SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

Department of Computer Science and Engineering

Minutes of 8th Board of Studies Meeting (UG)

The Eighth Board of Studies meeting of Computer Science and Engineering Department was held on **30th August 2024 at 10:00 A.M** at Seminar Hall, Computer science department, Sri Manakula Vinayagar Engineering College, with Head of the Department in the Chair through online mode.

The following members were present for the BoS meeting

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS
1.	**Dr.K. Premkumar, M.E., Ph.D.,** Professor and Head Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry hodcse@smvec.ac.in 9842127679	Chairperson
2.	**Dr. M. Shanmugam, M.E.,Ph.D.,** Associate Professor, Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry shanmugam.mm@smvec.ac.in 9444370963	Member Secretary
3.	**Dr. T. CHITHRALEKHA** Professor, Department of Computer Science, School of Technology, Pondicherry University, Puducherry tchithralekha.csc@pondiuni.edu.in	Subject Expert (Pondicherry University Nominee)
4.	**Dr. M. Ramakrishnan** Professor and Head, School of Information Technology, Department of Computer Applications, Madurai Kamaraja University, Madurai. Ph:8939432261 Mail id: ramkrishod@gmail.com	Subject Expert (Academic Council Nominee)
5.	**Dr. A. Kalaivani** Professor, Department of Information Technology, Rajalakshmi Engineering College, Chennai. 7904977893 Mail: kalaivanianbarasan@rediffmail.com	Subject Expert (Academic Council Nominee)
6.	**Aroulvel S** Technical leader, Cisco, Bangalore	Representative from Industry

2.A.3.1

	aroshanm@cisco.com, 9003898387	
7.	**Shakin Banu. H** Design Engineer Specialist British Telecomm unication, UK shakin2cse@gmail.com 9791854301	Postgraduate Alumnus (nominated by the Principal)
8.	**Dr. M. Ganesan, M.E., Ph.D.,** Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry ganesan@smvec.ac.in 9486341535	Internal Member
9.	**Dr. R. Ramachandiran, M.Tech., Ph.D.,** Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry ramachandiran@smvec.ac.in 7639031674	Internal Member
10.	**Dr. T. Megala, M.Tech., Ph.D.,** Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email :Megalag26@gmail.com 9789722271	Internal Member
11.	**Dr. N. Pazhaniraja** Associate Professor, Computer Science and Engineering, Sri Manakula Vinayagar Engineering College Email:pazhaniraja.cse@smvec.ac.in	Internal Member
12.	**Mr. P. Karthikeyan** Associate Professor, Computer Science and Engineering, Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:karthikcse@smvec.c.in	Internal Member
13.	**Mr.B.Thiyagarajan** Assistant Professor Sri Manakula Vinayagar Engineering College Email:thiyagarajan@smvec.ac.in	Internal Member
14.	**Mr.S.Kumarakrishnan** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Skumarakrishnan@smvec.acin	Internal Member
15.	**Mrs.C.Kalpana** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:ckalpana@ smvec.ac.in	Internal Member

2.A.3.2

16.	**Mrs.P.Bhavani** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Bhavani@ smvec.ac.in	Internal Member
17.	**Mr.D.Rajesh** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:successraju@gmail.com	Internal Member
18.	**Mr.Arokiaraj Christian Hubert** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Arokiaraj@smvec.ac.in	Internal Member
19.	**Ms.Swathilakshmi.V** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Swathilakshmi@gmail.com	Internal Member
20.	**Mrs.S.Subasree** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Subasree@smvec.ac.in	Internal Member
21.	**Mrs.S.Deeba** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:deebacse@smvec.ac.in	Internal Member
22.	**Mrs. R. Deepa** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:deepa.cse@smvec.ac.in	Internal Member
23.	**Mrs.C.Karthika** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:karthikacse@smvec.ac.in	Internal Member
24.	**Mr.K. Anbuthiruvarangan** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Anbuthiruvarangan.cse@smvec.ac.in	Internal Member
25.	**Mrs.N.Suganya** Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Suganaya.cse@smvec.ac.in	Internal Member
26.	**Ms.N.Pavithra** Assistant Professor	Internal Member

2.A.3.3

	Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Pavithra.cse@smvec.ac.in	
27.	**Mrs.M.Hemalatha** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry hemalatha.cse@smvec.ac.in	Internal Member
28.	**Mr.S.Santhoshrajan** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry santhoshrajan.cse@smvec.ac.in	Internal Member
29.	**Ms.V.Nivetha** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry nivetha.cse@smvec.ac.in	Internal Member
30.	**Ms.A.Mohanapriya** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry mohanapriya.cse@smvec.ac.in	Internal Member
31.	**Mrs.S.Jayalakshmi** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry jayalakshmi.cse@smvec.ac.in	Internal Member
32.	**Ms.A.Amala Margret** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry amalamargret.cse@smvec.ac.in	Internal Member
33.	**Dr.M.A.IshrathJahan** Associate Professor, Department of English, SMVEC	Internal Member
34.	**Dr.T.Jayavarthanan** Professor, Department of Physics, SMVEC	Internal Member
35.	**Dr.S.Savithiri** Professor and Head, Department of Chemistry, SMVEC	Internal Member
36.	**Dr.K.Raja** Assistant Professor, Department of Mathematics, SMVEC	Internal Member

Agenda of the Meeting	
Item No. : BoS/ UG/ CSE 8.1	Welcome Address and to confirm the minutes of the seventh meeting of Board of Studies held on 04.03.2024.
Item No. : BoS/ UG / CSE 8.2	To discuss and approve Curriculum for 1 to 8 semesters and syllabi of fifth and Sixth Semesters for the B.Tech Computer Science and Engineering students admitted from the academic year 2023-24 under R-2023 Regulation. • Credit Distribution

2.A.3.4

	• Course structure • Professional Core Courses • Professional Elective Courses • Open Elective Courses offered to other departments

Item No. : BoS/ UG / CSE 8.3	To discuss the uniqueness of the Curriculum (R-2023)
	• Theory cum Practical Courses
	• Micro and Mini Projects
	• Ability Enhancement Courses
	  o Skill Enhancement Courses
	  o Certification Courses
	• Mandatory courses
	• Introduction of Universal Human Values II
	Sustainable Development Goals (SDG) – Equivalent courses as per NEP 2020.

Item No. : BoS/ UG / CSE 8.4	To Discuss the Honours Degree and Minor Degree-Courses, Syllabus and Credits
Item No. : BoS/ UG / CSE 8.5	To discuss and approve the Evaluation Systems for regulation R-2023. • Mark weightage for Continuous Assessment and End Semester Examination • Question paper pattern • Mark requirement to pass the course
Item No. : BoS/ UG / CSE 8.6	• To discuss and approve the Academic Calendar for the odd semester 2024.
Item No. : BoS/ UG / CSE 8.7	To apprise about the Industry Institute Interactions of the department of Computer Science and Engineering • Guest lectures • Internship details • MOUs • Industrial Visits • Value Added Courses
Item No. : BoS/ UG / CSE 8.8	To apprise the End Semester Results of the students admitted in the Academic Year 2021-2022 (VI sem), 2022-2023 (IV sem), 2023-2027 (II sem) and to discuss about Extra-Curricular and Co-Curricular activities.
Item No. : BoS/ UG / CSE 8.9	To apprise the schedule of the End Semester Examination to be conducted in the month of May/June 2024 and to discuss and recommend the panel of examiners to the Academic Council
Item No. : BoS/ UG / CSE 8.10	Any other item with the permission of chair

Minutes of the Meeting

Dr. K.Premkumar, Chairperson, BoS opened the meeting by welcoming and introducing the external members, to the internal members and the meeting thereafter deliberated on agenda items that had been approved by the Chairperson.

Item No. : BoS/ UG/ CSE 8.1

Confirmation of minutes of 7th BoS meeting held on 04.03.2024

Chairperson, BoS, apprised the minutes of 8th BoS. Then it is confirmed that suggestion and minor revision stated at 7th BoS meeting was incorporated and mentioned below.

2.A.3.5

S. No	Regulation	Semester	Subject Name with code	Unit	Particulars
1	2023	IV	Cloud and Big Data Theory	-	This paper needs to be splitted into two courses. since the syllabus is too heavy. Therefore, the course is framed has cloud computing and moved to 5th semester as suggested by the experts
2	2023	IV	Distributed Systems	-	Distributed system Course is moved to fourth semester elective from fifth semester as suggested by experts
3	2023	VIII	Cryptography for Cybersecurity	-	This course needs to be removed from elective. since already the curriculum has similar paper Network Security and Cryptography

The above correction was incorporated and approved by BoS members in 7th BoS meeting

Item No. : BoS/ UG/ CSE 8.2

To discuss and approve Curriculum for 1 to 8 semesters and syllabi of Fifth and Sixth Semesters for the B.Tech Computer Science and Engineering and students admitted from the Academic year 2023-24 under R-2023 Regulation.

The B.Tech. Degree curriculum and syllabus approval of V and VI semesters under Autonomous Regulations 2023 for the B.Tech programme and the students admitted in the 2023-24 were discussed and recommended with the following modifications.

S. No	Regulation	Semester	Subject Name with code	Unit	Particulars
1	2023	V	Research Methodology U23HSTC02	-	Reconsider Syllabus for Research Methodology
2	2023	V	Cloud Computing U23CST504	III,IV	Swap Unit III -Cloud deployment tools to unit IV and Unit-IV AWS Cloud computing basics to Unit III
3	2023	V	Artificial Intelligence U23CSTC06	IV,V	Reframe unit 4 and Unit 5 and suggested to include Typical AI Syllabus
4	2023	V	Web Designing U23CSTC07	-	CO4, CO5 need to be revised and prerequisite to be changed

2.A.3.b

5	2023	V,VI	-	-	Text Books and Reference books of all courses need to be updated to recent edition
6	2023	V	Cloud Laboratory U23CSP503		Change exercise number 6 and 7 as to write a procedure instead of find a procedure
7	2023	V	Artificial Intelligence Laboratory U23CSPC05		Reframe Artificial Intelligence Laboratory all exercises
8	2023	V	Programming in C# U23CSE506		Practical exercises need to be added in Syllabus
9	2023	V	Cloud Tools and Techniques U23CSE508		Replace Elective Cloud Tools and Techniques with any other paper(Included Network Security U23CSE507)
10	2023	V	Front-End Development U23CSE510		Replace Elective Front-End Development and Techniques with any other paper(Included Software Project Management U23CSE509)
11	2023	V	Open source Programming for IoT U23CSE508	-	Swap the elective paper Open source Programming for IoT from 6th Semester to 5th Semester and IoT challenges and Future from 5th Semester to 6th Semester
13	2023	-	-	-	Include Neural Computation Course in Syllabus-(Included in VII semester)
14	2023	VI	Designing and Building of Bots U23CST605	-	In Course Designing and Building of Bots include Robotic Process Automation alone
15	2023	VI	Animation and Visual Effects U23CST606	v	Reframe Unit 5 Blender
16	2023	VI	Blockchain Concepts and Applications U23CSB602	I,II	Reframe unit I and III in Blockchain Concepts and Applications
17	2023	VI	Game Design and Development U23CSE611	-	Include unity in the Course Game Design and Development

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18	2023	IV	Cyber Security Essentials U23CSH401	-	In Honours degree Swap the course Cyber Security Essentials from 5th Semester to 4th
19	2023	IV	Cryptography and data privacy U23CSH502	-	In Honour degree change the title Cryptography and data privacy to Cryptography

The above correction was incorporated and approved by BoS members in 8th BoS meeting, and the details are enclosed in Annexure - I.

Item No. : BoS/ UG/ CSE 8.3

To discuss the uniqueness of the Curriculum (R-2023)

- ❖ Credit Distribution
- ❖ Course structure
- ❖ Professional Core Courses
- ❖ Professional Elective Courses
- ❖ Open Elective Courses offered to other departments

- Discussed about the approval of Theory cum Practical Courses, Micro and Mini Projects , Syllabus Credits, Ability Enhancement Courses, Mandatory courses Introduction of Universal Human Values II and Sustainable Development Goals (SDG) introduced for B.Tech Computer Science and Engineering under R-2023 regulation from the Academic Year 2023 -2024 and the same is approved by BoS members.

Item No. : BoS/ UG/ CSE 8.4

To Discuss the Honours Degree and Minor Degree – Courses, Syllabus and Credits

- Discussed about the Honours and Minor Degree syllabus and the same was approved by BoS members. The Details are attached in **Annexure-II**

Item No. : BoS/ UG/ CSE 8.5

To discuss and approve the Evaluation Systems for regulation R-2023.

