1	0	4

**Name of Honours Degree offered by the CSE Department**

**Honours in CYBER SECURITY**

Semester	Course Title	Periods			Credits
		L	T	P	
IV	<u>Cyber Security Essentials</u>	3	1	0	4
V	<u>Cryptography and Cyber laws</u>	3	1	0	4
VI	<u>Malware Analysis and Reverse Engineering</u>	3	1	0	4
VII	<u>Security Incidence and Response management</u>	3	1	0	4
VIII	<u>Artificial Intelligence for Cyber Security</u>	3	1	0	4

**Name of Honours Degree offered by the IT Department**

**Honours in Advanced Web Development**

Semester	Course Title	Periods			Credits
		L	T	P	
IV	Frontend Development	3	1	0	4
V	Advanced Databases	3	1	0	4
VI	Microservices and Spring-Boot	3	1	0	4
VII	Container Orchestration and Security	3	1	0	4
VIII	Cloud Management	3	1	0	4

2. 9. 11. 132



Department	<b>Computer Science and Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>III / VI</b>		Course Category: <b>ES</b>		End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23CSH603</b>		Periods/Week		Credit	Maximum Marks			
Course Name	<b>Malware Analysis and Reverse Engineering</b>		L	T	P	C	CAM	ESE	TM
			3	-	-	3	25	75	100
(Common to all branches)									
Prerequisite	NIL								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	CO1	Overview of Tools like Autoruns and The Process Explorer.							K2
	CO2	Design a payload.							K2
	CO3	Working with Assemblers.							K3
	CO4	Binary Obfuscation Technique.							K4
	CO5	Passing code execution via SHE. Reversing Various File Types.							K4
<b>UNIT - I</b>	<b>Preparing to Reverse Engineer</b>					<b>Periods:09</b>			
What is Reverse engineering, Reverse engineering as a process, Tools, The operating system environment, Typical malware behaviour: Persistence, Malware delivery, Software piracy, Payload – the evil within, Tools: Autoruns, The Process explorer.									CO1
<b>UNIT - II</b>	<b>The Low-Level Language</b>					<b>Periods:09</b>			
Binary numbers, x86: Registers, Memory addressing: Endianness. Basic instructions, Bitwise algebra, Control flow, Stack manipulation, Tools – builder and debugger: Popular assemblers: MASM, NASM, FASM, x86 Debuggers, WinDbg, Ollydbg, x64dbg. Hello World: Installation of FASM, Dealing with common errors when building, Dissecting the program. After Hello: Calling APIs, Common Windows API libraries, Short list of common, API functions, Debugging									CO2
<b>UNIT - III</b>	<b>Static and Dynamic Reversing</b>					<b>Periods:09</b>			
Assessment and static analysis: Static analysis, File types and header analysis: Extracting useful information from file, Other information: PE executables. Deadlisting: IDA (Interactive Disassembler), Decompilers: ILSpy – C# Decompiler. Dynamic analysis, Analysis environments, Information gathering tools, Disassemblers, Debuggers, Decompilers, Network tools, Editing tools, Attack tools, Automation tools, Software forensic tools, Automated dynamic analysis, Online service sites.									CO3
<b>UNIT - IV</b>	<b>Sandboxing and Binary Obfuscation Techniques</b>					<b>Periods:09</b>			
Emulation of Windows and Linux under an x86 host, Analysis in unfamiliar environments: Linux ARM guest in QEMU, MBR debugging with Bochs. Binary Obfuscation Techniques: Data assembly on the stack, Encrypted data identification, Assembly of data in other memory regions, decrypting with x86dbg, Other obfuscation techniques, Packing and Encryption: A quick review on how native executables are loaded by the OS, Packers, crypters, obfuscators, protectors and SFX, Unpacking, Dumping processes from memory, How about an executable in its unpacked state? Other file-types.									CO4
<b>UNIT - V</b>	<b>Anti-analysis Tricks</b>					<b>Periods:09</b>			
Anti-debugging tricks, Debugger information from NtQueryInformationProcess, Timing tricks. Passing code execution via SHE, Anti-VM tricks, Anti-emulation tricks, Anti-dumping tricks. Practical Reverse Engineering of a Windows Executable, Initial static analysis, Debugging, Reversing Various File Types: Analysis of HTML scripts, MS Office macro analysis, PDF file analysis, SWF file analysis: SWFTools, FLASM, Flare, XXXSWF, JPEXS SWF decompiler.									CO5
<b>Lecture Periods:45</b>		<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods:45</b>		
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>1. Reginald Wong, "Mastering Reverse Engineering", Packt Publishing, 2018</li> <li>2. Bruce Dang, Alexandre Gazet, Elias Bachaalany, "Practical Reverse Engineering"</li> <li>3. Eldad Eilam, "Reversing: Secrets of Reverse Engineering",</li> </ol>									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Implementing Reverse Engineering: The Real Practice of X86 Internals by Jitender Narula.</li> <li>2. Ghidra Software Reverse Engineering for Beginners: Analyze, identify, and avoid malicious code and potential threats in your networks and systems by A. P. David.</li> <li>3. Michael Sikorski and Andrew Honig "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software", No Starch press 2012</li> <li>4. Justin Seitz, "Gray Hat Python: Python Programming for Hackers and Reverse Engineers", No Starch Press, 2009</li> <li>5. Andrew Case, Jamie Levy, and Aaron Walters, "The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory", Wiley Publication 2014</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://www.geeksforgoeks.org/distributed-systems">https://www.geeksforgoeks.org/distributed-systems</a></li> <li>2. <a href="http://www.tutorialspoint.com/distributed-systems">www.tutorialspoint.com/distributed-systems</a></li> <li>3. <a href="http://www.splunk.com">www.splunk.com</a></li> </ol>									

**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	1	2	1	2	-	-	1	1	2	2	3
2	3	2	1	1	1	2	1	2	-	-	1	1	2	2	3
3	3	2	1	2	2	2	1	2	-	-	3	3	2	3	3
4	3	2	2	2	3	2	1	2	-	-	3	3	2	3	3
5	3	2	2	2	3	2	1	2	-	-	3	3	2	3	3

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

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

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

Department	<b>Computer Science and Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>II / IV</b>		Course Category: <b>ES</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CSH402</b>		Periods/Week		Credit	Maximum Marks			
Course Name	<b>Cyber Security Essentials</b>		L	T	P	C	CAM	ESE	TM
			3	-	-	3	25	75	100
(Common to All Branches)									
Prerequisite	NIL								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	CO1	Explain the basics of cyber security, cyber-crime and cyber law.							K2
	CO2	Classify various types of attacks and learn the tools to launch the attacks.							K2
	CO3	Apply various tools to perform information gathering.							K3
	CO4	Apply intrusion techniques to detect intrusion.							K3
	CO5	Apply intrusion prevention techniques to prevent intrusion.							K3
<b>UNIT - I</b>	<b>Introduction</b>				<b>Periods:09</b>				
Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.									CO1
<b>UNIT - II</b>	<b>Attacks and Countermeasures</b>				<b>Periods:09</b>				
OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.									CO2
<b>UNIT - III</b>	<b>File System and Peer to Peer Service</b>				<b>Periods:09</b>				
Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.									CO3
<b>UNIT - IV</b>	<b>Intrusion Detection</b>				<b>Periods:09</b>				
Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.									CO4
<b>UNIT - V</b>	<b>Intrusion Prevention</b>				<b>Periods:09</b>				
Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.									CO5
<b>Lecture Periods:45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods:45</b>			
<b>Text Books</b>									
1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021									
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011									
3. J. Brooks and Christopher Grow, "Cyber security Essentials", Jones & Bartlett Learning Publishers, 2018									
<b>Reference Books</b>									
1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013									
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011									
3. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, 2007									
4. William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015									
5. Timothy J. Shimeall, Jonathan Spring, Vincent Nestler, "Introduction to Cybersecurity", CRC Press, 2014									
<b>Web References</b>									
1. <a href="https://www.geeksforgeeks.org/cyber-security/">https://www.geeksforgeeks.org/cyber-security/</a>									
2. <a href="http://www.tutorialspoint.com/cyber-security/">www.tutorialspoint.com/cyber-security/</a>									
3. <a href="https://owasp.org/www-project-top-ten/">https://owasp.org/www-project-top-ten/</a>									

\* TE – Theory Exam, LE – Lab Exam

2.A.11.135

**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	1	1	1	1	1	1	-	-	-	-	1	1	1	2	3
2	1	3	1	3	2	-	-	-	-	-	-	-	2	2	3
3	2	1	1	1	-	1	-	-	-	-	1	-	2	2	3
4	3	3	2	2	2	1	-	-	-	-	-	-	2	2	3
5	3	2	1	1	1	1	-	1	-	-	1	-	2	2	3