- Mark weightage for Continuous Assessment and End Semester Examination
- Question paper pattern
- Mark requirement to pass the course

Discussed about the Evaluation System and Question paper Format under R-2023 for the students admitted from the Academic Year 2023-24 and the same was approved by BoS members

Item No. : BoS/ UG/ CSE 8.6

To discuss and approve the Academic Calendar for the odd semester 2024

The Panel of Experts discussed and approved the calendar for the odd semester 2024

Item No. : BoS/ UG/ CSE 8.7

To apprise about the Industry Institute Interactions of the department of Computer Science

2.A.3.8

and Engineering

- Guest lectures
- Internship details
- MOUs
- Industrial Visits
- Value Added Courses

The Panel of Experts discussed about the Industry Institute Interactions

Item No. : BoS/ UG/ CSE 8.8

To apprise the End Semester Results of the students admitted in the Academic Year 2020-2021 (VI sem), 2021-2022 (IV sem), 2022-2023 (II sem) and to discuss about Extra-Curricular and Co-Curricular activities

The panel discussed about Results of II ,IV and VI semester and encouraged students to participate in Extra-Curricular and Co-Curricular activities

Item No. : BoS/ UG/ CSE 8.9

To apprise the schedule of the End Semester Examination to be conducted in the month of NOV / DEC 2024 and to discuss and recommend the panel of examiners to the Academic Council

The list of question paper setters and recommended to include government college faculties. The suggestion is incorporated and details are enclosed in Evaluators **(given in Annexure-III)**

Item No. : BoS/ UG/ CSE 8.10

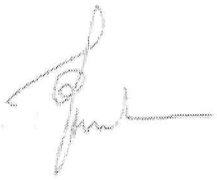
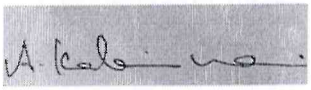
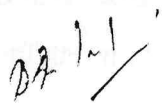
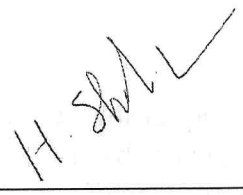
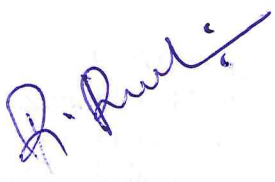
Any other item with the permission of chair.

The panel discussed about bringing up new research topic in curriculum

The meeting for the above Agenda regarding B.Tech – Computer Science and Engineering was concluded by 1:00 pm with by **Dr. K.Premkumar**, Chairperson-BoS and Head of Department, Department of Computer Science and Engineering, Sri Manakula Vinayagar Engineering College.

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1.	**Dr.K. Premkumar, M.E., Ph.D.,** Professor and Head Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry hodcse@smvec.ac.in 9842127679	Chairperson	
2.	**Dr. M. Shanmugam, M.E.,Ph.D** Associate Professor, Sri Manakula Vinayagar Engineering College	Member Secretary	

2.10.24

	Madagadipet,Puducherry shanmugam.mm@smvec.ac.in 9444370963		
3.	**Dr. T. CHITHRALEKHA** Professor, Department of Computer Science, School of Technology, Pondicherry University, Puducherry tchithralekha.csc@pondiuni.edu.in	Subject Expert (Pondicherry University Nominee)	
4.	**Dr. M. Ramakrishnan** Professor and Head, School of Information Technology, Department of Computer Applications, Madurai Kamaraja University, Madurai. Ph:8939432261 Mail id: ramkrishod@gmail.com	Subject Expert (Academic Council Nominee)	
5.	**Dr. A. Kalaivani** Professor, Department of Information Technology, Rajalakshmi Engineering College, Chennai. 7904977893 Mail: kalaivanianbarasan@rediffmail.com	Subject Expert (Academic Council Nominee)	
6.	**Aroulvel S** Technical leader, Cisco,Bangalore aroshanm@cisco.com, 9003898387	Representative from Industry	
7.	Shakin Banu. H Design Engineer Specialist British Telecommunication, UK shakin2cse@gmail.com 9791854301	Postgraduate Alumnus (nominated by the Principal)	
8.	**Dr. M. Ganesan, M.E., Ph.D.,** Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry ganesan@smvec.ac.in 9486341535	Internal Member	
9.	**Dr. R. Ramachandiran, M.Tech., Ph.D.,** Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry ramachandiran@smvec.ac.in 7639031674	Internal Member	

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10.	**Dr. T. Megala, M.Tech., Ph.D.,** Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email :Megalag26@gmail.com 9789722271	Internal Member	
11.	**Dr. N. Pazhaniraja** Associate Professor, Computer Science and Engineering, Sri Manakula Vinayagar Engineering College Email:pazhaniraja.cse@smvec.ac.in	Internal Member	
12.	**Mr. P. Karthikeyan** Associate Professor, Computer Science and Engineering, Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:karthikcse@smvec.c.in	Internal Member	
13.	**Mr.B.Thiyagarajan** Assistant Professor Sri Manakula Vinayagar Engineering College Email:thiyagarajan@smvec.ac.in	Internal Member	
14.	**Mr.S.Kumarakrishnan** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Skumarakrishnan@smvec.acin	Internal Member	
15.	**Mrs.C.Kalpana** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:ckalpana@ smvec.ac.in	Internal Member	
16.	**Mrs.P.Bhavani** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Bhavani@ smvec.ac.in	Internal Member	
17.	**Mr.D.Rajesh** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:successraju@gmail.com	Internal Member	
18.	**Mr.Arokiaraj Christian Hubert** Assistant Professor	Internal Member	

2.A.3.11

	Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Arokiaraj@smvec.ac.in		
19.	**Ms.Swathilakshmi.V** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Swathilakshmi@gmail.com	Internal Member	
20.	**Mrs.S.Subasree** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Subasree@smvec.ac.in	Internal Member	
21.	**Mrs.S.Deeba** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:deebacse@smvec.ac.in	Internal Member	
22.	**Mrs. R. Deepa** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:deepa.cse@smvec.ac.in	Internal Member	
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25.	**Mrs.N.Suganya** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Suganaya.cse@smvec.ac.in	Internal Member	
26.	**Ms.N.Pavithra** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Pavithra.cse@smvec.ac.in	Internal Member	

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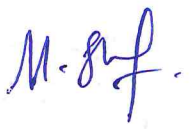
27.	**Mrs.M.Hemalatha** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry hemalatha.cse@smvec.ac.in	Internal Member	
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31.	**Mrs.S.Jayalakshmi** Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry jayalakshmi.cse@smvec.ac.in	Internal Member	
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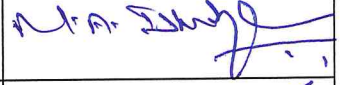
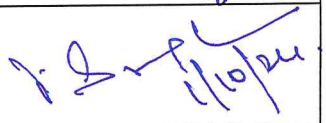
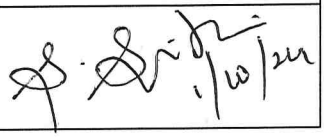
33.	**Dr.M.A.IshrathJahan** Associate Professor, Department of English, SMVEC	Internal Member	
34.	**Dr.T.Jayavarthanan** Professor, Department of Physics, SMVEC	Internal Member	
35.	**Dr.S.Savithiri** Professor and Head, Department of Chemistry, SMVEC	Internal Member	

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36.	**Dr.K.Raja** Assistant Professor, Department of Mathematics, SMVEC	Internal Member	

2.A.3.19

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

Puducherry

B.TECH.

COMPUTER SCIENCE AND ENGINEERING

ACADEMIC REGULATIONS 2023
(R - 2023)

CURRICULUM

9.A.3.15

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 create a productive learning and research environment for graduates to become highly dynamic, competent, ethically responsible, professionally knowledgeable in the field of computer science and engineering to meet the industrial needs on par with global standards.

MISSION

M1: Quality Education: Empowering the students with the necessary technical skills through quality education to grow professionally.

M2: Innovative Research: Advocating the innovative research ideas by incorporating with industries for developing products and services.

M3: Placement and Entrepreneurship: Advancing the education by strengthening the Industry-academic relationship through hands-on training to seek placement in the top most industries or to develop a start-ups.

M4: Ethics and Social Responsibilities: Stimulating professional behaviour and good ethical values to improve the leadership skills and social responsibilities.

2.A.3.16

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge:

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

PO2: Problem analysis:

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

PO3: Design/development of solutions:

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

PO4: Conduct investigations of complex problems:

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

PO5: Modern tool usage:

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

PO6: The engineer and society:

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

PO7: Environment and sustainability:

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

PO8: Ethics:

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

PO9: Individual and team work:

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

PO10: Communication:

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

PO11: Project management and finance:

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

PO12: Life-long learning:

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

2.11.3.17

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Competitive Platform: To create a competitive platform for solving critical problems in a wide variety of fields.

PEO2: Exploration: Enthusiastic participation in learning, understanding, designing and applying new innovative research ideas as the field evolves.

PEO3: Career: Applying cutting-edge technology that improves knowledge and to commit students for life-long learning to reach the leading positions in the career.

PEO4: Professional Values: Simulate the graduates to hold the responsibilities in the context of technology, ethics, society and humanity.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Computational Skills: Graduates with the ability to apply basic knowledge of Computer Science in solving the critical problems.

PSO2: Studious Research: Ability to convert innovative ideas into research or society oriented projects through current trending technologies.

PSO3: Employability: Acquire placement in highly reputed industries or accomplish new technical business skills with the contemporary trends in the industry.

2.A-3.18

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAMME

Sl. No.	Course Category	Breakdown of Credits
1	Humanities and Social Sciences including Management courses (HS)	15
2	Basic Science Courses (BS)	20
3	Engineering Science including workshop, drawing, basics of electrical / mechanical / computer etc. (ES)	18
4	Professional Core Courses (PC)	77
5	Professional Electives Courses (PE)	18
6	Open Electives Courses (OE)	9
7	Project Work and Internship (PA)	13
8	Ability Enhancement Courses (AEC*)	
9	Mandatory Courses (MC*)	-
Total		**170**

SCHEME OF CREDIT DISTRIBUTION - SUMMARY

Sl. No	AICTE Suggested Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences (HS)	5	3	1	1	2	-	-	3	15
2	Basic Sciences (BS)	4	7	5	4	-	-	-	-	20
3	Engineering Sciences (ES)	9	5	-	4	-	-	-	-	18
4	Professional Core (PC)	3	8	17	11	12	15	11	-	77
5	Professional Electives (PE)	-	-	-	3	3	3	3	6	18
6	Open Electives (OE)	-	-	-	-	3	3	3	-	9
7	Project Work (PA)	-	-	-	-	1	1	2	8	12
8	Internship (PA)	-	-	-	-	-	-	1	-	1
9	Employability Enhancement Courses (AEC)*	-	-	-	-	-	-	-	-	-
10	Mandatory Courses (MC)*	-	-	-	-	-	-	-	-	-
Total		**21**	**23**	**23**	**23**	**21**	**22**	**20**	**17**	**170**

** 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 ofengineeringin 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 IV**.

9.5.3.19

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC01	Engineering Mathematics - I	BS	3	1	0	4	25	75	100
2	U23ESTC03	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
3	U23CSTC01	Programming in C	ES	3	0	0	3	25	75	100
4	U23CSTC02	Problem Solving Approach	PC	3	0	0	3	25	75	100
5	U23HSTC01	Universal Human Values- II	HS	2	0	0	2	25	75	100
Theory Cum Practical										
6	U23ENBC01	Communicative English - I	HS	2	0	2	3	50	50	100
Practical										
7	U23ESPC01	Basics of Electrical and Electronics Engineering Laboratory	ES	0	0	2	1	50	50	100
8	U23CSPC01	Programming in C Laboratory	ES	0	0	2	1	50	50	100
9	U23ESPC03	Engineering Graphics using AutoCAD	ES	0	0	2	1	50	50	100
Ability Enhancement Course										
10	U23CSC1XX	Certification Course – I **	AEC	0	0	4	-	100	-	100
Mandatory Course										
11	U23CSM101	Induction Programme	MC	2 Weeks			-	-	-	-
							21	425	575	1000

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC02	Engineering Mathematics - II	BS	3	1	0	4	25	75	100
2	U23BSTC01	Physical Science for Engineers	BS	3	0	0	3	25	75	100
3	U23ADTC01	Programming in Python	ES	3	0	0	3	25	75	100
4	U23CSTC03	Data Structures	PC	3	0	0	3	25	75	100
5	U23ITTC01	Digital Design and System Architecture	PC	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23ENBC02	Communicative English - II	HS	2	0	2	3	50	50	100
Practical										
7	U23ESPC02	Design Thinking and IDEA Lab	ES	0	0	2	1	50	50	100
8	U23ADPC01	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
9	U23CSPC02	Data Structures Laboratory	PC	0	0	2	1	50	50	100
10	U23ITPC01	Digital Design and System Architecture Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CSC2XX	Certification Course – II **	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CSM202	Sports Yoga and NSS	MC	0	0	2	-	100	-	100
							23	575	625	1200

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

2.A.3.20

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC03	Probability and Statistics	BS	3	1	0	4	25	75	100
2	U23CST301	Embedded System Architecture and Interfacing	PC	3	0	0	3	25	75	100
3	U23CST302	Software Engineering and Testing	PC	3	0	0	3	25	75	100
4	U23CSDC01	Automata and Compiler Design	PC	3	0	0	3	25	75	100
5	U23CST303	Computer Networks	PC	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CSBC01	Design and Analysis of Algorithms	PC	2	0	2	3	50	50	100
Practical										
7	U23ENPC01	General Proficiency - I	HS	0	0	2	1	50	50	100
8	U23MAPC01	Engineering Mathematics Laboratory	BS	0	0	2	1	50	50	100
9	U23CSP301	Embedded System Architecture and Interfacing Laboratory	PC	0	0	2	1	50	50	100
10	U23CSP302	Software Engineering and Testing Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CSC3XX	Certification Course – III**	AEC	0	0	4	-	100	-	100
12	U23CSS301	Skill Enhancement Course – I*	AEC	0	0	2	-	100	-	100
Mandatory Course										
13	U23CSM303	Climate Change	MC	2	0	0	-	100	-	100
							23	675	625	1300