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

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

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

Department	<b>Computer Science and Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>III / V</b>		Course Category: <b>ES</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CSH501</b>		Periods/Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Cryptography and Cyber Laws</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>
(Common to All Branches)									
Prerequisite	NIL								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	To understand cryptography and its need to various applications.							<b>K1</b>
	<b>CO2</b>	To design public and private key cryptosystems							<b>K2</b>
	<b>CO3</b>	To understand cryptanalysis and implement various cryptosystems.							<b>K3</b>
	<b>CO4</b>	To implement cryptographic algorithms							<b>K4</b>
	<b>CO5</b>	To analyze different types of attacks on various cryptosystems.							<b>K5</b>
<b>UNIT - I</b>	<b>Introduction to Security</b>					<b>Periods:09</b>			
Introduction to Security:-Security Goals – Security services(Confidentiality, Integrity, Authentication, Non-repudiation, Access control) – Security Mechanisms (Encipherment, Data Integrity, Digital Signature, Authentication Exchange, Traffic Padding, Routing Control, Notarization, Access control) - Security Principles, Introduction to Cryptography:-Kerckhoff's Principle -Classification of Cryptosystems-Cryptanalytic attacks- Cipher Properties (Confusion, Diffusion).									<b>CO1</b>
<b>UNIT - II</b>	<b>Traditional Cryptography</b>					<b>Periods:09</b>			
Traditional Secret Key Ciphers:- Substitution Ciphers (mono alphabetic ciphers, poly alphabetic ciphers)-Transposition Ciphers-Stream and Block Ciphers. Modern Secret Key Ciphers:- Substitution Box-Permutation Box-Product Ciphers.									<b>CO2</b>
<b>UNIT - III</b>	<b>Data Encryption Standard</b>					<b>Periods:09</b>			
Data Encryption Standard (DES) (Fiestel and Non-Fiestel Ciphers, Structure of DES, DES Attacks, 2-DES, 3-DES) - Advanced Encryption Standard (AES) (Structure, Analysis)-Cryptographic Hash Functions– Properties - Secure Hash Algorithm-Message Authentication Code (MAC).									<b>CO3</b>
<b>UNIT - IV</b>	<b>Public key cryptography</b>					<b>Periods:09</b>			
Public Key Cryptosystems (PKC): - Types of PKC –Trapdoor -one way functions -RSA Cryptosystem (Integer Factorisation Trapdoor, Key Generation, Encryption, Decryption) - El Gamal Cryptosystem (Discrete Logarithm Trapdoor, Key Generation, Encryption, Decryption) - Diffie-Hellman Key Exchange Protocol, Man in the Middle attack on Diffie-Hellman Protocol.									<b>CO4</b>
<b>UNIT - V</b>	<b>Secure electronic records</b>					<b>Periods:09</b>			
Digital Signature:-Signing – Verification - Digital signature forgery (Existential forgery, Selective forgery, Universal forgery) - RSA Digital Signature Scheme - ElGamal Signature Scheme - IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security PayloadIntruders, Intrusion Detection, Distributed Denial of Service attacks									<b>CO5</b>
<b>Lecture Periods:45</b>		<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods:45</b>		
<b>Text Books</b>									
1. Jonathan Katz and Yehuda Lindell, "Introduction to Modern Cryptography: Principles and Protocols" ,Chapman and Hall/CRC,2014									
2. Behrouz A. Forouzan and Debdeep Mukhopadhyay, "Cryptography & Network Security", Second Edition, Tata McGraw Hill, New Delhi, 2010									
3. Douglas R. Stinson, "Cryptography: Theory and Practice", Third Edition, CRC Press. 3. William Stallings, "Cryptography and Network Security – Principles and Practices", Pearson Education, Fourth Edition, 2006.									
<b>Reference Books</b>									
1. Atul Kahate, "Cryptography and Network Security", 2nd Edition, TataMcGraw Hill, 2003.									
2. Bernard Menezes, Network Security and Cryptography-Cengage Learning India, 2011									
3. Bruce Schneier, "Applied Cryptography: Protocols, Algorithms, and SourceCode in C", Second Edition, John Wiley and Sons Inc, 2001.									
4. Thomas Mowbray, "Cybersecurity : Managing Systems Conducting Testing, and Investigating Intrusions", John Wiley, 2013									
5. Wenbo Mao, "Modern Cryptography- Theory & Practice", Pearson Education, 2006.									
<b>Web References</b>									
1. <a href="https://www.geeksforgeeks.org/cryptography">https://www.geeksforgeeks.org/cryptography</a>									
2. <a href="http://www.tutorialspoint.com/cryptography">www.tutorialspoint.com/cryptography</a>									
3. <a href="https://www.geeksforgeeks.org/network-security">https://www.geeksforgeeks.org/network security</a>									

\* TE – Theory Exam, LE – Lab Exam

2. 4.11.137

**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	1	2	1	2	-	-	1	1	2	2	3
2	3	2	1	1	1	2	1	2	-	-	1	1	2	2	3
3	3	2	1	2	2	2	1	2	-	-	3	3	2	3	3
4	3	2	2	2	3	2	1	2	-	-	3	3	2	3	3
5	3	2	2	2	3	2	1	2	-	-	3	3	2	3	3

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

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

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

Department	<b>Computer Science and Engineering</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV / VII</b>		Course Category: <b>ES</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CSH704</b>		Periods/Week		Credit	Maximum Marks			
Course Name	<b>SECURITY INCIDENT AND RESPONSE MANAGEMENT</b>		L	T	P	C	CAM	ESE	TM
			3	-	-	3	25	75	100
(Common to All Branches)									
Prerequisite	Information security and applied cryptography								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	CO1	Understanding inevitable incident and incident detection and characterization							K1
	CO2	To get an exposure to live data collection, Forensic duplication.							K2
	CO3	Understanding network evidence							K3
	CO4	Analyze the concept of data analysis in various file system							K4
	CO5	To gain knowledge on Investigation including Windows and Mac OS Systems							K5
<b>UNIT - I</b>	<b>Introduction</b>					<b>Periods:09</b>			
Introduction: Preparing for the Inevitable incident: Real world incident, IR management incident handbook, Pre incident preparation, Preparing the Organization for Incident Response, Preparing the IR team, Preparing the Infrastructure for Incident Response. Incident Detection and Characterization: Getting the investigation started on the right foot, collecting initial facts, Maintenance of Case Notes, Understanding Investigative Priorities. Discovering the scope of incident: Examining initial data, Gathering and reviewing preliminary evidence, determining a course of action, Customer data loss scenario, Automated clearing fraud scenario.									CO1
<b>UNIT - II</b>	<b>Data Collection</b>					<b>Periods:09</b>			
Data Collection: Live Data Collection: When to perform live response, selecting a live response tool, what to collect, collection best practices, Live data collection on Microsoft Windows Systems, Live Data Collection on Unix-Based Systems. Forensic Duplication: Forensic Image Formats, Traditional duplication, Live system duplication, Duplication of Enterprise Assets.									CO2
<b>UNIT - III</b>	<b>Network Evidence</b>					<b>Periods:09</b>			
Network Evidence: The case for network monitoring, Types for network monitoring, Setting Up a Network Monitoring System, Network Data, Analysis, Collect Logs Generated from Network Events. Enterprise Services: Network Infrastructure Services, Enterprise Management Applications, Web servers, Database Servers									CO3
<b>UNIT - IV</b>	<b>Data Analysis</b>					<b>Periods:09</b>			
Data Analysis: Analysis Methodology: Define Objectives, Know your data, Access your data, Analyse your data, Evaluate Results. Investigating Windows Systems: NTFS and File System analysis, Prefetch, Event logs, Scheduled Tasks, The Windows Registry, Other Artifacts of Interactive Sessions, Memory Forensics, Alternative Persistence Mechanisms.									CO4
<b>UNIT - V</b>	<b>Investigation</b>					<b>Periods:09</b>			
Investigating Mac OS X Systems: HFS+ and File System Analysis, Core Operating systems data. Investigating Applications: What is Application Data?, Where is application data stored?, General Investigation methods, Web Browser, Email Clients, Instant Message Clients.									CO5
<b>Lecture Periods:45</b>		<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>			<b>Total Periods:45</b>	
<b>Text Books</b>									
1. Jason T. Luttgens, Mathew Pepe and Kevin Mandia, "Incident Response and Computer Forensics", 3rd Edition, Tata McGraw-Hill Education									
2. Eric. C. Thompson, "Cyber Security Incident Response-How to Contain, Eradicate, and Recover from Incidents", Apress									
3. Eric C. Thompson, "Security Incident Management: A Comprehensive Guide to Planning, Response, and Recovery," Apress, 2019									
<b>Reference Books</b>									
1. Nadean H. Tanner, "Cybersecurity Incident Response: How to Contain, Eradicate, and Recover from Incidents," Wiley, 2020									
2. Gerard Johansen, "Digital Forensics and Incident Response: Incident response techniques and procedures to respond to modern cyber threats," Packt Publishing, 2020.									
3. Jason Luttgens, Matthew Pepe, and Kevin Mandia, "Incident Response & Computer Forensics," McGraw-Hill Education, 2014.									
4. Steve Anson, "Applied Incident Response," Wiley, 2020.									
5. Andrew Gorecki, "Effective Cybersecurity Incident Response: Expert tools and techniques for defending the network infrastructure and responding to cybersecurity incidents," Packt Publishing, 2018.									
<b>Web References</b>									
1. <a href="http://www.ibm.com/incident-response">www.ibm.com/incident-response</a>									
2. <a href="https://www.coursera.org/cyber-incident-response">https://www.coursera.org/cyber-incident-response</a>									
3. <a href="https://www.crowdstrike.com/cybersecurity-101/incident-response/">https://www.crowdstrike.com/cybersecurity-101/incident-response/</a>									