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC05	Discrete Mathematics and Graph Theory	BS	3	1	0	4	25	75	100
2	U23ITTC02	Programming in Java	ES	3	0	0	3	25	75	100
3	U23CSTC04	Database Management Systems	PC	3	0	0	3	25	75	100
4	U23CSTC05	Operating Systems	PC	3	0	0	3	25	75	100
5	U23CSE4XX	Professional Elective I #	PE	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CSB401	Android Programming	PC	2	0	2	3	50	50	100
Practical										
7	U23ENPC02	General Proficiency - II	HS	0	0	2	1	50	50	100
8	U23ITPC02	Programming in Java Laboratory	ES	0	0	2	1	50	50	100
9	U23CSPC03	Database Management Systems Laboratory	PC	0	0	2	1	50	50	100
10	U23CSPC04	Operating Systems Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Course										
11	U23CSC4XX	Certification Course – IV **	AEC	0	0	4	-	100	-	100
12	U23CSS402	Skill Enhancement Course -II *	AEC	0	0	2	-	100	-	100
Mandatory Course										
13	U23CSM404	Right to Information and Good Governance	MC	2	0	0	0	100	-	100
							23	675	625	1300

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

**** Skill Enhancement Courses (1and 2) are to be selected from the list given in Annexure III***

29.03.21

SEMESTER – V

Sl. No	Course Code	Course Title	Category	Periods L	T	P	Credits	Max. Marks CAM	ESM	Total
Theory										
1	U23HSTC02	Research Methodology	HS	2	0	0	2	25	75	100
2	U23CST504	Cloud Computing	PC	3	0	0	3	25	75	100
3	U23CSTC06	Artificial Intelligence	PC	3	0	0	3	25	75	100
4	U23CSTC07	Web Designing	PC	3	0	0	3	25	75	100
5	U23CSE5XX	Professional Elective II #	PE	3	0	0	3	25	75	100
6	U23XXOCXX	Open Elective I $	OE	3	0	0	3	25	75	100
Practical										
7	U23CSP503	Cloud Computing Laboratory	PC	0	0	2	1	50	50	100
8	U23CSPC05	Artificial Intelligence Laboratory	PC	0	0	2	1	50	50	100
9	U23CSPC06	Web Designing Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23CSW501	Micro Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CSC5XX	Certification Course –V **	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CSM505	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	600	600	1200

SEMESTER – VI

Sl. No	Course Code	Course Title	Category	Periods L	T	P	Credits	Max. Marks CAM	ESM	Total
Theory										
1	U23ITTC03	Machine Learning	PC	3	0	0	3	25	75	100
2	U23CST605	Designing and Building of Bots	PC	3	0	0	3	25	75	100
3	U23CST606	Animation and Visual Effects	PC	3	0	0	3	25	75	100
4	U23CSE6XX	Professional Elective III #	PE	3	0	0	3	25	75	100
5	U23XXOCXX	Open Elective II $	HS	3	0	0	3	25	75	100
Theory Cum Practical										
6	U23CSB602	Blockchain Concepts and Applications	PC	2	0	2	3	50	50	100
Practical										
7	U23ITPC03	Machine Learning Laboratory	PC	0	0	2	1	50	50	100
8	U23CSP604	Designing and Building of Bots Laboratory	PC	0	0	2	1	50	50	100
9	U23CSP605	Animation and Visual Effects Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23CSW602	Mini Project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23CSC6XX	Certification Course – VI **	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23CSM606	Gender Equality	MC	2	0	0	-	100	-	100
							22	625	575	1200

$ Open electives are to be selected from the list given in Annexure II

2.A.3.22

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23CST707	IoT and Edge Computing	PC	3	0	0	3	25	75	100
2	U23CST708	Data Science and Digital Marketing Analytics	PC	3	0	0	3	25	75	100
3	U23CST709	Neural computation	PC	3	0	0	3	25	75	100
4	U23CSE7XX	Professional Elective IV #	PE	3	0	0	3	25	75	100
5	U23XXOCXX	Open Elective III $	OE	3	0	0	3	25	75	100
Practical										
6	U23CSP706	IoT and Edge Computing Laboratory	PC	0	0	2	1	50	50	100
7	U23CSP707	Data Science and Digital Marketing Analytics Laboratory	PC	0	0	2	1	50	50	100
Project Work										
8	U23CSW703	Project phase – I	PA	0	0	4	2	50	50	100
9	U23CSW704	Internship / Inplant Training	PA	0	0	2	1	100	-	100
							20	375	525	900

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC03	Entrepreneurship and Business Management	HS	3	0	0	3	25	75	100
2	U23CSE8XX	Professional Elective V #	PE	3	0	0	3	25	75	100
3	U23CSE8XX	Professional Elective VI #	PE	3	0	0	3	25	75	100
Project Work										
4	U23CSW805	Project phase – II	PA	0	0	16	8	50	100	150
							17	125	325	450

2.A.3.23

ANNEXURE - I
PROFESSIONAL ELECTIVE COURSES

Professional Elective –I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE401	Programming in C++
2.	U23CSE402	Computer Graphics
3.	U23CSE403	Distributed Systems
4.	U23CSE404	IoT Design Protocols
5.	U23CSE405	UI / UX Development
Professional Elective –II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE506	Programming in C#
2.	U23ECEC01	Digital Image Processing
3.	U23CSE507	Network Security
4.	U23CSE508	Open-Source Programming for IOT
5.	U23CSE509	Software Project Management
Professional Elective –III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE610	Haskell Programming
2.	U23CSE611	Game Design and Development
3.	U23CSE612	NOSQL Database
4.	U23CSE613	IOT challenges and Future
5.	U23CSE614	Server-Side Scripting Languages
Professional Elective –IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE715	Go Programming
2.	U23CSE716	Augmented Reality
3.	U23CSE717	Digital Watermarking and Steganography
4.	U23CSE718	Digital Security
5.	U23CSE719	Drone Technology
Professional Elective –V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE820	Redux Programming
2.	U23CSE821	Virtual Reality
3.	U23CSE822	Social Networking
4.	U23CSEC02	Introduction to Industry 4.0
5.	U23CSE823	Testing and Automation
Professional Elective –VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1.	U23CSE824	Kotlin Programming
2.	U23CSE825	Scalable Data Science
3.	U23CSE826	Quantum Informatics
4.	U23CSE827	IOT Security
5.	U23CSE828	Open AI

2.A.3.24

ANNEXURE - II
OPEN ELECTIVE COURSES (R-2023)

S. No.	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I (Offered in Semester V/VI)				
1	U23CSOC01	Structured Query Language	CSE	ECE, EEE, ICE, MECH, CIVIL, BME and MECHTRONICS
2	U23CSOC02	Computer Peripherals and Networking	CSE	Offered to all Branches
Open Elective – II (Offered in Semester VII)				
1	U23CSOC03	Web Programming	CSE	ECE, EEE, ICE, MECH, CIVIL, BME AND MECHTRONICS
2	U23CSOC04	Cloud Technology	CSE	ECE, EEE, ICE, MECH, CIVIL, BME and MECHTRONICS

29.A.3.25

ANNEXURE – III

ABILITY ENHANCEMENT COURSES-(A) CERTIFICATION COURSES

S. No	Course Code	Course Title	Certified By
1	U23XXCX01	Adobe Photoshop	Adobe
2	U23XXCX02	Adobe Animate	Adobe
3	U23XXCX03	Adobe Dreamweaver	Adobe
4	U23XXCX04	Adobe After Effects	Adobe
5	U23XXCX05	Adobe Illustrator	Adobe
6	U23XXCX06	Adobe InDesign	Adobe
7	U23XXCX07	Autodesk AutoCAD -ACU	Autodesk
8	U23XXCX08	Autodesk Inventor - ACU	Autodesk
9	U23XXCX09	Autodesk Revit - ACU	Autodesk
10	U23XXCX10	Autodesk Fusion 360 - ACU	Autodesk
11	U23XXCX11	Autodesk 3ds Max - ACU	Autodesk
12	U23XXCX12	Autodesk Maya - ACU	Autodesk
13	U23XXCX13	Cloud Security Foundations	AWS
14	U23XXCX14	Cloud Computing Architecture	AWS
15	U23XXCX15	Cloud Foundation	AWS
16	U23XXCX16	Cloud Practitioner	AWS
17	U23XXCX17	Cloud Solution Architect	AWS
18	U23XXCX18	Data Engineering	AWS
19	U23XXCX19	Machine Learning Foundation	AWS
20	U23XXCX20	Robotic Process Automation / Medical Robotics	Blue Prism
21	U23XXCX21	Advance Programming Using C	CISCO
22	U23XXCX22	Advance Programming Using C ++	CISCO
23	U23XXCX23	C Programming	CISCO
24	U23XXCX24	C++ Programming	CISCO
25	U23XXCX25	CCNP Enterprise: Advanced Routing	CISCO
26	U23XXCX26	CCNP Enterprise: Core Networking	CISCO
27	U23XXCX27	Cisco Certified Network Associate - Level 2	CISCO
28	U23XXCX28	Cisco Certified Network Associate- Level 1	CISCO
29	U23XXCX29	Cisco Certified Network Associate- Level 3	CISCO
30	U23XXCX30	Fundamentals Of Internet of Things	CISCO
31	U23XXCX31	Internet Of Things / Solar and Smart Energy System with IoT	CISCO
32	U23XXCX32	Java Script Programming	CISCO
33	U23XXCX33	NGD Linux Essentials	CISCO
34	U23XXCX34	NGD Linux I	CISCO
35	U23XXCX35	NGD Linux II	CISCO
36	U23XXCX36	Advance Java Programming	Ethnotech
37	U23XXCX37	Android Programming / Android Medical App Development	Ethnotech
38	U23XXCX38	Angular JS	Ethnotech
39	U23XXCX39	Catia	Ethnotech
40	U23XXCX40	Communication Skills for Business	Ethnotech
41	U23XXCX41	Coral Draw	Ethnotech
42	U23XXCX42	Data Science Using R	Ethnotech
43	U23XXCX43	Digital Marketing	Ethnotech

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44	U23XXCX44	Embedded System Using C	Ethnotech
45	U23XXCX45	Embedded System with IOT / Arduino	Ethnotech
46	U23XXCX46	English For IT	Ethnotech
47	U23XXCX47	Plaxis	Ethnotech
48	U23XXCX48	Sketch Up	Ethnotech
49	U23XXCX49	Financial Planning, Banking and Investment Management	Ethnotech
50	U23XXCX50	Foundation Of Stock Market Investing	Ethnotech
51	U23XXCX51	Machine Learning / Machine Learning for Medical Diagnosis	Ethnotech
52	U23XXCX52	IOT Using Python	Ethnotech
53	U23XXCX53	Creo (Modelling & Simulation)	Ethnotech
54	U23XXCX54	Soft Skills, Verbal, Aptitude	Ethnotech
55	U23XXCX55	Software Testing	Ethnotech
56	U23XXCX56	MX-Road	Ethnotech
57	U23XXCX57	CLO 3D	Ethnotech
58	U23XXCX58	Solid works	Ethnotech
59	U23XXCX59	Staad Pro	Ethnotech
60	U23XXCX60	Total Station	Ethnotech
61	U23XXCX61	Hydraulic Automation	Festo
62	U23XXCX62	Industrial Automation	Festo
63	U23XXCX63	Pneumatics Automation	Festo
64	U23XXCX64	Agile Methodologies	IBM
65	U23XXCX65	Block Chain	IBM
66	U23XXCX66	Devops	IBM
67	U23XXCX67	Artificial Intelligence	ITS
68	U23XXCX68	Cloud Computing	ITS
69	U23XXCX69	Computational Thinking	ITS
70	U23XXCX70	Cyber Security	ITS
71	U23XXCX71	Data Analytics	ITS
72	U23XXCX72	Databases	ITS
73	U23XXCX73	Java Programming	ITS
74	U23XXCX74	Networking	ITS
75	U23XXCX75	Python Programming	ITS
76	U23XXCX76	Web Application Development (HTML, CSS, JS)	ITS
77	U23XXCX77	Network Security	ITS & Palo alto
78	U23XXCX78	MATLAB	MathWorks
79	U23XXCX79	Azure Fundamentals	Microsoft
80	U23XXCX80	Azure AI (AI-900)	Microsoft
81	U23XXCX81	Azure Data (DP -900)	Microsoft
82	U23XXCX82	Microsoft 365 Fundamentals (SS-900)	Microsoft
83	U23XXCX83	Microsoft Security, Compliance and Identity (SC-900)	Microsoft
84	U23XXCX84	Microsoft Power Platform (PI-900)	Microsoft
85	U23XXCX85	Microsoft Dynamics Fundamentals 365 – CRM	Microsoft
86	U23XXCX86	Microsoft Excel	Microsoft
87	U23XXCX87	Microsoft Excel Expert	Microsoft
88	U23XXCX88	Securities Market Foundation	NISM
89	U23XXCX89	Derivatives Equinity	NISM
90	U23XXCX90	Research Analyst	NISM
91	U23XXCX91	Portfolio Management Services	NISM

2.9.3.27

92	U23XXCX92	Cyber Security	Palo alto
93	U23XXCX93	Cloud Security	Palo alto
94	U23XXCX94	PMI – Ready	PMI
95	U23XXCX95	Tally – GST & TDS	Tally
96	U23XXCX96	Advance Tally	Tally
97	U23XXCX97	Associate Artist	Unity
98	U23XXCX98	Certified Unity Programming	Unity
99	U23XXCX99	VR Development	Unity

ABILITY ENHANCEMENT COURSES - (B) SKILL ENHANCEMENT COURSES

Sl. No.	Course Code	Course Title
1.	U23CSS301	Skill Enhancement Course 1 *
		1) Computer Assembly and Troubleshooting
		2) Aptitude - I
		3) Electronic Devices and Circuits
2.	U23CSS402	Skill Enhancement Course 2 *
		1) Exploring Photoshop
		2) Aptitude - II
		3) Office Automation

** Any one course to be selected from the list*

2.A.3.28

ANNEXURE-I

(Syllabi of V and VI Sem)

9.11.3.19

SEMESTER V

2.D.3.31

Department	Computer Science and Engineering	Programme: B. Tech						
Semester	V	Course Category Code: HS				*End Semester Exam Type: TE		
Course Code	U23HSTC02	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	RESEARCH METHODOLOGY	2	0	0	2	25	75	100

(Common to all branches)

Prerequisite	Nil	
Course Outcomes	*On completion of the course, the students will be able to*	**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: 06**
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: 06**
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: 06**
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: 06**
Preparing a Research Report: Key Sections (Abstract, Introduction, Methodology, Results, Discussion, Conclusion). Referencing and Citation: Brief Overview.		**CO4**
UNIT- V	**Introduction to Intellectual Property Rights (IPR)**	**Periods: 06**
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: 0**	**Practical Periods: 0**	**Total Periods: 30**

Text Books

1. Kumar, R., "Research Methodology: A Step-by-Step Guide for Beginners", 5th Edition, SAGE Publications, 2019.
2. Creswell, J. W., and Creswell, J. D., "Research Design: Qualitative, Quantitative, and Mixed Methods Approaches", 5th Edition, SAGE Publications, 2018.