\* 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	PSO1	PSO2	PSO3
1	3	3	2	2	1	-	-	-	-	-	1	1	1	2	3
2	2	2	3	3	1	-	-	-	-	-	-	-	2	2	3
3	3	3	3	2	3	1	-	-	-	-	1	-	2	2	3
4	2	3	3	2	3	1	-	-	-	-	-	-	2	2	3
5	3	2	1	1	1	1	-	1	-	-	1	-	2	2	3

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

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

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



Department	<b>Computer Science and Engineering</b>	Programme: <b>B.Tech.</b>						
Semester	<b>IV / VIII</b>	Course Category: <b>ES</b>			End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23CSH805</b>	Periods/Week			Credit	Maximum Marks		
Course Name	<b>Artificial Intelligence for Cyber security</b>	L	T	P	C	CAM	ESE	TM
		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>100</b>

(Common to all Branches)

Prerequisite	<b>Artificial Intelligence</b>							
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)
	<b>CO1</b>	Understand the cyber threats, attacks and vulnerabilities and its defensive mechanism						<b>K1</b>
	<b>CO2</b>	Understand and implement various AI techniques to detect cyber attacks						<b>K2</b>
	<b>CO3</b>	The recent challenges in AI related to cyber security and able to develop new security solutions to the real time applications						<b>K3</b>
	<b>CO4</b>	Understand the various applications of AI to detect cyber-attacks.						<b>K4</b>
	<b>CO5</b>	Understand mail server to detect spam.						<b>K5</b>

<b>UNIT - I</b>	<b>Fundamentals of AI</b>	<b>Periods:09</b>	
Introduction – Problems that AI Solves – Why AI in Cyber security – Current Cyber Security Solutions - Structured data, Unstructured data – Supervised learning – Unsupervised learning – Reinforcement learning – classification problem - clustering problems – SVM – ANNs.			<b>CO1</b>

<b>UNIT - II</b>	<b>AI and DDoS</b>	<b>Periods:09</b>	
Time series – Types of Time series – Time Series analysis in Cyber Security – Detecting DDoS with Time Series – Predicting DDoS attacks – Ensemble Techniques for Cyber security – Types of Ensembles – Types of Ensemble Algorithms – Bagging, Boosting, Stacking, Bayesian Model - Ensemble Method to detect Cyber-attack.			<b>CO2</b>

<b>UNIT - III</b>	<b>Detection of malicious web pages, URLs</b>	<b>Periods:09</b>	
URL Blacklisting – Drive by download URL- Command and Control URLs – Phishing URLs – Using Heuristics to detect Malicious Pages – Data for the analysis – Feature Extraction – Lexical Features – Web Content based Features – Host based features – site Popularity features.			<b>CO3</b>

<b>UNIT - IV</b>	<b>Scan detection and malicious event detection</b>	<b>Periods:09</b>	
Using AI to crack CAPTCHA – Types of CAPTCHAS – ReCAPTCHA – Breaking a CAPTCHA – Solving CAPTCHA with neural network - Machine Learning in Scan Detection - Machine-Learning Applications in Scan Detection. Context based Malicious event detection – Adware – Bots –Bugs – Ransomware – Rootkit – Spyware – Trojan horses – Viruses – Worms – Malicious Injections in Wireless networks.			<b>CO4</b>

<b>UNIT - V</b>	<b>AI and Mail Server</b>	<b>Periods:09</b>	
Types of Mail Server – Data Collection from mail server – Naive Bayes theorem to detect spam – Laplace smoothing – Featurization Techniques to covert text-based emails to numeric values – Logistic regression to spam filters - Anomaly detection techniques for SMTP and HTTP.			<b>CO5</b>

<b>Lecture Periods:45</b>	<b>Tutorial Periods: -</b>	<b>Practical Periods: -</b>	<b>Total Periods:45</b>
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<b>Text Books</b>
<ol style="list-style-type: none"> <li>Hands-On Machine Learning for Cyber Security: Safeguard your system by making your machine intelligence using the python ecosystem, Soma Harder, Sinan Ozdemir, Packt Publishing Ltd, 2018.</li> <li>The state of the Art in Intrusion Detection System, Al-Sakib Khan Pathan, CRC Press, Taylor &amp; Francis Group, 2014</li> <li>Data Mining and Machine Learning in Cyber Security, Sumeet Dua and Xian Du, CRC Press, 2011.</li> </ol>

<b>Reference Books</b>
<ol style="list-style-type: none"> <li>Cybersecurity for Dummies, Brian Underdahl, Wiley, 2011</li> <li>Cryptography and Network security, Behrouz A. Forouzan , Debdeep Mukhopadhyay, Mcgraw Hill Education, 2nd Edition, 2011</li> <li>Anne-Laure Joussetme, Quentin Bernhard, and Dorothee Lahalle "Artificial Intelligence for Cybersecurity: A Comprehensive Guide" Wiley Publication,2021.</li> <li>S. S. Rajput, Suman Bhattacharya, and Sushil Kumar Sharma "Deep Learning for Cybersecurity" , CRC Press,2019</li> <li>Leslie F. Sikos,"Artificial Intelligence in Cybersecurity: Risk Management" , Springer Publication, 2020</li> </ol>

<b>Web References</b>
<ol style="list-style-type: none"> <li><a href="https://www.geeksforgeeks.org/AI-for-cybersecurity">https://www.geeksforgeeks.org/AI-for-cybersecurity</a></li> <li><a href="http://www.tutorialspoint.com/cybersecurity">www.tutorialspoint.com/cybersecurity</a></li> <li><a href="http://www.tutorialspoint.com/AI">www.tutorialspoint.com/AI</a></li> </ol>

\* 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	PSO1	PSO2	PSO3
1	3	2	1	1	1	2	1	2	-	-	1	1	2	2	3
2	3	2	1	1	1	2	1	2	-	-	1	1	2	2	3
3	3	2	1	2	2	2	1	2	-	-	3	3	2	3	3
4	3	2	2	2	3	2	1	2	-	-	3	3	2	3	3
5	3	2	2	2	3	2	1	2	-	-	3	3	2	3	3

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

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

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

Department	Artificial Intelligence and Data Science		Programme: B.Tech.						
Semester	II		Course Category: PC			*End Semester Exam Type: TE			
Course Code	U23ADH502		Periods / Week		Credit	Maximum Marks			
Course Name	Advanced Deep Learning		L	T	P	C	CAM	ESE	TM
			3	1	-	4	25	75	100

Prerequisite: Solid understanding of basic machine learning concepts and neural network architectures, Proficiency in Python Programming

Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)
	CO1	Understand and explore advanced deep learning models and techniques						K2
	CO2	Apply deep learning concepts to real-world problems						K3
	CO3	Analyze different sequence models and its use in NLP.						K4
	CO4	Understand and apply deep RL techniques						K2, K4
	CO5	Understand Neural architecture search and optimization and applications						K2, K3

**UNIT – I**      **Advanced Convolutional Networks and Visual Recognition**      **Periods:09**

Deep Convolutional Networks: ResNet, DenseNet, Inception, and their architectures. Transfer Learning: Pre-trained models (VGG, EfficientNet), fine-tuning, domain adaptation. Attention in Vision: Vision transformers (ViT), attention mechanisms in CNNs. Object Detection and Segmentation: R-CNN, Fast R-CNN, YOLO, Mask R-CNN. Applications: Image classification, detection, segmentation, and enhancement tasks. CO1

**UNIT – II**      **Generative Models**      **Periods:09**

Generative Adversarial Networks (GANs): Architecture, loss functions, training instability, and improvements (DCGAN, WGAN, StyleGAN). Variational Autoencoders (VAEs): Probabilistic interpretation, KL divergence, reconstruction. Diffusion Models: Overview of diffusion probabilistic models for image generation. Applications: Image synthesis, style transfer, super-resolution, and data augmentation. CO2

**UNIT – III**      **Sequence Models and Natural Language Processing (NLP)**      **Periods:09**

Recurrent Neural Networks (RNNs): Advanced concepts in LSTMs, GRUs, and bidirectional RNNs. Transformers: Architecture, self-attention mechanism, positional encoding. BERT, GPT, T5 Models: Pre-training, fine-tuning, masked language models. Multimodal Learning: Combining text, images, and audio for richer representations. Applications: Text generation, translation, summarization, sentiment analysis. CO3