Reference Books

1. Saunders, M. N. K., Lewis, P., and Thornhill, A., "Research Methods for Business Students", 8th Edition, Pearson, 2019.
2. Sekaran, U., and Bougie, R. Research Methods for Business: A Skill-Building Approach, 8th Edition, Wiley, 2020.
3. Bhattacherjee, A., "Social Science Research: Principles, Methods, and Practices", 2nd Edition, CreateSpace Independent Publishing, 2012.

Web References

1. https://conjointly.com/kb/
2. 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/

COs/POs/PSOs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	1	1	1	1	3
CO2	2	3	2	2	2	1	1	1	2	2	1	3
CO3	3	3	3	3	2	1	1	1	1	1	2	2
CO4	2	2	1	2	1	1	1	3	2	3	1	2
CO5	2	2	2	2	1	2	2	3	2	2	3	3

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

Evaluation Method

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

Department	Computer Science and Engineering	Programme: B.Tech					
Semester	V	Course Category: PC			End Semester Exam Type: TE		
Course Code	U23CST504	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	CLOUD COMPUTING	3	0	0	3	25	75	100

CSE

Prerequisite	Basics of Networks	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Demonstrate the Architecture and Deployment models of Cloud computing.	K2
	CO2 Understand virtualization concepts in Cloud	K2
	CO3 Build AWS Cloud	K3
	CO4 Relate Cloud Deployment tools	K2
	CO5 Select the security issues and analyze it.	K3

UNIT - I	Introduction to Cloud Computing and Architecture	Periods:09
Cloud Computing: Overview - History Characteristics -Models - Benefits and Challenges - Parallel and Distributed Computing in the Cloud, Architecture: Components of Cloud Architecture - Service-Oriented Architecture (SOA) in Cloud - Cloud Deployment Models: Public Cloud - Private Cloud - Hybrid Cloud - Community Cloud		CO1
UNIT - II	**Virtualization in Cloud Computing**	**Periods:09**
Virtualization: Introduction- Concepts - Architectures - Processor Virtualization - Memory Virtualization -Storage Virtualization - Virtualization in Cloud Environments: Role of Virtualization in Cloud Computing - Virtualized Data Centers - Advanced Virtualization: Virtualization Security -, Performance and Management in Virtualized Clouds.		CO2
UNIT - III	**AWS Cloud Computing Basics**	**Periods:09**
Introduction to AWS Cloud: Overview of Cloud Computing - AWS Global Infrastructure - Core AWS Services: Compute Services - Storage Services - AWS Networking and Security: AWS Networking - AWS Identity and Access Management (IAM) - AWS Security.		CO3
UNIT - IV	**Cloud Deployment Tools**	**Periods:09**
Google App Engine: Overview of Google App Engine (GAE) - Key features and services - App hosting, scaling, and managed services – Microsoft Azure: Overview - Azure architecture - Virtual Machines, Azure Functions – OpenStack: Overview - OpenStack architecture - Core services: Nova – Swift – Neutron – Glance – Keystone.		CO4
UNIT - V	**Cloud Security**	**Periods:09**
Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods:0	Total Periods:45

Text Books

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi S,"Mastering Cloud Computing: Foundations and Applications Programming", 2nd Edition,2023.
2. Anthony T. Velte, "Cloud Computing: Concepts and Technologies" ,1st edition ,2023.
3. Einar Høst ,"Cloud Security Handbook: Securely Deploy, Manage, and Operate in the Cloud",1st Edition, Packt publishing ,2023.
4. Cornelia Davis, "Cloud Native Patterns: Designing Change-Tolerant Software" ,1st Edition, Manning publications, 2023.
5. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", 1st Edition, Morgan Kaufmann Publishers ,2012.

Reference Books

1. Erick M. Francisco, "Cloud Computing: Concepts and Technologies for Architects",1st edition, Apress, 2023.
2. Jeroen Mulder, "Multi-Cloud Strategy for Cloud Architects" ,1st Edition, Apress,2023.
3. Ian Foster and Dennis B. Gannon ,"Cloud Computing for Science and Engineering",1st edition, MIT press,2022.
4. Vikram Dhillon, "Cloud Computing Basics: A Non-Technical Introduction",1st Edition, Apress,2021.
5. Nikos Antonopoulos, Spiros Zervas , "Cloud Data Management: From Infrastructure to Data Integration",1st Edition,Springer,2021.

Web References

1. https://cic.gsa.gov › basics › cloud-basics
2. https://cloud.google.com/learn/what-is-cloud-computing
3. https://www.ibm.com/cloud-security
4. https://aws.amazon.com/getting-started/
5. https://www.geeksforgeeks.org/cloud-deployment-models/

* TE – Theory Exam, LE – Lab Exam

2.A.3.35

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

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

Department	Computer Science and Engineering	Programme: B.Tech					
Semester	V	Course Category: PC			End Semester Exam Type: TE		
Course Code	U23CSTC06	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	ARTIFICIAL INTELLIGENCE	3	0	0	3	25	75	100
	(Common CSE, IT and CCE)							
Prerequisite	Basics of Algorithms and Probability							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand AI fundamentals and apply search strategies to solve complex problems	K2
	CO2 Apply the fundamentals of knowledge representation	K3
	CO3 Build and Apply Fuzzy logic and Predicate logic.	K3
	CO4 Categorize models and manage uncertainty using probabilistic reasoning techniques.	K3
	CO5 Apply the AI in different fields	K3

UNIT - I	Introduction to AI and Problem Solving	Periods:09	
Overview of AI - Foundations of AI - History of AI - Agents Structure and its types. Problem Solving by Searching: Uninformed search - BFS - DFS - Informed search - Greedy Best First Search - A* Search - AO* Search - Constraint Satisfaction Problem(CSP) - Backtracking search for CSP.			CO1
UNIT - II	**Knowledge Representation**	**Periods:09**	
Introduction to Knowledge Representation: Types - Approaches - Knowledge representation using Semantic Network – Extended semantic networks - Frames – Conceptual dependencies – Scripts.			CO2
UNIT - III	**Fuzzy and Predicate Logic**	**Periods:09**	
Basic Concepts of Fuzzy Set Theory – Operations of Fuzzy Sets – Properties of Fuzzy Sets – Crisp Relations – Fuzzy Relational Equations – Operations on Fuzzy Relations – Fuzzy Systems – Logical Agents, Predicate Logic – First-Order Logic, Inference in First-Order Logic, Forward and Backward Chaining.			CO3
UNIT - IV	**Probabilistic Reasoning**	**Periods:09**	
Probabilistic Notations - Bayes rule - Bayesian Network - Probabilistic reasoning over time: Time and Uncertainty - Understanding Partially Observable Environments - Inference in Temporal Models - Hidden Markov Models - Kalman Filters - Dempster and Shafer Theory.			CO4
UNIT - V	**Applications of AI**	**Periods:09**	
AI in healthcare: Disease Diagnosis and Prediction.AI In Finance: Automated trading and Portfolio Management – AI in Education: Adaptive Learning and Assessment – AI in Customer service: Chatbot and Virtual Assistance.			CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson Education, 2020.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, McGraw Hill, 2017.
3. S. Rajasekaran, G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms synthesis and applications",15th Edition, PHI Learning Private Limited,2011.

Reference Books

1. Cherry Bhargava," Artificial Intelligence Fundamentals and Applications", 1st Edition, CRC Press,2021.
2. S. Kanimozhi Suguna, M.Dhivya,Sra Paiva, "Artificial Intelligence Recent Trends and Applications, 1st Edition, "CRC Press,2021.
3. Wolfgang Ertel," Introduction to Artificial Intelligence", 2nd Edition, Springer, 2018.
4. David Poole and Alan Mackworth," Artificial Intelligence: Foundations of Computational Agents", 2nd Edition, Cambridge University Press, 2017.
5. Chris Thornton, Benedict Du Boulay," Artificial Intelligence through Search",4th Edition, Springer Netherlands, 2012.

Web References

1. https://www.tutorialspoint.com/artificial_intelligence/index.htm
2. https://www.javatpoint.com/artificial-intelligence-ai
3. https://www.geeksforgeeks.org/artificial-intelligence/
4. https://towardsdatascience.com/
5. https://www.coursera.org/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	-	2	2	-	-	-	-	-	-	2	3	2	2
2	3	3	-	2	-	-	-	-	-	-	-	2	2	3	2
3	3	3	3	2	2	-	-	-	-	-	-	2	3	3	2
4	3	2	2	3	3	2	-	-	-	-	-	2	3	3	2
5	2	3	3	2	2	2	2	-	-	-	-	3	3	3	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	5	5	5	5	5	75	100

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

Department	Computer Science and Engineering	Programme: B. Tech						
Semester	V	Course Category: PC				End Semester Exam Type: TE		
Course Code	U23CSTC07	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	WEB DESIGNING	3	0	0	3	25	75	100

(Common to CSE and AI&DS)

Prerequisite	Basic knowledge in Programming and Database	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Interpret the concepts of HTML and CSS in creating and designing web page	K2
	CO2 Apply client-side programming using JavaScript	K3
	CO3 Interpret the concepts of PHP to include forms and process the form data in web pages	K2
	CO4 Apply PHP scripts to handle and manipulate databases	K3
	CO5 Apply the web hosting procedures to host a web application in Internet	K3

UNIT - I	Web Basics, Html and CSS	Periods:09
Web Basics: The Internet – World wide web – DNS – URI and URL – HTTP – web client and web server. Introduction to HTML: HTML Syntax – Structure of HTML Documents – HTML Elements: Headings – Links – Images – Lists – Tables – Forms. Introduction to CSS: CSS Syntax – Location of Styles – Selectors – Box Model – Text Styling – CSS Layout: Positioning Elements – Floating Elements.		CO1
UNIT - II	**Javascript**	**Periods:09**
JavaScript Introduction: Syntax – Variables – Operators – Data Types – Functions – Objects – String Methods – Number Methods – Arrays – Array Methods – Conditions – Loops – Popup Alert – Events – Event Listener. JavaScript Objects: Object Definitions – Object Properties –Object Methods– Object Display.		CO2
UNIT - III	**Introduction to PHP and Forms**	**Periods:09**
Introduction to PHP: Variables – Data Types – Constants – Echo / Print. Operators: Arithmetic – Comparison – Logical – String – If...Else...Elseif – Switch – Loops – Arrays – Functions – Super globals – RegEx. PHP Form: Form Handling – GET/POST – Using Bootstarp – Form Validation – Form Required – Form Submission. Data: Date and Time – File Upload – Cookies – Sessions – Include – Exceptions.		CO3
UNIT - IV	**PHP with Database Connectivity**	**Periods:09**
Introduction to Database: Essential SQL – Creating a MySQL Database – Creating a New Table – Putting Data into the New Database – Accessing the Database in PHP – Updating Databases – Inserting New Data Items into a Database – Deleting Records – Sorting the Data.		CO4
UNIT - V	**Web Hosting**	**Periods:09**
Introduction to Web Hosting: Creating the website – Working on the site – Sending email and access other websites – Registering domains – Themes Publishing web sites – Maintaining a website.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. Randy Connolly and Ricardo Hoar, "Fundamentals of Web Development", Pearson Education Inc, 3rd Edition, 2022.
2. Steven Holzner, "PHP: The Complete Reference", McGraw Hill Education, 3rd Edition, 2020.
3. Jon Dukett, "JavaScript and JQuery: Interactive Front–End Web Development", Paperback, 2018.