**UNIT – IV**      **Reinforcement Learning and Deep RL**      **Periods:09**

Foundations of Reinforcement Learning: Markov decision processes (MDPs), policy, value functions. Deep Q-Networks (DQN): Q-learning with deep networks, experience replay. Policy Gradient Methods: REINFORCE, actor-critic methods, Proximal Policy Optimization (PPO). Deep RL Applications: Game AI, robotics, autonomous systems, recommendation systems. CO4

**UNIT – V**      **Neural Architecture Search and Model Optimization**      **Periods:09**

Neural Architecture Search (NAS): Techniques for automating architecture discovery (e.g., ENAS, AutoML). Model Pruning and Quantization. Knowledge Distillation: Transfer of knowledge from large models to smaller, Meta-Learning: Few-shot learning, model adaptation to new tasks with limited data. Applications: Optimizing models for edge devices, mobile AI, energy-efficient deep learning. CO5

LecturePeriods:45	TutorialPeriods: -	PracticalPeriods: -	Total Periods:45
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- Textbooks**
1. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", MIT Press, 1<sup>st</sup> Edition, 2016.
  2. Charu C. Aggarwal, "Neural Networks and Deep Learning", Springer, 2018.
  3. Denis Rothman, "Transformers for Natural Language Processing", Packt Publishing, 1<sup>st</sup> Edition, 2021.
  4. Frank Hutter, Lars Kotthoff, and Joaquin Vanschoren, "AutoML: Methods, Systems, Challenges", Springer Cham, 1<sup>st</sup> Edition, 2021.

**References**

1. Cosma Rohilla Shalizi, "Advanced Data Analysis from an Elementary Point of View", Cambridge University Press, 2015.
2. Deng & Yu, "Deep Learning: Methods and Applications", Now Publishers, 2014.
3. Michael Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015.
4. Josh Patterson, Adam Gibson, "Deep Learning A Practitioner's Approach", O'Reilly Media, 2017.
5. Nikhil Buduma, "Fundamentals of Deep Learning", O'Reilly, 2017.

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**Web References**

1. <https://nptel.ac.in/courses/106/106/106106184/>
2. <http://deeplearning.net/Dj>

3. <https://www.guru99.com/deep-learning-tutorial.html>
4. <https://www.coursera.org/specializations/deep-learning>
5. <http://neuralnetworksanddeeplearning.com>

### 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	3	2	1	-	-	-	-	-	-	-	1	1	-	1
2	3	3	2	1	-	-	-	-	-	-	-	1	1	-	-
3	3	3	2	1	-	-	-	-	-	-	-	1	1	-	-
4	3	3	2	1	-	1	-	-	-	1	1	1	1	-	-
5	3	3	2	1	-	1	-	-	-	1	1	1	1	-	1

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

### Evaluation Methods

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

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Department	<b>Artificial Intelligence and Data Science</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VII</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ADH704</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Image and Video Analytics</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	Basic image processing concepts, knowledge of Machine Learning and Deep Learning fundamentals								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand Digital image and video processing.						<b>K2</b>	
	<b>CO2</b>	Understand the Concept of Image and Video enhancement and restoration						<b>K2</b>	
	<b>CO3</b>	Understand and apply Various concepts of Image analysis and video analysis.						<b>K2,K3</b>	
	<b>CO4</b>	Understand Various concept Feature Detection and Description						<b>K2</b>	
	<b>CO5</b>	Understand the Concept of Object detection and recognition.						<b>K2</b>	
<b>UNIT-I</b>	<b>Introduction to Digital Image and Video Processing</b>					<b>Periods: 09</b>			
Digital image representation - Sampling and Quantization - Types of Images - Basic Relations between Pixels – Neighbors – Connectivity - Distance Measures between pixel - Linear and Non-Linear Operations - Introduction to Digital Video - Sampled Video - Video Transmission. Gray-Level Processing: Image Histogram, Arithmetic Operations between Images - Geometric Image Operations. Binary Image Processing, Binary Image Morphology.									<b>CO1</b>
<b>UNIT-II</b>	<b>Image and Video Enhancement and Restoration</b>					<b>Periods: 09</b>			
Spatial domain - Linear and Non-linear Filtering - Morphological filtering - Frequency domain– Homomorphic Filtering - Blotch Detection and Removal - Blotch Detection - Motion Vector Repair and Interpolating Corrupted Intensities - Intensity Flicker Correction – Flicker Parameter Estimation - Wavelet based image denoising - Basic methods for image restoration using deconvolution filters.									<b>CO2</b>
<b>UNIT-III</b>	<b>Image and Video Analysis</b>					<b>Periods: 09</b>			
Image Compression: Huffman coding - Run length coding - LZW coding - Lossless Coding - Wavelets based image compression. Video Compression: Basic Concepts and Techniques of Video Coding and the H.264 Standard - MPEG-1 and MPEG-2 Video Standards.									<b>CO3</b>
<b>UNIT-IV</b>	<b>Feature Detection and Description</b>					<b>Periods: 09</b>			
Introduction to feature detectors - descriptors - matching and tracking - Basic edge detectors– canny – sobel - prewitt etc. - Image Segmentation - Region Based Segmentation – Region Growing and Region Splitting and Merging - Thresholding– Basic global thresholding - optimum global thresholding using Otsu's Method									<b>CO4</b>
<b>UNIT-V</b>	<b>Object Detection and Recognition</b>					<b>Periods: 09</b>			
Object detection and recognition in image and video - basic texture descriptors - GLCM - LBP and its applications in image and video analysis - object tracking in videos.									<b>CO5</b>
<b>LecturePeriods:45</b>	<b>TutorialPeriods: -</b>			<b>PracticalPeriods: -</b>			<b>Total Periods:45</b>		
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>1. Alan Bovik, "Handbook of Image and Video Processing", 2<sup>nd</sup> Edition, Academic Press, 2005.</li> <li>2. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 3<sup>rd</sup> Edition, Pearson Education, 2008.</li> <li>3. Richard Szeliski, "Computer Vision – Algorithms and Applications", Springer, 2011.</li> <li>4. Ali Ismail Awad and Mahmoud Hassaballah, "Image Feature Detectors and Descriptors", Foundations and Applications, Springer, 1st ed. 2016 edition.</li> <li>5. Xiaoyue Jiang and Abdenour Hadid, "Deep Learning in Object Detection and Recognition Hardcover", Springer, 1st ed. 2019 edition (27 November 2019).</li> </ol>									

### Reference Books

1. Anil K Jain, "Fundamentals of Digital Image Processing ", PHI, 2011.
2. Oge Marques, "Practical Image and Video Processing Using MatLab ", Wiley, 2011.
3. John W. Woods, "Multidimensional Signal, Image, Video Processing and Coding ", Academic Press, 2006.
4. Mohammed Salemdeeb, "Object Detection and Recognition Using Deep Learning", Scholars' Press, 2020.
5. Davut Armagan Kaya, "Feature Detection and Matching", Grin Verlag, 1<sup>st</sup> edition, 2021).

### Web References

1. <https://www.geeksforgeeks.org/digital-image-processing-basics/>
2. <https://www.javatpoint.com/digital-image-processing-tutorial>
3. <https://www.tutorialspoint.com/dip/index.htm>

### 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	3	2	1	-	-	-	-	-	-	-	1	1	-	1
2	3	3	2	1	-	-	-	-	-	-	-	1	1	-	-
3	3	3	2	1	-	-	-	-	-	-	-	1	1	-	-
4	3	3	2	1	-	1	-	-	-	1	1	1	1	-	-
5	3	3	2	1	-	1	-	-	-	1	1	1	1	-	1

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

### Evaluation Methods

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

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

Department	<b>Artificial Intelligence and Data Science</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ADH401</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Parallel Programming and High Performance Computing</b>		<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	Basics of Programming (C,C++), Computer architecture concepts, operating system concepts								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Develop message passing parallel programs using MPI framework						<b>K4</b>	
	<b>CO2</b>	Implement shared memory parallel programs using Pthreads						<b>K3</b>	
	<b>CO3</b>	Work with shared memory parallel programs using OpenMP						<b>K3</b>	
	<b>CO4</b>	Analyze the complexity of parallel algorithms						<b>K3</b>	
	<b>CO5</b>	Build applications using GPU based CUDA programming						<b>K4</b>	
<b>UNIT-I</b>	<b>Message Passing Paradigm</b>					<b>Periods: 09</b>			
Basic MPI programming – MPI_Init and MPI_Finalize – MPI communicators – SPMD programs – Message passing – MPI_Send and MPI_Recv – Message matching – MPI I/O – Parallel I/O – Collective communication – MPI_Reduce – MPI_Allreduce, broadcast, scatter, gather, allgather – Derived types – Remote Memory Access – Performance evaluation of MPI programs								<b>CO1</b>	
<b>UNIT-II</b>	<b>Shared Memory Paradigm: Pthreads</b>					<b>Periods: 09</b>			
Basics of Pthreads – Thread synchronization – Critical sections – Busy waiting – Mutex – Semaphores – Barriers and condition variables – Read write locks with examples - Caches, cache coherence and false sharing – Pthreads case study								<b>CO2</b>	
<b>UNIT-III</b>	<b>Shared Memory Paradigm: OpenMP</b>					<b>Periods: 09</b>			
Basic OpenMP constructs – scope of variables – Reduction clause – Parallel For directive – loops in OpenMP – Scheduling loops – Synchronization in OpenMP – Case Study: Producer-Consumer problem – Cache issues – Threads safety in OpenMP – OpenMP best practices								<b>CO3</b>	
<b>UNIT-IV</b>	<b>Parallel Algorithms</b>					<b>Periods: 09</b>			
Elementary parallel algorithms: Reduction – Broadcast - Prefix sum. Matrix multiplication: Algorithm for processor array - Algorithm for multiprocessors and multicomputer. Sorting: Odd even transposition sort - Bitonic merge - Quick sort algorithms.								<b>CO4</b>	
<b>UNIT-V</b>	<b>GPU Programming with CUDA</b>					<b>Periods: 09</b>			
GPUs and GPGPU - GPU architectures - Heterogeneous computing – Simple CUDA program - Threads, blocks, and grids - Vector addition – CUDA trapezoidal rule – improvements - Implementation of trapezoidal rule with warp Size thread blocks – block with more than one warp								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>			<b>Total Periods: 45</b>	
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>1. Peter S. Pacheco, Matthew Malensek, "An introduction to parallel programming", Second edition, Morgan Kaufmann, 2021</li> <li>2. Niranjan N. Chiplunkar, Raju K, "Introduction to Parallel Computing", Wiley, 2021.</li> <li>3. Michael J. Quinn, "Parallel Computing: Theory &amp; Practice", Tata McGraw Hill, Second edition, Reprint 2017.</li> </ol>									

### Reference Books

1. A. Munshi, B. Gaster, T. G. Mattson, J. Fung, and D. Ginsburg, "OpenCL programming guide", Addison Wesley, 2011
2. M. J. Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2011.
3. Rob Farber, "CUDA application design and development", Morgan Kaufmann, 2011

### Web References

1. <http://condor.cc.ku.edu/~grobe/docs/intro-MPI-C.shtml>
2. <http://www.hpcc.unn.ru/mskurs/ENG/DOC/pp09.pdf>
3. <https://www.cs.cmu.edu/afs/cs/academic/class/15492-f07/www/pthreads.html>
4. <https://www.openmp.org/>
5. <https://developer.nvidia.com/blog/even-easier-introduction-cuda/>

### 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	3	2	1	-	-	-	-	-	-	-	1	1	-	1
2	3	3	2	1	-	-	-	-	-	-	-	1	1	-	-
3	3	3	2	1	-	-	-	-	-	-	-	1	1	-	-
4	3	3	2	1	-	1	-	-	-	1	1	1	1	-	-
5	3	3	2	1	-	1	-	-	-	1	1	1	1	-	1

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

### Evaluation Methods

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

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



Department	<b>Artificial Intelligence and Data Science</b>		Programme: <b>B.Tech.</b>						
Semester	<b>VIII</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ADH805</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Prompt Engineering</b>		<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	Strong understanding of Natural Language Processing, familiarity with Machine Learning models and techniques.								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Understand the basic concepts and importance of prompt engineering, including various types of prompts and their applications.							<b>K2</b>
	<b>CO2</b>	Develop skills in designing effective prompts with clear structure and contextual relevance, avoiding common pitfalls.							<b>K3</b>
	<b>CO3</b>	Gain proficiency in evaluating prompt performance using various metrics and feedback, and improve prompt effectiveness.							<b>K3</b>
	<b>CO4</b>	Explore advanced techniques in prompt engineering, including machine learning integration, personalization, and ethical considerations. the different types of Graphs.							<b>K3</b>
	<b>CO5</b>	Apply prompt engineering concepts in various industries through case studies and projects, understanding future trends and building interactive systems.							<b>K4</b>
<b>UNIT-I</b>	<b>Introduction to Prompt Engineering</b>					<b>Periods: 09</b>			
Introduction – Importance and Applications – Types of Prompts – Components of Effective Prompts – Challenges and Solutions – Case Studies in Prompt Engineering.									<b>CO1</b>
<b>UNIT-II</b>	<b>Designing Effective Prompts</b>					<b>Periods: 09</b>			
Principles of Prompt Design – Structuring Prompts – Contextual Relevance – Clarity and Precision – Examples and Best Practices – Common Pitfalls and How to Avoid Them.									<b>CO2</b>
<b>UNIT-III</b>	<b>Evaluating Prompt Performance</b>					<b>Periods: 09</b>			
Metrics for Prompt Effectiveness – User Feedback and Iteration – Testing and Validation Methods – Analyzing User Engagement – Improving Prompt Responsiveness – Tools for Evaluation and Optimization.									<b>CO3</b>
<b>UNIT-IV</b>	<b>Advanced Techniques in Prompt Engineering</b>					<b>Periods: 09</b>			
Adaptive Prompting Techniques – Leveraging Machine Learning for Prompt Improvement – Multi-turn Prompts and Conversations – Personalization and Customization – Integrating Prompts with AI Systems – Ethical Considerations and Bias Mitigation.									<b>CO4</b>
<b>UNIT-V</b>	<b>Case Studies and Applications</b>					<b>Periods: 09</b>			
Industry-Specific Prompt Engineering Applications – Healthcare, Finance, Education, and Customer Service – Building Interactive Systems with Prompts – Real-world Case Studies and Success Stories – Future Trends in Prompt Engineering – Capstone Project: Designing a Prompt System.									<b>CO5</b>
<b>LecturePeriods:45</b>			<b>TutorialPeriods: -</b>			<b>PracticalPeriods: -</b>			<b>Total Periods:45</b>
<b>Text Books</b>									
1. John D. Kelleher, Brian Mac Namee, and Aoife D'Arcy, "Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies," MIT Press, 2015.									
2. Christopher Manning, Hinrich Schütze, and Prabhakar Raghavan, "Introduction to Information Retrieval," Cambridge University Press, 2008.									
3. Kathleen R. McKeown, "Introduction to Natural Language Processing," McGraw-Hill, 1992.									
4. Jacob Andreas, "Task-Oriented Dialogue Systems for Conversational AI," Springer, 2020.									

**Reference Books**

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing," 3rd Edition, Pearson, 2021.
2. Yoav Goldberg, "Neural Network Methods for Natural Language Processing," Morgan & Claypool Publishers, 2017.
3. Christopher D. Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing," MIT Press, 1999.
4. Mike Lewis and Tom Kwiatkowski, "Advanced Methods for Natural Language Processing," Springer, 2022.

**Web References**

1. <https://www.nltk.org/book/>
2. <https://github.com/dennybritz/deeplearning-pytorch>
3. <https://towardsdatascience.com/prompt-engineering-7e1666f71e7f>
4. <https://github.com/f/awesome-chatgpt-prompts>
5. <https://ai.googleblog.com/search/label/Dialog%20Systems>

**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	3	2	1	-	-	-	-	-	-	-	1	1	-	1
2	3	3	2	1	-	-	-	-	-	-	-	1	1	-	-
3	3	3	2	1	-	-	-	-	-	-	-	1	1	-	-
4	3	3	2	1	-	1	-	-	-	1	1	1	1	-	-
5	3	3	2	1	-	1	-	-	-	1	1	1	1	-	1