Reference Books

1. Lyza Danger Gardner, "Java Script on Things: Hacking Hardware for Web Developers", Dream tech Press,1st Edition, 2018.
2. Nixon Robin, "Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5", O'Reilly Media, 5th Edition, 2018.
3. Laura Lemay, Rafe Colburn, "Mastering HTML, CSS & Javascript Web", BPB Publications, 1st Edition, 2016.
4. Alex Libby, Gaurav Gupta, Asoj Talesra, "Responsive Web Design with HTML5 and CSS3 Essentials", Packt Publishing, 2nd Edition, 2016.
5. Bassett, Lindsay, "Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, 2015.

Web References

1. https://developer.mozilla.org/en-US/docs/Learn
2. https://www.w3schools.com/sql/default.asp
3. https://www.smashingmagazine.com/2021/03/complete-guide-accessible-front-end-components/
4. https://alistapart.com/article/mobile-first-css-is-it-time-for-a-rethink/
5. https://css-tricks.com/tag/view-transitions/
6. https://www.tutorialspoint.com/php/php_introduction.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	3	-	3	-	2	-	-	-	2	-	2	2	-	1	2
2	3	-	3	1	2	-	-	-	-	-	-	-	-	1	2
3	2	-	3	-	2	1	-	1	-	-	-	-	-	1	2
4	2	-	3	2	2	2	-	2	-	-	-	-	-	1	2
5	2	-	3	1	-	1	-	2	-	-	-	-	-	1	2

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

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

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

Department	**Computer Science and Engineering**	Programme: **B.Tech.**					
Semester	**V**	Course Category: **PC**			End Semester Exam Type: **LE**		
Course Code	**U23CSP503**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**CLOUD COMPUTING LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

CSE

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Construct various virtualization tools such as Virtual Box, VMware workstation.	**K3**
	CO2 Construct a web application in a PaaS environment.	**K3**
	CO3 Experiment a cloud environment to implement new schedulers.	**K3**
	CO4 Utilize a generic cloud environment that can be used as a private cloud.	**K3**
	CO5 Infer about Hadoop	**K2**

List of Exercises

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Write a procedure to transfer the files from one virtual machine to another virtual machine.
7. Write a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like word count.
9. Deploy a static website using Amazon S3.
10. Set up a Virtual Private Cloud (VPC).

Lecture Periods:0	**Tutorial Periods:0**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Stephen Baron," AWS: The Complete Beginner's Guide",1st edition, 2020.
2. Todd Koff," Learn the secrets of AWS, AZURE, GCP, and K8S",1st Edition, 2017.
3. Lizhe Wang, Rajiv Ranjan, Jinjun Chen, and Boualem Benatallah," Cloud Computing: Methodology, Systems, and Applications",1st Edition, CRC Press, 2017.
4. Arshdeep Bahga and Vijay Madisetti," Cloud Computing: A Hands-On Approach" ,1st Edition, Create Space independent publications, 2014.
5. Derrick Rountree and Ileana Castrillo," Understanding the Fundamentals of Cloud Computing in Theory and Practice",1st edition, Syngress publications,2013.

Web References

1. https://aws.amazon.com
2. https://codered.eccouncil.org/course/a-practical-introduction-to-cloud-computing
3. https://www.kyndryl.com/in/en/services/
4. https://www.tutorialspoint.com/a-practical-introduction-to-cloud-computing/
5. https://www.ibm.com/topics/cloud-computing

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

2.A.3.42

Department	Computer Science and Engineering	Programme: **B.Tech.**						
Semester	V	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	U23CSPC05	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ARTIFICIAL INTELLIGENCE LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE, IT and CCE)

Prerequisite	Basics of Algorithms and Probability	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Apply Search Algorithms to implement and compare heuristic-based search algorithms like Greedy Best First Search, A*, and AO* to solve pathfinding and graph-based problems.	**K3**
	CO2 Solve CSPs with Backtracking to model and solve complex Constraint Satisfaction Problems (CSPs) such as N-Queens or Sudoku using backtracking techniques.	**K3**
	CO3 Develop Inference Engines: Students will develop forward and backward chaining inference engines, leveraging First-Order Logic for AI decision-making tasks.	**K3**
	CO4 Examine Probabilistic Reasoning: to construct and use Bayesian Networks, Hidden Markov Models, and Kalman Filters for probabilistic reasoning and sequence prediction tasks.	**K3**
	CO5 Make use of AI in different applications.	**K3**

List of Exercises

1. Implement Greedy Best First Search and A* Search for pathfinding problems (e.g., solving a grid-based puzzle).
2. Model a classic Constraint Satisfaction Problem (e.g., N-Queens problem or Sudoku) and solve using backtracking.
3. Implement AO* search for a graph-based problem.
4. Develop an inference engine using forward chaining and backward chaining to deduce conclusions from a given set of facts and rules.
5. Implement basic inference techniques in First-Order Logic using forward and backward chaining for an AI-based decision-making task.
6. Construct a Bayesian Network for a real-world problem (e.g., medical diagnosis) and perform inference using conditional probabilities.
7. Implement a Hidden Markov Model for sequence prediction (e.g., weather prediction or speech recognition).
8. Simulate a Kalman Filter for a tracking or navigation problem (e.g., predicting object positions over time).
9. Implement basic belief functions and apply Dempster-Shafer theory for uncertainty modeling in a decision-making problem.
10. Develop a model to predict stock price movements using historical data.

Lecture Periods: 0	**Tutorial Periods: 0**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Cherry Bhargava," Artificial Intelligence Fundamentals and Applications", 1st Edition, CRC Press,2021.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson, 2020.
3. Elaine Rich, Kevin Knight and Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, McGraw Hill Educations, 2017.
4. Chris Thornton, Benedict Du Boulay," Artificial Intelligence through Search",4th Edition, Springer Netherlands,2012.
5. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms synthesis and applications",15th Edition, PHI Learning Private Limited,2011

Web References

1. https://www.tutorialspoint.com/artificial_intelligence/index.html
2. https://www.javatpoint.com/artificial-intelligence-ai
3. https://www.geeksforgeeks.org/artificial-intelligence/

COs/POs/PSOs Mapping

Co's	Program Outcomes (POs)												Program Outcomes		Specific (PSOs)
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	-	-	-	2	-	-	2	3	3	2
2	3	3	3	3	2	-	-	-	2	-	-	2	3	3	3
3	3	3	3	3	2	-	-	-	2	-	-	2	3	3	3
4	3	3	3	3	2	-	-	-	2	-	-	2	3	3	3
5	3	2	3	2	2	-	-	-	2	-	-	2	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
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**V**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSPC06**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**WEB DESIGNING LABORATORY**	0	0	2	1	50	50	100

(CSE and AI&DS)

Prerequisite	Basic knowledge in Programming and Database	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
CO1	Construct and display webpage with HTML and CSS elements	**K3**
CO2	Develop JavaScript programming for website creation	**K3**
CO3	Build PHP Forms	**K3**
CO4	Develop Database Connectivity using PHP	**K3**
CO5	Utilize PHP applications for Web hosting	**K3**

List of Exercises

1. (a) Design a home page which displays information about your college department using headings, HTML entities and paragraphs.
   (b) Create a webpage for any clinic using marquee and HTML formatting tags.
2. Design a timetable and display it in tabular format.
3. Design an admission form for any course in your college with text, password fields, drop-down list, check-boxes, radio buttons, submit and reset button etc.
4. Design a web page of your home town with an attractive background color, text color, an image, font face by using Inline CSS formatting.
5. (a) Design a web page by using different CSS border styles.
   (b) Demonstrate the use of CSS Box Model.
6. Write a JavaScript program to remove a character at the specified position of a given string and return the new string.
7. Develop and demonstrate a HTML file that includes JavaScript script for taking a number n as input using prompt and display first n Fibonacci numbers in a paragraph.
8. Design HTML form for keeping student record, apply JavaScript validation in it for restriction of mandatory fields, numeric field, email-address field, specific value in a field etc.
9. Write a program in PHP for processing a simple form (use controls like checkbox, radio buttons and options).
10. Write a program in PHP for a simple POST and GET functions
11. Design a login form using cookies, bootstrap, PHP, Database.
12. Design a student form with add, update, delete, display all and search option using student database.

Lecture Periods: 0	**Tutorial Periods:0**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Lyza Danger Gardner, "Java Script on Things: Hacking Hardware for Web Developers", Dreamtech Press, 1st Edition, 2018.
2. Laura Lemay, Rafe Colburn, "Mastering HTML, CSS and Javascript Web", BPB Publications, 1st edition, 2016.
3. Keith Wald, Jason Lengstorf, "Pro PHP and jQuery", Paperback, 2016.
4. Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript & HTML5 All-in-One", John Wiley and Sons Inc, 2013.
5. Leon Atkinson," Core PHP Programming: Using PHP to Build Dynamic Web Sites", Paperback, 2000.

Web References

1. https://www.w3schools.com/php/DEFAULT.asp
2. https://www.tutorialspoint.com/php/index.html
3. https://www.phptpoint.com/php-tutorial/
4. https://www.javatpoint.com/php-tutorial
5. https://www.w3schools.com/html/default.asp

2.A.3:45

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

Department	Computer Science and Engineering			Programme: **B. Tech.**				
Semester	V			Course Category Code: **PA**		*End Semester Exam Type: -		
Course Code	U23CSW501	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	MICRO PROJECT	0	0	2	1	100	-	100
CSE								
Prerequisite	Programming Languages, Databases							

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

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: 0	**Tutorial Periods: 0**	**Practical Periods: 30**	**Total Periods: 30**

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	3	-	1	1	1	1
2	3	3	3	2	2	2	2	2	3	3	3	1	2	2	2
3	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

9.0.3.47

2.A.3.48

Department	**Computer Science and Engineering**	Programme : **B. Tech**						
Semester	**V**	Course Category Code: **AEC**			*End Semester Exam Type: -			
Course Code	**U23CSC5XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CERTIFICATION COURSE – V**	0	0	**4**	**-**	**100**	**-**	**100**
CSE								

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 calculatio in the grade sheet.

Evaluation Methods

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

2.A.3.49

Department	Computer Science and Engineering	Programme: B.Tech.					
Semester	V	Course Category Code: MC				*End Semester Exam Type: -	
Course Code	U23CSM505	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	-	100	-	100
Prerequisite	-	Common to ALL Branches						

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Familiarize with the philosophy of Indian culture	K1
CO2	Distinguish the Indian languages and literature	K2
CO3	Learn the philosophy of ancient, medieval and modern India	K1
CO4	Acquire the information about the fine arts in India	K1
CO5	Know the contribution of scientists of different eras	K1

UNIT- I	Introduction To Culture	Periods:06	
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.			CO1
UNIT- II	**Indian Languages, Culture and Literature**	**Periods:06**	
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
UNIT- III	**Religion and Philosophy**	**Periods:06**	
Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only).			CO3
UNIT- IV	**Fine Arts in India (Art, Technology and Engineering)**	**Periods:06**	
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
UNIT-V	**Education System in India**	**Periods:06**	
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.			CO5

Lecture Periods:30 | **Tutorial Periods: 0** | **Practical Periods: 0** | **Total Periods:30**

Reference Books

1. M. Hiriyanna, "Essentials of Indian Philosophy",1st edition, Motilal Banarsidass Publishers,2014.
2. Samskrita Bharti, "Science in Samskrit",1st Edition, Samskrita Bharti Publisher, 2007.
3. NCERT, "Position paper on Arts, Music, Dance and Theatre",1st Edition, NCERT, 2006.
4. Kapil Kapoor, "Text and Interpretation: The India Tradition", 1st Edition, D.K.Print world, 2005.
5. S. Narain, "Examinations in ancient India",1st edition, Arya Book Depot, 1993.
6. Satya Prakash, "Founders of Sciences in Ancient India", 1st edition, Vijay Kumar Publisher, 1989.

Web References

1. https://nptel.ac.in/courses/109/104/109104102/
2. https://nptel.ac.in/courses/101/104/101104065/
3. https://nptel.ac.in/courses/109/108/109108158/
4. https://nptel.ac.in/courses/109/106/109106059/
5. https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-ae01/

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

2.A.3.51

2. A - 3. 52

PROFESSIONAL ELECTIVE COURSES

2. A. 3. 54

Department	Computer Science and Engineering			Programme: **B.Tech**				
Semester	V			Course Category: **PE**			End Semester Exam Type: **TE**	
Course Code	**U23CSE506**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**PROGRAMMING IN C#**	3	0	0	3	25	75	100
		CSE						
Prerequisite	Basic knowledge of OOPS concepts							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the concept of .Net framework.	**K2**
	CO2 Demonstrate the fundamental concepts using C#.	**K2**
	CO3 Understand the Programming Constructs using C#.	**K2**
	CO4 Develop the Graphical User Interface using C#.	**K3**
	CO5 Build the Database Connectivity using ADO.NET.	**K3**

UNIT - I	**C# Language Fundamentals**	**Periods:09**
Common language Runtime (CLR) – Common Type System (CTS) – Common language Specification (CLS) – Compilation process – Assembly and its types – Namespaces – Command line compiler. C# Basics: Literals- Variables- Data Types- Expressions- Operators- Program control statements- Program: conversion of temperature - simple calculator program.		**CO1**
UNIT - II	**Object Oriented Programming**	**Periods:09**
Classes – Objects – Arrays – Strings – Methods- Operator overloading – Constructors - Encapsulation – Inheritance – Polymorphism - Program: count duplicate elements in an array - Compare two strings without using a string library- Create a nested struct that store two data for an employee.		**CO2**
UNIT - III	**Programming Constructs**	**Periods:09**
Programming Constructs – Value Types and Reference Types- Interface – Structures –Generics - Collection- Enumeration- Iterator - Exceptions Handling - Multithreading – Delegates and Events - File I/O – Program: Divide two numbers and handle an exception when the user enters non-numeric values - Read a file path from the user and tries to open the file and handle exceptions if the file does not exist - Create a blank file on the disk if the same file already exists.		**CO3**
UNIT - IV	**Graphics & Window Forms**	**Periods:09**
Tool Box Controls – Container Control – Menu – Tool Bar – Tool Tip Controls During Design Time – Run Time – Graphics Programming GDI+ - Develop an application to implement multiple tools for designing graphical interfaces.		**CO4**
UNIT - V	**Database Programming**	**Periods:09**
Data Access with ADO.NET – Architecture – Data reader – Data Adapter – Command – Connection – Data Set – Data Binding – Data Grid Control – XML Based Data Sets. Enterprise Edition Overview – Multi-Tier Architecture – Best Practices – Comparison between J2EE and .NET - Develop an interactive application to connect database through ADO.NET.		**CO5**

Lecture Periods:45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods:45**

Text Books

1. Fiodar sazanavets ,"Implementing C# 11 and .Net 7.0 ",1st Edition, BPB Publications, 2023.
2. E.Balagurusamy, "Programming in C# Primer",2nd Edition ,TataMcGraw-Hill Education Pvt Ltd, 2011.
3. Christian Nagel, Bill Evjen, Jay Glynn, "Professional C# 2008",4th Edition, Wiley India Pvt Ltd,2008
4. Mark Michaelis, "Essential C#2.0",2nd Edition, Pearson Education,2005.

Reference Books

1. Gabriel Baptista and Francesco Abbruzzese, "Hands-On Software Architecture with C# 8 and .NET Core 3: Architecting software solutions using microservices, DevOps, and design patterns for Azure Cloud", 1st Edition, Packt Publications, 2019.
2. Mark J. Price,"C# 8.0 and .NET Core 3.0 – Modern Cross-Platform Development",1st Edition, Packt Publications, 2019.
3. Joh Skeet, "C# in depth", 3rd Edition, Manning publications, 2014.
4. Adrew Stellman and Jennifer Greene, "Head First C#", 3rd Edition, O'Reilly, 2013.
5. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework", 6th edition, A Press, 2012.
6. David Chappell, "Understanding .NET – A Tutorial and Analysis",1st Edition, Addison Wesley, 2002.

Web References

1. https://www.mheducation.co.in/programming-in-c-97893513431 89-india
2. https://www.amazon.in/Programming-Primer-Balagurusamy-SECOND-636363/dp/B0C74FB9NJ
3. https://www.w3schools.com/cs/index.php

* TE – Theory Exam, LE – Lab Exam

2.A.3.55

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	2	-	-	-	2	-	-	2	3	2	2
2	3	3	3	3	2	-	-	-	2	-	-	2	3	2	2
3	3	3	3	3	2	-	-	-	2	-	-	2	3	3	2
4	3	2	3	2	2	-	-	-	3	-	-	2	3	3	3
5	3	3	3	3	3	-	-	-	3	-	-	2	3	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

2.A.3.56

Semester	V	Course Category Code: PE			*End Semester Exam Type: TE		
Course Code	U23ECEC01	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	DIGITAL IMAGE PROCESSING	3	0	0	3	25	75	100

(Common to ECE, CSE, IT, CCE and MCTRS)

Prerequisite	Students should have an introduction to signal processing or an equivalent course.	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand fundamentals, visual perception, and pixel relationships.	K2
	CO2 Correlate the various image processing technique with the help of mathematical preliminaries	K3
	CO3 Apply different types of image enhancement and restoration techniques in various applications	K3
	CO4 Illustrate the significance of Colour Image Processing and Image Segmentation techniques	K4
	CO5 explore image compression techniques, coding methods, and pattern recognition based on matching.	K4

UNIT- I	**Digital image Fundamentals**	**Periods: 09**
Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels., simple image formation model, Brightness, contrast, hue, saturation, Mach band effect		**CO1**
UNIT- II	**Image Transform**	**Periods: 09**
Two-dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT- Image transforms – 1D DFT, 2D DFT, Discrete Cosine transform, Discrete Sine transform, Hadamard transform, Haar transform, Slant transform, KL transform, SVD transform, Wavelet transform.		**CO2**
UNIT- III	**Image Enhancement and Image Restoration**	**Periods: 09**
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.		**CO3**
UNIT - IV	**Colour Image Processing and Image Segmentation**	**Periods: 09**
Colour fundamentals – Colour models – HIS to RGB and RGB to HIS. Detection of Discontinuities– Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation. Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.		**CO4**
UNIT - V	**Image Compression and Recognition**	**Periods: 09**
Need for compression – Coding Redundancy - Interpixel Redundancy - Psycho visual Redundancy - Bit plane coding - Variable length coding – Adaptive coding – Arithmetic coding – LZW coding – Hybrid coding – Wavelet – JPEG – MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.		**CO5**

Lecture Periods: 45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods: 45**

Text Books

1. Rafael C. Gonzalez & Richard E. Woods, " Digital Image Processing", 4th edition, Pearson Education,USA, 2017.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", 1st edition, Pearson India, 2015.
3. Kenneth R," Castleman, Digital Image Processing",1st Edition, Pearson Education, 2006.

Reference Books

1. John C. Russ, F. Brent Neal,"The Image Processing Handbook", 7th Edition, CRC Press Taylor & Francis Group,2016.
2. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", 3rd Edition, Tata Mc Graw Hill Pvt. Ltd., 2011.
3. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", 1st Edition, PHI Learning Pvt. Ltd., 2011.
4. P.Ramesh Babu, "Digital Image Processing",1st Edition, Scitech Publications, 2003.
5. Willliam K Pratt, "Digital Image Processing",1st Edition, John Willey, 2002.

Web References

1. http://eeweb.poly.edu/~onur/lectures/lectures.html
2. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html
3. https://nptel.ac.in/courses/117/105/117105079/
4. https://nptel.ac.in/courses/117/105/117105135/
5. https://www.csie.nuk.edu.tw/ .

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

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

Evaluation Method

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

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

Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	V	Course Category Code: PE				*End Semester Exam Type: TE		
Course Code	U23CSE507	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	NETWORK SECURITY	3	0	0	3	25	75	100
CSE								
Prerequisite	Basic knowledge in Networks							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the need of Security Services and Techniques.	K2
CO2	Apply the different cryptographic operations using public and private key cryptography	K3
CO3	Inspect solutions for effective key management distribution and maintain message integrity	K2
CO4	Identify and use appropriate algorithms for assuring System security and authentication.	K3
CO5	Outline the security requirements and solutions for wireless networks and distributed systems	K2

UNIT-I	Introduction	Periods: 9	
Security Attack - Non-cryptographic Protocol Vulnerabilities - Software Vulnerabilities - The need for security - Security services - Security Mechanisms- Classical encryption: Classical Techniques.			CO1
UNIT-II	**Symmetric and Asymmetric Cipher**	**Periods: 9**	
Symmetric Ciphers: Symmetric and asymmetric cryptography- Key size and Key Range- DES - Triple DES -AES - Blowfish - RC5- Pseudorandom Number Generators - Asymmetric Ciphers: RSA Algorithms - Security of RSA - Knapsack Algorithm - Differential and Linear Cryptanalysis-Number Theory.			CO2
UNIT-III	**Key Management and Data Integrity Algorithms**	**Periods: 9**	
Diffie Hellman key exchange -Elgamal Cryptographic System - Elliptic Curve Arithmetic - Elliptic Curve Cryptography - Cryptographic Hash Functions: Secure Hash Algorithm (SHA-1) -Message authentication codes: HMAC.			CO3
UNIT-IV	**Authentication**	**Periods: 9**	
Digital Signatures -Elgamal Digital Signature Scheme - NIST Digital Signature Algorithm - Elliptic Curve Digital Signature Algorithm – RSA-PSS Digital Signature - Biometric Authentication – Kerberos - X.509 Authentication Service - Public Key Infrastructure			CO4
UNIT-V	**Network and Wireless Security's**	**Periods: 9**	
Email Security: Pretty good privacy – S/MIME-IP Security - Web Security: SSL/ Transport Layer Security - Secure electronic transaction (SET) –System Security- Firewalls design principles. Intrusion detection System - Virtual Private Networks - Wireless security: IEEE 802.11 overview and its security – WEP - WPA. **Case Studies:** Snort and Stenographic tools - Bit coin and Crypto currency system.			CO5
Lecture Periods: 45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods: 45**

Text Books

1. William Stallings, "Cryptography & Network Security- Principles and Practices",7th Edition, Pearson Publishers, 2017.
2. AtulKahate, "Cryptography and Network Security", 3rd Edition, McGraw Hill, 2011.
3. William Stallings, "Network Security Essentials: Applications and Standards",4th Edition, Prentice Hall,2007.

Reference Books

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in computing",5th Edition, Prentice Hall of India,2015.
2. William Stallings, "Network Security Essentials: Applications and Standards",4th Edition, Prentice Hall, 2007.
3. Douglas R. Stinson, "Cryptography: Theory and Practice",3rd Edition, CRC press,2006.
4. Wenbo Mao, "Modern Cryptography: Theory and Practice",1st Edition, Prentice Hall PTR,2003.
5. Charlie Kaufman, Radia Perlman, and Mike Speciner, "Network Security: PRIVATE Communication in a PUBLIC World", 1st Edition, Prentice Hall,2002.

2.A.3.59

Web References

1. https://www.coursera.org/learn/crypto
2. https://www.mitel.com/articles/web-communication-cryptography-and-network-security
3. http://williamstallings.com/Cryptography/Crypto7e-Student/
4. http://www.maths.usyd.edu.au/u/afish/Math2068/index_lectures.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	3	3	2	2	2	-	-	-	2	-	-	1	2	2	2
2	3	3	3	3	3	-	-	-	2	-	-	2	3	3	2
3	3	3	2	3	2	-	-	-	2	-	-	1	3	2	2
4	3	3	3	3	3	-	-	-	3	-	-	2	3	3	3
5	3	3	2	2	3	-	-	-	3	-	-	2	3	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

2.A.3.60

Department	**Computer Science and Engineering**	Programme: **B.Tech**					
Semester	**V**	Course Category: **PE**			End Semester Exam Type: **TE**		
Course Code	**U23CSE508**	Periods/Week			Credit	Maximum Marks	
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Open-Source Programming for IOT**	3	0	0	3	25	75	100

Prerequisite	Basic knowledge in Programming and Networks	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify key IoT platforms and languages.	**K3**
	CO2 Develop real-time IoT applications with Python/MicroPython	**K3**
	CO3 Build IoT applications and dashboards using Node.js.	**K3**
	CO4 Develop analytics systems with Julia.	**K3**
	CO5 Inference secure, scalable IoT solutions with Rust/Go.	**K4**

UNIT - I	**Open Source IOT Platforms and Programming Languages**	**Periods:09**
Introduction to IoT – Basic Concepts – Importance of Open Source in IoT – Popular Open Source IoT Platforms – Arduino – Raspberry Pi – ESP8266 – ESP32 – Programming Languages for IoT – C – C++ – Python – MicroPython – JavaScript (Node.js). Basic Real-Time Concepts –Latency – Throughput and Response Time – Case Study – Getting Started with Arduino and C/C++ – Weather Station Project.		**CO1**
UNIT - II	**Python and Micropython for IOT Applications**	**Periods:09**
Introduction to Python in IoT – Basics of Python and its role in IoT development – Overview of MicroPython – Use in IoT and difference from standard Python – Setting Up Python and MicroPython – Installing Python on Raspberry Pi – Setting up MicroPython on ESP8266 and ESP32– Requirements for real-time data processing – Connecting and reading data from sensors – Visualizing data using Python libraries – Case Study – Develop a real-time light monitoring system using the BH1750 ambient light sensor with ESP32/ESP8266.		**CO2**
UNIT - III	**Real-Time IoT with Node.js**	**Periods:09**
Overview of JavaScript and Node.js for IoT – Setting Up Node.js for IoT – Installing Node.js on IoT platforms – Configuring the development environment – Using Node.js with IoT Devices – Integrating sensors and actuators – Handling asynchronous I/O - Real-Time Data Communication with Node.js – Case Study – Create a real-time dashboard to monitor and visualize sensor dat using Node.js.		**CO3**
UNIT - IV	**IoT Data Processing using Julia**	**Periods:09**
Overview of Julia – Key features and benefits for IoT – Basic syntax and programming constructs – Setting Up Julia for IoT – Installing Julia on IoT platforms like Raspberry Pi – Configuring the Julia environment – Real-Time Data Processing with Julia – Implementing multi-threading and asynchronous processing – Advanced data visualization techniques using Julia – Implementing real-time machine learning models for IoT applications – Case Study – Develop an IoT data analytics system using Julia.		**CO4**
UNIT - V	**RUST AND GO FOR IoT Security**	**Periods:09**
Introduction to Rust – Overview of Rust and its benefits – Key features-Rust's role in IoT security and embedded systems – Rust for IoT Development – Basics – Advantages of Rust in IoT – Secure communication protocols. Introduction to Go (Golang) – Overview of Go and its suitability for real-time applications – Key features – Go's role in scalable IoT solutions – Network Programming with Rust and Go – Implementing secure communication protocols with Rust – Network programming techniques with Go for real-time data transmission – Case Study – Develop a secure, real-time IoT monitoring system using Rust or Go.		**CO5**

Lecture Periods:45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods:45**

Text Books

1. Malcolm Sherrington, "Mastering Julia: A Comprehensive Guide for Advanced Users",1st edition, Packt Publishing, 2022.
2. Arshdeep Bahga and Vijay Madisetti," Internet of Things: A Hands-On Approach", 2nd Edition, McGraw-Hill Education, 2021.
3. Patrick Mulder and Kelsey Breseman, Node.js for Embedded Systems: Using Web Technologies to Build Connected Devices,1st Edition, Apress, 2021.
4. Mihalis Tsoukalos," Mastering Go: Harness the Power of Go to Build Professional Utilities and Concurrent Servers and Services", Packt Publishing, 2020.
5. Pratik Desai, "Python Programming for Arduino",1st Edition, Packt Publishing, 2018.
6. Jim Blandy and Jason Orendorff," Programming Rust: Fast, Safe Systems Development",1st Edition, O'Reilly Media, 2018.