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

**Evaluation Methods**

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

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

Department	<b>Artificial Intelligence and Data Science</b>		Programme: <b>B.Tech.</b>							
Semester	<b>VI</b>		Course Category: <b>PC</b>			*End Semester Exam Type: <b>TE</b>				
Course Code	<b>U23ADH603</b>		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	<b>Reinforcement Learning</b>		<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>	
Prerequisite	Machine Learning, Programming in Python, knowledge of Probability and statistics									
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)		
	<b>CO1</b>	Understand the concepts of Reinforcement Learning to solve real world problems.							<b>K2</b>	
	<b>CO2</b>	Apply Markov Decision Process, Monte Carlo, Temporal Difference methods for policy evaluation and prediction							<b>K3</b>	
	<b>CO3</b>	Analyze the Tabular Methods and On-policy Prediction with Approximation.							<b>K4</b>	
	<b>CO4</b>	Analyze a given problem and use the suitable Reinforcement Techniques							<b>K4</b>	
	<b>CO5</b>	Implement eligibility traces, REINFORCE, tabular methods, Dyna, prioritized sweeping, and Monte Carlo tree search in reinforcement learning applications.							<b>K3</b>	
<b>UNIT-I</b>	<b>Reinforcement Learning Primitives</b>					<b>Periods: 09</b>				
Introduction and Basics of RL, Defining RL Framework, Probability Basics: Probability Axioms, Random Variables, Probability Mass Function, Probability Density Function, Introduction to Agents, Intelligent Agents – Problem Solving – Searching, Logical Agents.									<b>CO1</b>	
<b>UNIT-II</b>	<b>Finite Markov Decision Process</b>					<b>Periods: 09</b>				
Basics, The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notation for Episodic and Continuing Tasks, Policies and Value Functions, Optimal Policies and optimal Value Functions.									<b>CO2</b>	
<b>UNIT-III</b>	<b>Dynamic Programming</b>					<b>Periods: 09</b>				
Definition, Policy Evaluation (Prediction), Policy Improvement, Policy Iteration, Value Iteration, Asynchronous dynamic programming, Generalized Policy Iteration, Efficiency of dynamic programming. Monte Carlo Methods: Definition, Monte Carlo Prediction, Monte Carlo Estimation of Action values, Monte Carlo Control, Monte Carlo Control without Exploring Starts.									<b>CO3</b>	
<b>UNIT-IV</b>	<b>Monte Carlo methods for model free prediction and control and TD methods</b>					<b>Periods: 09</b>				
Temporal-Difference Learning: TD Prediction, Advantages of TD Prediction Methods, Optimality of TD (0), Sarsa: On-policy TD control, Q-learning Off-policy TD control.									<b>CO4</b>	
<b>UNIT-V</b>	<b>Eligibility Traces and Reinforce</b>					<b>Periods: 09</b>				
Planning and Learning with Tabular Methods: Models and Planning, Dyna: Integrated Planning, acting and learning, Prioritized Sweeping- Real-time dynamic programming, Planning at decision time, Heuristic search, Rollout algorithms, Monte Carlo tree search.									<b>CO5</b>	
<b>LecturePeriods:45</b>			<b>TutorialPeriods: -</b>			<b>PracticalPeriods: -</b>			<b>Total Periods:45</b>	
<b>Text Books</b>										
1. Russell, S. J., & Norvig, P. "Artificial Intelligence: A Modern Approach", 4 <sup>th</sup> Edition, Pearson, 2020. 2. Busoniu, L., Babuška, R., & De Schutter, B., "Reinforcement Learning and Dynamic Programming Using Function Approximators". CRC Press, 2010 3. Richard S. Sutton, Andrew G. Barto, "Reinforcement Learning, An Introduction: Adaptive Computation and Machine Learning series", MIT Press, 4 <sup>th</sup> edition, 2018 4. Paul A. Gagnic, "Markov Chains: From Theory to Implementation and Experimentation", John Wiley & Sons, 2017, ISBN 1119387558, 9781119387558										

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### Reference Books

1. Sutton, R. S., & Barto, A. G. "Reinforcement Learning: An Introduction", 2<sup>nd</sup> Edition, 2018.
2. Silver, D."UCL Course on Reinforcement Learning" , 2015..
3. Mnih, V., et al., "Human-level control through deep reinforcement learning". Springer Nature, 2015.

### Web References

1. <https://www.datacamp.com/tutorial/reinforcement-learning-python-introduction>
2. <https://medium.com/analytics-vidhya/a-beginners-guide-to-reinforcement-learning-and-its-basic-implementation-from-scratch-2c0b5444cc49>
3. <https://towardsdatascience.com/reinforcement-learning-101-e24b50e1d292>
4. <https://towardsdatascience.com/introduction-to-reinforcement-learning-rl-part-5-monte-carlo-methods-25067003bb0f>

### 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	3	2	1	-	-	-	-	-	-	-	-	1	1	-
2	3	3	2	1	-	-	-	-	-	-	-	-	1	1	-
3	3	3	2	1	-	-	-	-	-	-	-	-	1	1	-
4	3	3	2	1	-	1	-	-	-	1	1	1	1	-	-
5	3	3	2	1	-	1	-	-	-	1	1	1	1	-	1

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

### Evaluation Methods

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

\* Application oriented

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Department	Information Technology		Programme: B.Tech.						
Semester	Fourth		Course Category Code: PC			*End Semester Exam Type: TE			
Course Code	U23ITH401		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	Frontend Development		3	1	0	4	25	75	100
Prerequisite	Basic knowledge of programming concepts, HTML, and CSS.								
Course Outcome	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	CO1	Explain the fundamentals of HTML and CSS and their role in web development.							K2
	CO2	Understand the principles of responsive design and learn to use Bootstrap for creating responsive web pages.							K2
	CO3	Implement database operations using DML and DDL commands in a relational database.							K3
	CO4	Understand the basics of Node.js and learn to build server-side applications that connect to a database.							K2
	CO5	Build an Event Management System							K3
Unit- I	<b>HTML and CSS</b>					Periods: 09			
Introduction to Web Development - HTML Basics - CSS Basics - Advanced HTML and CSS - Hands-on Projects: Building a static web page, Creating a responsive portfolio site.									CO1
Unit- II	<b>Bootstrap and Database Commands</b>					Periods: 09			
Introduction to Bootstrap - Advanced Bootstrap - Database Fundamentals - Database Commands (DDL, DML) - Hands-on Projects: Building a web page with Bootstrap, Basic CRUD operations in a database.									CO2
Unit- III	<b>Connecting Database using Node js</b>					Periods: 09			
Introduction to Node.js - Node.js Basics - Building a Server with Node.js - Database Integration - Hands-on Projects: Building a RESTful API with Node.js, Connecting the API to a database.									CO3
Unit- IV	<b>Connecting Database using Angular js</b>					Periods: 09			
Introduction to Angular.js - Angular.js Basics - Advanced Angular.js - Database Integration - Hands-on Projects: Building a dynamic web application with Angular.js, Integrating the web app with a database.									CO4
Unit- V	<b>Case Study: Event Management System</b>					Periods: 09			
Project Planning - Frontend Development - Backend Development - Database Integration - Project Implementation - Deployment - Project Documentation.									CO5
Lecture Periods: 45		Tutorial Periods:		Practical Periods: -			Total Periods: 45		
<b>Text Books</b>									
1. "HTML and CSS: Design and Build Websites", Jon Duckett, 1 <sup>st</sup> Edition, Wiley, 2011.									
2. "Node.js, MongoDB, and Angular Web Development", Brad Dayley, Brendan Dayley, and Caleb Dayley, 2 <sup>nd</sup> Edition, Addison-Wesley Professional, 2018.									
3. "Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js", Shama Hoque, 2 <sup>nd</sup> Edition, Packt Publishing, 2020.									
<b>Reference Books</b>									
1. "Eloquent JavaScript: A Modern Introduction to Programming", Marijn Haverbeke, 3 <sup>rd</sup> Edition, No Starch Press, 2018.									
2. "You Don't Know JS Yet: Get Started", Kyle Simpson, 2 <sup>nd</sup> Edition, 2020.									
3. "Web Development with Node and Express: Leveraging the JavaScript Stack", Ethan Brown, 2 <sup>nd</sup> Edition, O'Reilly Media, 2019.									
4. "Pro Angular 9: Build Powerful and Dynamic Web Apps", Adam Freeman, 4 <sup>th</sup> Edition, Apress, 2020.									
5. "Learning SQL: Generate, Manipulate, and Retrieve Data", Alan Beaulieu, 3 <sup>rd</sup> Edition, O'Reilly Media, 2020.									
<b>Web References</b>									
1. <a href="https://developer.mozilla.org/en-US/docs/Web/HTML">https://developer.mozilla.org/en-US/docs/Web/HTML</a>									
2. <a href="https://developer.mozilla.org/en-US/docs/Web/CSS">https://developer.mozilla.org/en-US/docs/Web/CSS</a>									
3. <a href="https://getbootstrap.com/docs/">https://getbootstrap.com/docs/</a>									
4. <a href="https://nodejs.org/en/docs/">https://nodejs.org/en/docs/</a>									
5. <a href="https://angular.io/docs">https://angular.io/docs</a>									