9.A.3.61

Reference Books

1. Nicholas H. Tollervey, "Programming with MicroPython: Get MicroPython Working for You on the Raspberry Pi Pico, ESP32, and Other Microcontrollers",1st Edition, No Starch Press, 2021.
2. Patrick Mulder and Kelsey Breseman, "Node.js for Embedded Systems: Using Web Technologies to Build Connected Devices",1st Edition, Apress, 2021.
3. Michael Margolis," Arduino Cookbook", 3rd Edition, O'Reilly Media, 2020.
4. Chris Rackauckas and Shalabh Bhatnagar, "Julia Programming for Operations Research: A Primer on Computing",1st Edition, Springer, 2018.
5. Claus Matzinger, "Rust Programming By Example",1st Edition, Packt Publishing, 2018.
6. Alan A. A. Donovan and Brian W. Kernighan, "The Go Programming Language",1st Edition, Addison-Wesley Professional, 2015.

Web References

1. https://www.arduino.cc
2. https://docs.micropython.org/en/latest/
3. https://www.w3schools.com/nodejs/
4. https://julialang.org/
5. https://www.rust-lang.org
6. https://go.dev

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

2-A-3-62

Department	Computer Science and Engineering	Programme: **B.Tech**						
Semester	V	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	U23CSE509	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	SOFTWARE PROJECT MANAGEMENT	3	0	0	3	25	75	100
CSE								
Prerequisite	-							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand Project Management and planning strategies	K2
	CO2 Build adequate knowledge about software process models and software effort estimationtechniques	K3
	CO3 Examine the risks involved in various project activities	K2
	CO4 Utilize the project monitoring and control strategies	K3
	CO5 Simplify Staff selection process and the issues related to people management	K4

UNIT - I	Project Evaluation and Planning	Periods:09
Software Project Management – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk Evaluation – Strategic Program Management – Stepwise Project Planning		CO1
UNIT - II	**Project Life Cycle and Effort Estimation**	**Periods:09**
Project Life Cycle – Software Process and Process Models – Rapid Application Development – Agile Methods – Dynamic System Development Method – Extreme Programming – Managing Interactive Processes – Basics of Software Estimation – Effort and Cost Estimation Techniques – COSMIC Full Function points – COCOMO II – A Parametric Productivity Model		CO2
UNIT - III	**Activity Planning, Scheduling and Risk Management**	**Periods:09**
Objectives of Activity planning – Project Schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo Simulation – Resource Allocation – Creation of Critical Patterns – Cost Schedules.		CO3
UNIT - IV	**Monitoring and Control**	**Periods:09**
Collecting the Data – Visualizing Progress – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Getting Project Back to Target – Change Control – Managing Contracts – Introduction – The ISO 12207 Approach – Supply Process – Types of Contract – Stages in Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance		CO4
UNIT - V	**Managing Peoples and Organizing Teams**	**Periods:09**
Staffing in Software Projects – Managing People – Organizational Behavior – Best methods of Staff Selection – Motivation – The Oldham – Hackman Job Characteristic Model – Stress – Health and Safety – Ethical and Professional Concerns – Working in Teams – Decision Making – Organizational Structures – Dispersed and Virtual Teams – Communications Genres – Communication Plans – Leadership.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. Kalpesh Ashar, "Project Management Essentials You Always Wanted To Know",1st Edition, Vibrant Publishers, 2020.
2. Bob Hughes," Mike Cotterell and Rajib Mall ,Software Project Management",5th Edition, Tata McGraw Hill, New Delhi, 2017.
3. Maneesh Dutt, "Mind Maps for Effective Project Management", 1st Edition , Notion Press, 2015.

Reference Books

1. Meredith , Mantel , Shafer, "Project Management, ISV: A Managerial Approach",9th Edition, Wiley, 2017.
2. Stanley E. Portny, "Project Management For Dummies", 5th edition, Wiley, 2017.
3. Gopalaswamy Ramesh, "Managing Global Software Projects",14th Edition, McGraw Hill Education (India), 2013.
4. Robert K. Wysocki, "Effective Software Project Management" ,1st Edition ,Wiley Publication, 2011.
5. Walker Royce, "Software Project Management",1St Edition, Addison-Wesley, 1998.

Web References

1. https://www.pmi.org/learning/library/strategic-program-management-office-structure-4613
2. https://www.simplilearn.com/project-estimation-techniques-article
3. https://www.tutorialspoint.com/software_engineering/software_project_management.html
4. https://www.javatpoint.com/software-project-management
5. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/

* TE – Theory Exam, LE – Lab Exam

9.A.3.63

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

SEMESTER VI

Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	VI	Course Category Code: PC				*End Semester Exam Type:TE		
Course Code	U23ITTC03	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	MACHINE LEARNING	3	0	0	3	25	75	100

Common to CSE, IT and CCE

Prerequisite	Mathematics	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the basic concepts of machine learning	**K2**
	CO2 Apply supervised algorithms for different classification problems	**K3**
	CO3 Explain the need for ensemble methods	**K2**
	CO4 Apply unsupervised and reinforcement learning techniques to various problems	**K3**
	CO5 Apply dimensionality reduction and optimization techniques	**K3**

Unit- I	**Introduction**	**Periods: 09**
Introduction: Machine learning; Examples of Machine Learning Applications: Learning associations – Classification – Regression – Unsupervised learning – Reinforcement learning; Preliminaries: Weight space – Curse of dimensionality – Testing machine learning algorithms – Turning data into probabilities – Basic statistics – Bias-variance tradeoff.		**CO1**
Unit- II	**Supervised Learning**	**Periods: 09**
Neural Networks and Linear Discriminants: Brain and the Neuron – Neural networks – Perceptron – Linear separability – Linear regression; Multi-layer Perceptron: Forward and Backward propagation; Support Vector Machines.		**CO2**
Unit- III	**Probabilistic Learning, Learning with Trees**	**Periods: 09**
Probabilistic Learning: Gaussian mixture models – Nearest neighbor methods; Learning with Trees: Constructing decision trees – Classification and Regression trees – Classification example; Ensemble Learning: Boosting – Bagging – Random forests.		**CO3**
Unit- IV	**Unsupervised Learning, Reinforcement Learning**	**Periods: 09**
Unsupervised: K-means algorithm; Reinforcement learning: State and action space – Reward function – Discounting – Action selection – Policy – Markov decision process – Values – SARSA and Q-learning.		**CO4**
Unit- V	**Dimensionality Reduction, Optimization Techniques**	**Periods: 09**
Dimensionality Reduction Techniques: Linear Discriminant analysis, Principal Component Analysis; Optimization and Search: Least-squares optimization – Conjugate gradients – Search approaches – Exploitation and exploration.		**CO5**

Lecture Periods: 45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods: 45**

Text Books

1. Ethem Alpaydin, "Introduction to Machine Learning", 3rd Edition, The MIT Press, 2014
2. Stephen Marsland, "Machine Learning - An Algorithmic Perspective", 2nd Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2015
3. Oliver Theobald, "Machine Learning for Absolute Beginners",3rd Edition, 2021

Reference Books

1. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", 1st Edition, Wiley, 2014.
2. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", 1st Edition, Cambridge University Press, 2012.
3. Richert, Willi, "Building machine learning systems with Python", Packt Publishing, 2013.
4. Tom M Mitchell, "Machine Learning", McGraw-Hill Education (India), 2013.
5. Y S Abu-Mostafa, M Magdon-Ismail, H T Lin, "Learning from Data", AML Book Publishers, 2012

Web References

1. https://nptel.ac.in/courses/106/105/106105152/
2. https://www.coursera.org/learn/machine-learning
3. https://machinelearningmastery.com/
4. https://towardsdatascience.com/machine-learning/home/
5. https://www.analyticsvidhya.com/blog/2017/09/common-machine-learning-algorithms/

9.A.3.67

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

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

Evaluation Method

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

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

2.A.3.68

Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	VI	Course Category: PC				End Semester Exam Type: TE		
Course Code	U23CST605	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	DESIGNING AND BUILDING OF BOTS	3	0	0	3	25	75	100
CSE								
Prerequisite	NIL							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Identify insights on robotic process automation (RPA) technology and automation anywhere	K3
	CO2 Apply the feature of Web Control Room	K3
	CO3 Categorize bots using bot Creator	K4
	CO4 Identify Metabot functionality	K3
	CO5 Develop and Train IQ Bots	K3

UNIT - I	**Introduction to Robotic Process Automation & Bot Creation**	**Periods:09**
Introduction to RPA and Use cases – Automation Anywhere Enterprise Platform (Control Room, Bot Creator, and Bot Runner)- RPA Components-RPA Lifecycle– RPA features and capabilities – Ways to create Bots		CO1
UNIT - II	**Web Control Room and Client**	**Periods:09**
Introduction - Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel – Activity (View Tasks in Progress and Scheduled Tasks) - Bots (View Bots Uploaded and Credentials) - Devices (View Development and Runtime Clients and Device Pools) - Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – introduction to client and Workbench-Recorders		CO2
UNIT - III	**Bot Creator**	**Periods:09**
Variables - Command Library – Loop Command – Excel Command – Database Command - String Operation Command - XML Command - Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer - Best Practices		CO3
UNIT - IV	**Meta Bot and Bot Insight**	**Periods:09**
Introduction to MetaBot - MetaBot With Screen - MetaBot with DLL- Introduction to Bot Insight - Transactional Analytics - Operational Analytics.		CO4
UNIT - V	**IQ Bots**	**Periods:09**
Introduction to IQ Bots-Overview of Cognitive Automation-Setting up and Training IQ Bot- Invoice Processing with IQ Bots – Performance and Monitoring- Integrating IQ Bots with Other Automation Anywhere Bots.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. Kelly Bocci, "RPA Implementation Guide: A Practical Approach to Implementing Automation Anywhere", 1st Edition, Independently Published, 2022.
2. Will Neymar, "Mastering RPA with Automation Anywhere: Expert Guide for Bot Developers", 1st Edition, Apress, 2021.
3. Alok Mani Tripathi, "Learning Robotic Process Automation: Create Software Robots and Automate Business Processes with the Leading RPA Tool - Automation Anywhere", 1st Edition, Packt Publishing, 2018.

Reference Books

1. Chris Skinner, "Cognitive Automation and Robotic Process Automation: AI and Digital Transformation in Financial Services", 1st Edition, Marshall Cavendish International, 2020.
2. Rajesh K, "Robotic Process Automation with Automation Anywhere: Learn the Nuts and Bolts of RPA and How to Design, Develop, and Implement RPA Bots", 1st Edition, BPB Publications, 2020.
3. Gerardus Blokdyk, "Robotic Process Automation: A Guide to Implementing RPA Systems", 1st Edition, 5STARCooks, 2020.
4. Richard Murdoch, "Hands-On Robotic Process Automation (RPA): Automate Repetitive Tasks in the Workplace with UiPath and Automation Anywhere", 1st Edition, Apress, 2020.
5. Pascal Bornet, Ian Barkin, Jochen Wirtz, "Intelligent Automation: Welcome to the World of Hyperautomation", 1st Edition, World Scientific Publishing, 2020.