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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	PSO1	PSO2	PSO3
1	2	1	-	-	2	-	-	-	-	-	-	-	-	1	1
2	3	2	1	1	2	-	-	-	-	-	-	-	-	1	1
3	3	2	1	1	2	-	-	-	-	-	-	-	-	1	1
4	3	2	1	1	2	-	-	-	-	-	-	-	-	1	1
5	3	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	Information Technology		Programme: B.Tech.						
Semester	III/V		Course Category Code: PC			*End SemesterExamType:TE			
CourseCode	U23ITH502		Periods/Week			Credit	MaximumMarks		
			L	T	P	C	CAM	ESE	TM
Course Name	Advanced Databases		3	1	0	4	25	75	100
Prerequisite	Database Management Systems								
Course Outcome	On completion of the course, the students will be able to							BT Mapping (Highest Level)	
	CO1	Illustrate parallel and distributed databases to optimize database performance in practice.						K2	
	CO2	Use various Data mining and warehousing tools						K3	
	CO3	Examine data on Active, spatial and temporal databases						K3	
	CO4	Develop cloud-based applications						K3	
	CO5	Analyze access layer in applications using recent database technologies.						K4	
Unit-I	Parallel and Distributed DBMS					Periods:09			
Parallel DBMS: Architecture Query evaluation - Query optimization Parallelizing individual operations. Distributed DBMS: Architecture - Storing - Data Cataloguing - Query processing - Updates - Transactions Concurrency and Recovery.								CO1	
Unit-II	Data Mining, Data Warehousing					Periods:09			
Data Mining: Introduction - Counting co-occurrences - Mining for rules - Tree structured rules - Clustering -Similarity search over sequences. Data Warehousing: Definition and terminology - Characteristics - Data modeling - Data warehouse Vs Views -Typical functionality of a warehouse.								CO2	
Unit-III	Active, Temporal, Spatial Databases					Periods:09			
Active Databases: Syntax and Semantics (Starburst, Oracle, DB2) - Taxonomy - Applications - Design Principles for Active Rules. Temporal Databases: Overview of Temporal Databases - TSQL2 Spatial Databases - Spatial Data Types - Spatial Relationships - Spatial Data Structures - Spatial Access Methods - Spatial DB Implementation.								CO3	
Unit-IV	Cloud Based Databases					Periods:09			
Data Storage Systems on the Cloud - Cloud Storage Architectures - Cloud Data Models - Query Languages - Introduction to Big Data - Storage - Analysis								CO4	
Unit-V	Recent Database Technologies					Periods:09			
Mobile Databases - Multimedia Databases - Geographical Information Systems - Genome Data Management.								CO5	
LecturePeriods:45		TutorialPeriods:-		PracticalPeriods:-		TotalPeriods:45			
<b>TextBooks</b>									
1. Thomas M. Connolly, Carolyn Begg, Database Systems: practical approach to design, implementation, and management, Pearson Education Limited, (6th edition),2019									
2. Henry F Korth, Abraham Silberschatz, S. Sudharshan, —Database System ConceptsII, Seventh Edition, McGraw Hill, 2019.									
<b>ReferenceBooks</b>									
1. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, —Advanced Database SystemsII, Morgan Kaufmann publishers,2006.									
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, III Ed., McGraw Hill Publications									
3. C.J.Date, A.Kannan, S.Swamynathan, —An Introduction to Database SystemsII, Eighth Edition, Pearson Education, 2006.									
<b>Web References</b>									
1. <a href="http://www.exploredatabase.com/p/blog-page.html">http://www.exploredatabase.com/p/blog-page.html</a>									
2. <a href="http://csce.uark.edu/~cwt/COURSES/2014-01-CSCE-4543-SW-ARCH/03-CHAPTERS/Chapter09-Spatial and Temporal DBMS Extensions-Namburi.pdf">http://csce.uark.edu/~cwt/COURSES/2014-01-CSCE-4543-SW-ARCH/03-CHAPTERS/Chapter09-Spatial and Temporal DBMS Extensions-Namburi.pdf</a>									
3. <a href="https://www.tutorialspoint.com/Mobile-Databases">https://www.tutorialspoint.com/Mobile-Databases</a>									

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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	PSO1	PSO2	PSO3
1	3	2	2	2	3	-	-	-	-	-	-	1	3	2	-
2	3	2	2	2	3	-	-	-	-	-	-	1	3	2	-
3	3	2	2	2	3	-	-	-	-	-	-	1	3	2	-
4	3	2	2	2	3	-	-	-	-	-	-	1	3	2	-
5	3	2	2	2	3	-	-	-	-	-	-	1	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



Department	Information Technology		Programme: B.Tech.							
Semester	III/VI		Course Category Code: PC			*End Semester Exam Type: TE				
Course Code	U23ITH603		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	Microservices and Spring-Boot		3	1	0	4	25	75	100	
Prerequisite	Basic understanding of Java, web technologies, Spring Framework, relational databases, Git, and IDEs									
Course Outcome	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)		
	CO1	Understand microservices architecture and develop a basic Spring Boot microservice.							K2	
	CO2	Manage configuration, apply dependency injection, and use Spring Boot Actuator.							K2	
	CO3	Implement service discovery, inter-service communication, and fault tolerance.							K3	
	CO4	Perform data persistence, manage migrations, and implement event-driven architecture.							K3	
	CO5	Secure microservices, containerize with Docker, deploy with Kubernetes, and implement monitoring and logging.							K3	
<b>Unit- I</b>	<b>Introduction to Microservices and Spring Boot</b>							<b>Periods: 09</b>		
<b>Fundamentals of Microservices Architecture:</b> Definition and core principles of microservices - Advantages and challenges of microservices - Comparison with monolithic architecture <b>Overview of Spring Boot:</b> Introduction to the Spring Framework - Key features and benefits of Spring Boot - Setting up a Spring Boot development environment <b>Creating a Basic Microservice:</b> Building a simple Spring Boot application - Understanding essential Spring Boot annotations - Running and testing a basic microservice									CO1	
<b>Unit- II</b>	<b>Core Spring Boot Features</b>							<b>Periods: 09</b>		
<b>Configuration Management:</b> Externalized configuration using application. Properties and application.yml - Using Spring profiles for environment-specific configurations <b>Dependency Injection and Bean Management:</b> Understanding dependency injection (DI) - Configuring beans and component scanning - Using @Autowired and other Spring annotations <b>Spring Boot Actuator:</b> Introduction to Spring Boot Actuator for monitoring - Key Actuator endpoints and their usage - Customizing Actuator endpoints									CO2	
<b>Unit- III</b>	<b>Building and Integrating Microservices</b>							<b>Periods: 09</b>		
<b>Service Discovery with Eureka:</b> Setting up a Eureka server for service discovery - Client-side load balancing using Ribbon <b>Inter-Service Communication:</b> RESTful web services with Spring Boot - Using Rest Template and Web Client for inter-service communication - Introduction to gRPC for communication <b>Handling Fault Tolerance:</b> Implementing circuit breaker pattern with Resilience4j - Configuring retries and fallbacks									CO3	
<b>Unit- IV</b>	<b>Data Management in Microservices</b>							<b>Periods: 09</b>		
<b>Data Persistence with Spring Data JPA:</b> Introduction to Spring Data JPA - Configuring and using JPA repositories - Basic CRUD operations <b>Database Migrations:</b> Using Flyway for database migrations - Managing database schema changes <b>Event-Driven Architecture:</b> Introduction to event-driven microservices - Using RabbitMQ/Kafka for messaging- Spring Cloud Stream for event-driven communication									CO4	
<b>Unit- V</b>	<b>Security, Deployment, and Monitoring</b>							<b>Periods: 09</b>		
<b>Security in Microservices:</b> Introduction to Spring Security - Implementing basic authentication and authorization - Securing microservices with OAuth2 and JWT <b>Containerization with Docker:</b> Basics of Docker and containerization - Creating Docker images for Spring Boot applications - Running Spring Boot applications in Docker containers <b>Microservices Orchestration with Kubernetes:</b> Introduction to Kubernetes - Deploying Spring Boot microservices to Kubernetes - Managing microservices with Kubernetes <b>Monitoring and Logging:</b> Implementing centralized logging with ELK stack- Monitoring microservices with Prometheus and Grafana									CO5	
<b>Lecture Periods: 45</b>			<b>Tutorial Periods:</b>			<b>Practical Periods:</b>			<b>Total Periods: 45</b>	

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### Text Books

1. Microservices with Spring Boot and Spring Cloud: Build Resilient and Scalable Microservices Using Spring Cloud, Istio, and Kubernetes, 2nd Edition
2. Title: "Microservices Architecture: Aligning Principles, Practices, and Culture", Author: Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, and Mike Amundsen
3. Title: "Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy Java microservices using Spring Cloud, Istio, and Kubernetes", Author: Magnus Larsson

### Reference Books

1. "Spring Microservices in Action" by John Carnell
2. "Building Microservices" by Sam Newman
3. "Microservices Patterns: With examples in Java" by Chris Richardson
4. "Spring Boot in Action" by Craig Walls
5. "Cloud Native Java: Designing Resilient Systems with Spring Boot, Spring Cloud, and Cloud Foundry" by Josh Long and Kenny Bastani

### Web References

1. <https://docs.spring.io/spring-boot/index.html>
2. <https://www.baeldung.com/>
3. <https://www.javaguides.net/p/spring-boot-microservices-tutorial.html>
4. <https://www.javatpoint.com/microservices>
5. <https://www.geeksforgeeks.org/java-spring-boot-microservices-example-step-by-step-guide/>

### 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	1	3	1	1	-	1	-	-	-	-	-	-	3	2	1
2	2	3	3	3	-	3	-	-	-	-	-	-	3	2	1
3	3	3	3	3	1	3	-	-	-	-	-	-	3	2	1
4	3	3	3	3	1	3	-	-	-	-	-	-	3	2	1
5	3	3	3	3	1	3	-	-	-	-	-	-	3	2	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	Information Technology			Programme : B.Tech.						
Semester	IV / VII			Course Category Code :PE		End Semester Exam Type: TE				
Course Code	U23ITH704			Periods/Week			Credit	Maximum Marks		
				L	T	P	C	CAM	ESE	TM
Course Name	Container Orchestration and Security			3	1	0	4	25	75	100
Prerequisite	NIL									
Course Outcome	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)	
	CO1	Understand the basics of Container Orchestration and Security							K2	
	CO2	Identify Kubernetes architecture and integrating Kubernetes with CI/CD							K2	
	CO3	Overview of Orchestration with Docker Swarm and Other Tools							K3	
	CO4	Identify Security principles, encompassing authentication, authorization (RBAC).							K3	
	CO5	Understand the secure CI/CD integration with containers, utilizing tools							K2	
<b>UNIT-I</b>	<b>Introduction to Container Orchestration and Security</b>					<b>Periods:09</b>				
Introduction to Docker - Server virtualization - Advantages of Docker - Docker Setup - Limitations in Docker - Convergence of containerization and virtualization - Containerization innovations									CO1	
<b>UNIT-II</b>	<b>Kubernetes Concepts</b>					<b>Periods:09</b>				
Kubernetes Architecture - Overview of Kubernetes architecture - Integrating Kubernetes with CI/CD pipelines - Pod Lifecycle and Management - Pod states and transitions - Multi-container Pod patterns									CO2	
<b>UNIT-III</b>	<b>Container Orchestration with Docker Swarm and Other Tools</b>					<b>Periods:09</b>				
Docker Swarm Fundamentals - Overview of Docker Swarm - Setting up a Docker Swarm cluster - Comparison with Other Orchestration Tools - Docker Swarm vs. Kubernetes - Overview of Apache Mesos									CO3	
<b>UNIT-IV</b>	<b>Kubernetes Security</b>					<b>Periods:09</b>				
Kubernetes Security - Authentication and authorization in Kubernetes (RBAC) - Pod security policies and network policies - Securing: Kubernetes data store security - Container Security - Securing container images and runtimes Managing secrets and sensitive data in Kubernetes									CO4	
<b>UNIT-V</b>	<b>Securing and Monitoring Containerized Environments</b>					<b>Periods:09</b>				
CI/CD Integration - Continuous integration and continuous deployment with containers - CI/CD tools: Jenkins, GitLab CI, Tekton - Automating deployments with Kubernetes and Docker - Use cases and scenarios for different Orchestration tools									CO5	
<b>LecturePeriods:45</b>			<b>TutorialPeriods:-</b>			<b>PracticalPeriods:-</b>			<b>TotalPeriods:45</b>	
<b>Text Books</b>										
1. Up and Running by Brendan Burns, Joe Beda, Kuan-Wei Chiu, et al. , 2 <sup>nd</sup> edition, O'Reilly Media, 2019										
2. The Kubernetes Book, Nigel Poulton & Pushkar Joglekar , Self-published, 2018										
3. Kubernetes Security, Liz Rice, Michael Hausenblas , O'Reilly Media , 2018										
<b>Reference Books</b>										
1. Learning Helm: Managing Apps on Kubernetes, Matt Butcher, Matt Farina, Josh Dolitsky, O'Reilly Media , 2021										
2. Kubernetes security. Guide for beginners from zero to hero, Ivan Piskunov, Self-published, 2021.										
3. Production Kubernetes , Josh Rosso, Rich Lander, Alex Brand, John Harris, O'Reilly Media, Inc. 2021										
4. Docker Orchestration, Randall Smith, Packt Publishing, 2017										
5. Mastering Kubernetes, Gigi Sayfan, Packt Publishing ,2020										
<b>Web References</b>										
1. <a href="https://www.cb-india.com/books/operating-systems/unix-and-linux/book-of-kubernetes/">https://www.cb-india.com/books/operating-systems/unix-and-linux/book-of-kubernetes/</a>										
2. <a href="https://www.oreilly.com/library/view/python-for-devops/9781492057680/ch12.html">https://www.oreilly.com/library/view/python-for-devops/9781492057680/ch12.html</a>										
3. <a href="https://www.powells.com/book/-9781718502642/1-0">https://www.powells.com/book/-9781718502642/1-0</a>										
4. <a href="https://dl.acm.org/doi/10.5555/3265145">https://dl.acm.org/doi/10.5555/3265145</a>										
5. <a href="https://malaysia.kinokuniya.com/The_Book_of_Kubernetes_:A_Complete_Guide_to_Container_Orchestration/bw/9781718502642">https://malaysia.kinokuniya.com/The_Book_of_Kubernetes_:A_Complete_Guide_to_Container_Orchestration/bw/9781718502642</a>										

**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	-	-	-	-	-	-	-	3	-	3
2	2	1	-	-	3	-	-	-	-	-	-	-	3	-	3
3	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
4	3	2	1	1	3	-	-	-	-	-	-	-	3	-	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	-	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

Department	<b>Information Technology</b>		Programme: <b>B.Tech.</b>						
Semester	<b>IV/ VIII</b>		Course Category Code: <b>PC</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>U23ITH805</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Cloud Management</b>		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
Prerequisite	Computer Networks, Operating Systems								
Course Outcome	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Exhibit cloud-design skills to build and automate business solutions using cloud technologies							<b>K4</b>
	<b>CO2</b>	Possess Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services							<b>K4</b>
	<b>CO3</b>	Solve the real-world problems using Cloud services and technologies							<b>K3</b>
	<b>CO4</b>	Explain the Cloud Service in economical point of view							<b>K3</b>
	<b>CO5</b>	Govern various Cloud Services							<b>K3</b>
<b>Unit- I.</b>	<b>Cloud Service Management Fundamentals</b>					<b>Periods: 09</b>			
Cloud Ecosystem - The Essential Characteristics - Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, Cloud Service Deployment Models									<b>CO1</b>
<b>Unit- II</b>	<b>Cloud Services Strategy</b>					<b>Periods: 09</b>			
Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture									<b>CO2</b>
<b>Unit- III</b>	<b>Cloud Service Management</b>					<b>Periods: 09</b>			
Cloud Service Reference Model, Cloud Service LifeCycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management									<b>CO3</b>
<b>Unit- IV</b>	<b>Cloud Service Economics</b>					<b>Periods: 09</b>			
Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models									<b>CO4</b>
<b>Unit- V</b>	<b>Cloud Service Governance &amp; Value</b>					<b>Periods: 09</b>			
IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership									<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>	
<b>Text Books</b>									
1. Enamul Haque, "Cloud Service Management and Governance: Smart Service Management in Cloud Era", Enecl Publications, 2020									
2. Cloud Computing: Concepts, Technology & Architecture, Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Prentice Hall, 2013									
3. Imad M. Abbadi, Cloud Management and Security, Wiley, 1 <sup>st</sup> Edition, 2014.									
<b>Reference Books</b>									
1. S.K.Rao, Cloud Computing: Security and Risk Management, Discovery Publishing House, 2023.									
2. James F. Ransome , John W. Rittinghouse, Cloud Computing: Implementation, Management, and Security, CRC Press Inc, 1 <sup>st</sup> Edition, 2009									
3. Cloud Computing A Practical Approach: Toby Velte. Anthony Velte, Tata McGraw-Hill, 2 <sup>nd</sup> Edition.									
4. Cloud Computing: Concepts, Technology & Architecture, Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Prentice Hall, 2013									
5. Cloud Computing: Architecting Next-Gen Transformation Paradigms, Dr. Kumar Saurabh, 4 <sup>th</sup> Edition, Wiley.									
<b>Web References</b>									
1. <a href="https://www.geeksforgeeks.org/cloud-management-in-cloud-computing/">https://www.geeksforgeeks.org/cloud-management-in-cloud-computing/</a>									
2. <a href="https://www.techtarget.com/searchcloudcomputing/definition/cloud-management">https://www.techtarget.com/searchcloudcomputing/definition/cloud-management</a>									
3. <a href="https://aws.amazon.com/what-is/cloud-management/">https://aws.amazon.com/what-is/cloud-management/</a>									

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4. <https://www.ibm.com/topics/cloud-management>  
 5. <https://www.opentext.com/en-gb/what-is/cloud-management>

**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	2	2	3	-	-	-	-	-	-	1	3	2	3
2	3	2	2	2	3	-	-	-	-	-	-	1	3	2	3
3	3	2	2	2	3	-	-	-	-	-	-	1	3	2	3
4	3	2	2	2	3	-	-	-	-	-	-	1	3	2	3
5	3	2	2	2	3	-	-	-	-	-	-	1	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

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