Web References

1. https://www.automationanywhere.com
2. https://www.ibm.com/topics/rpa
3. https://university.automationanywhere.com
4. https://www.edureka.co/blog/automation-anywhere-tutorial
5. https://www.simplilearn.com/tutorials/automation-anywhere-tutorial

* TE – Theory Exam, LE – Lab Exam

2.0.3.69

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

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

2.A.3. To

Department	Computer Science and Engineering	Programme: B.Tech					
Semester	VI	Course Category: PC				End Semester Exam Type: TE	
Course Code	U23CST606	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	ANIMATION AND VISUAL EFFECTS	3	0	0	3	25	75	100
	CSE							
Prerequisite	Basics of Animation							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the concepts of VFX and Animation	K2
CO2	Build Animation Effects using After Effects.	K3
CO3	Examine Animation Effects using Premier Pro.	K4
CO4	Understand Blender tools and Design character design.	K2
CO5	Develop the Models using Blender.	K3

UNIT - I	Vfx And Animation	Periods:09
VFX – Understanding VFX – Brief History of VFX - Need for Visual Effects – Future of Visual Effects – Pros & Cons of Visual Effects – Applications of VFX – Comparison between VFX and Animation. Animation – History of Animation – Applications of Animation – Career in Animation – Pros & Cons of Animation.		CO1
UNIT - II	**Learning After Effects**	**Periods:09**
Usage of Platform – Tools used – Plugins & Types – Imports & Exports – Masking – Object Duplication – Motion Tracking – Rotoscoping – Color Play – Visual Effects – Render Tab & Advance Option – Exploring to Media Encoder.		CO2
UNIT - III	**Learning Premiere Pro**	**Periods:09**
Usage of Platform – Difference between After Effects & Premiere Pro – Effects & Presets Tab – Audio Splitting & its work – LUTs & its application – Working with Creative Curve – Render Tab & Advance Options.		CO3
UNIT - IV	**Introduction to Blender & Tools**	**Periods:09**
Basics of Blender – Understanding Blender Interface & Tools – The Blender Scene - Project overview & Character Design – Using Other Design Methods.		CO4
UNIT - V	**Blender Works**	**Periods:09**
Modeling & its Tools in Blender – Character Modelling – Unwrapping, Painting & Shaders – Character Rigging & Animation – The Render Page – Lighting & Composition.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. Lisa Fridsma, Brie Gyncild, "Adobe After Effects Classroom in a Book", 1st Edition, Adobe Press, 2024.
2. Maxim Jago, "Adobe Premiere Pro Classroom in a Book", 1st Edition, Pearson Education, 2022.
3. Jason van Gumster, "Blender For Dummies", 2nd Edition, John Wiley & Sons, 2011.

Reference Books

1. Trotter Burt," Mastering Adobe Premiere Pro 2024: Complete Step-by-Step Video Editing Course for Beginners & Veterans ", 1st Edition, Adobe Press, 2024.
2. Maxim Jago, "Adobe Premiere Pro Classroom in a Book", 1st Edition, Adobe Press, 2024.
3. Oscar Baechler and Xury Greer, "Blender 3D By Example", 2nd Edition, Packt Publishing,2020.
4. Joe Dockery, Conrad Chavez, "Learn Adobe After Effects CC for Visual Effects and Motion Graphics", 1st Edition, Peachpit Press, 2019.
5. Chad Perkins, "The After Effects Illusionist: All the Effects in One Complete Guide", 2nd Edition, Routledge, 2017.

Web References

1. https://www.bloopanimation.com/animation-for-beginners/
2. https://www.rocketstock.com/blog/learn-5-simple-animation-techniques-effects/
3. https://www.premiumbeat.com/blog/text-effect-premiere-pro/
4. https://conceptartempire.com/blender-animation-tutorials/
5. https://www.visualeffectssociety.com/

* TE – Theory Exam, LE – Lab Exam

2.A.3.71

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

2.A.3.72

Department	Computer Science and Engineering	Programme: B.Tech					
Semester	VI	Course Category: PC			End Semester Exam Type: TE		
Course Code	U23CSB602	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	BLOCKCHAIN CONCEPTS AND APPLICATIONS	2	0	2	3	50	50	100
CSE							
Prerequisite	-						

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the fundamentals of Blockchain.	K2
CO2	Identify the concepts of Cryptography.	K3
CO3	Analyze real-world case studies.	K4
CO4	Examine Blockchain concepts.	K4
CO5	Build the applications of Blockchain.	K2

UNIT - I	Introduction to Blockchain	Periods:10

Introduction to blockchain – History – CAP theorem and blockchain-Blockchain Network-Mining Mechanism-Life of Blockchain application-Soft & Hard Fork- Private and Public blockchain. Distributed Consensus: Nakamoto Consensus-Proof of Work-Proof of Stake Difficulty Level-Sybil Attack-Energy utilization and alternate. **CO1**

UNIT - II	Foundation to Cryptography	Periods:10

Introduction of Cryptography: Hash function, Digital Signature – ECDSA- Memory Hard Algorithm- Zero Knowledge Proof. Symmetric Key Encryption Simple DES, Linear and Differential cryptanalysis- DES- Modes of operation- Triple DES, AES – Public Key Cryptography - Factorization problem and RSA-Diffie Hellman Key Exchange- Elliptic curve cryptography-Authentication Algorithms: Message Digest- SHA-1- MD5. **CO2**

UNIT - III	Blockchain Applications	Periods:10

Bitcoin - Introduction – Transactions types – The structure of a block– The genesis block – The bitcoin network– Wallets and its types– Bitcoin installation – Bitcoin programming and the command-line interface –Cryptocurrency Exchange-Bitmap Indices. Transaction Management: Serializability – Recoverability – Transaction Isolation Levels –Smart Contracts: Automated contract. **CO3**

UNIT - IV	Laboratory Exercises-I	Periods:15

1. Implementation of constructing a Merkle tree with blockchain principles.
2. Implementation of Block construction using blockchain Principles
3. Implementation of blockchain using Java programming language
4. Implementing the running of the blockchain node
5. Implementation of several consensus techniques (such Proof of Work and Proof of Stake) and see how they affect the functionality of the network.
6. Implementation of a blockchain token (e.g., ERC-20) and explore its functionality.

CO4

UNIT - V	Laboratory Exercises-II	Periods:15

7. Implementation of Blockchain-based peer-to-peer network.
8. implementing block chain ideas to the development of a cryptocurrency wallet
9. Implement and configure Go Ethereum and the Mist browser. Develop and test a sample application
10. Implement the set-up interoperability between different blockchains (e.g., Polkadot, Cosmos).
11. Implement the blockchain reentrancy attacks and learn how to prevent them
12. Implement and deploy a simple smart contract on a blockchain platform like Ethereum or Binance Smart Chain.

CO5

Lecture Periods:30	Tutorial Periods: 0	Practical Periods: -30	Total Periods:60

Text Books

1. Andreas M. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", 2nd Edition, O'Reilly Media, 2023.
2. Don Tapscott and Alex Tapscott, "Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World", 2nd Edition, Penguin, 2023.
3. Antony Lewis, "The Basics of Bitcoins and Blockchains", 2nd Edition, Mango Media, 2022.
4. William Stallings, "Cryptography and Network Security: Principles and Practice", 8th Edition, Pearson, 2022.

Reference Books

1. Daniel Drescher, "Blockchain Basics: A Non-Technical Introduction in 25 Steps", 2nd Edition, Apress, 2019.
2. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, "A survey of attacks on Ethereum smart contracts",1st Edition, Yellow Paper, 2016.
3. Wattenhofer, "The Science of the Blockchain", 1st Edition, CreateSpace Independent Pub, 2016.
4. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", 1st Edition, O'Reilly Media, 2015.
5. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger", 1st Edition, Yellow paper,2014.

2.A.3.73

Web References

1. https://www.thew3university.io/
2. https://cryptozombies.io/
3. https://decrypt.co/
4. https://unchainedcrypto.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	2	2	1	1	1	-	-	-	-	-	-	-	1	2	3
2	2	2	2	1	1	-	-	-	-	-	-	-	2	2	3
3	2	2	2	2	2	-	-	-	-	-	-	-	3	2	1
4	2	3	3	2	2	-	-	-	-	-	-	-	2	2	2
5	2	3	2	2	2	-	-	-	-	-	-	-	1	2	2

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks									#End Semester Examination (ESE) Marks (Theory)	Total Marks
	Continuous Assessment (Theory)					Continuous Assessment (Practical)					
	CAT 1	CAT 2	Model	Attendance	Total	Conduction of Practical	Report	Viva	Total	#End Semester Examination (ESE) Marks (Practical-Internal Evaluation)		
Marks	5	5	5	5	20*	15	10	5	30*	30	75**	100
*To be weighted for 10 Marks					10	*To be weighted for 10 Marks			10		*To be weighted for 50 Marks	

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

2.A.3.74

Department	Computer Science and Engineering	Programme: **B.Tech.**						
Semester	VI	Course Category Code: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ITPC03**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**MACHINE LEARNING LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
Common to CSE, IT and CCE								
Prerequisite	Mathematics							

Course Outcome	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Apply python packages and libraries for various problems	K3
CO2	Apply supervised learning techniques for various problems	K3
CO3	Develop an open-ended solution with data privacy and ethical concerns, for a given real-world problem.	K3
CO4	Apply unsupervised and reinforcement learning techniques for various problems	K3
CO5	Apply ensemble techniques to solve the problems and demonstrate the working of dimensionality reduction methods	K3

List of Exercises

1. Working with Python packages - Numpy, Scipy, Scikit-learn, Matplotlib
2. Loan amount prediction using linear regression and visualize the interpretation
3. Handwritten character recognition using neural networks
4. Classification of Email spam and MNIST data using Support Vector Machines.
5. Predicting Diabetes using decision tree
6. Applications of Random Forest and AdaBoost ensemble techniques
7. K-means clustering for Euclidean distance metric
8. k-Nearest Neighbor algorithm
9. Applications of dimensionality reduction techniques on any dataset
10. Analyze any two supervised / unsupervised machine learning algorithms for any of the following real-time applications: (a) Text processing (b) Image processing (c) IoT systems

Lecture Periods: 0	**Tutorial Periods: 0**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. Tom M Mitchell, "Machine Learning",1st Edition, McGraw-Hill Education (India), 2017.
2. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", 1st Edition, Wiley, 2014.
3. Richert Willi, Luis Pedro Coelho, "Building machine learning systems with Python", 1st Edition, Packt Publishing, 2013.
4. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", 1st Edition, Cambridge University Press, 2012.
5. Y S Abu-Mostafa, M Magdon-Ismail, H T Lin, "Learning from Data", 1st Edition, AML Book Publishers, 2012.

Web References

1. https://nptel.ac.in/courses/106/105/106105152/
2. https://www.coursera.org/learn/machine-learning
3. https://machinelearningmastery.com/
4. https://towardsdatascience.com/machine-learning/home/
5. https://www.analyticsvidhya.com/blog/2017/09/common-machine-learning-algorithms/

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

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

9.A.3.75

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. 3. 76

Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	VI	Course Category: PC				End Semester Exam Type: PE		
Course Code	U23CSP604	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	DESIGNING AND BUILDING OF BOTS LABORATORY	0	0	2	1	50	50	100
		CSE						
Prerequisite	Nil							

Cours Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Identify insights of operations on Task Bot.	K3
CO2	Develop a bot to Automate extraction of data	K3
CO3	Examine Automation for web	K4
CO4	Apply metabot for workload automation	K4
CO5	Develop an IQ bot for automation	K3

List of Exercises

1. Set up Automation Anywhere, explore the Control Room, and create your first basic Task Bot.
2. Create a Task bot to Automate data entry tasks
   (opening a Notepad, typing a simple text, and saving the file)
3. Create a bot to Automate extraction of data from an Excel file and copies to another application
4. Create a bot to automate the submission of a simple web form.
5. Automate the process of sending an email using a bot.
6. Create a bot to automatically launch a website every day at a specific time, such as opening a news website every morning.
7. Automate the process of assigning customer support tickets (stored in an Excel file) to different agents using queues.
8. Automate the process of logging into a web-based email account, checking for new messages, and logging out.
9. Create a bot to download files from an FTP server and loop through them to rename each file based on a specific pattern.
10. Developing BOT to Create and deliver invoices.

Lecture Periods: 0	Tutorial Periods: 0	Practical Periods:30	Total Periods:30

Reference Books

1. Nandan Mullakara, Arun Kumar Asokan, "Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere", 1st Edition, Packt Publishing Ltd., 2020.
2. Alok Mani Tripathi, "Robotic Process Automation (RPA) - A Practical Guide to Implementing RPA in Your Organization", 1st Edition, BPB Publications, 2020.
3. Sandeep Kumar, "Robotic Process Automation: Guide to Building Software Robots", 1st Edition, Apress, 2020.
4. Ritesh Modi, "Learning Robotic Process Automation", 1st Edition, Packt Publishing, 2017.

Web References

1. https://university.automationanywhere.com/
2. https://www.youtube.com/c/AutomationAnywhere
3. https://www.guru99.com/robotic-process-automation-tutorial.html
4. https://www.automationanywhere.com/community
5. https://www.freecodecamp.org/news/robotic-process-automation-tutorial/

9.A.3.77

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

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.3.78

Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	VI	Course Category: PC			End Semester Exam Type: LE			
Course Code	U23CSP605	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	ANIMATION AND VISUAL EFFECTS LABORATORY	0	0	2	1	50	50	100
		CSE						
Prerequisite	Basics of Animation							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand Layers, Panels, Frames, etc.	K2
CO2	Utilize motion effects in video clips	K3
CO3	Build some new methods in animations	K3
CO4	Examine Bevel Tool, Knife Tool & Shading Concepts.	K4
CO5	Build a 3D Environment.	K3

List of Exercises

AFTEREFFECTS

1. Understanding AFTEREFFECTS
   a. Introduction to After Effects
   b. Interface Introduction
   c. Layers, Timeline Panels, Compositions, Links Panel
   d. Animation Principles
   e. Key frames
2. Simple Video Editing & Animation
3. Easing & Time Stretching & Imports\Exports\Footage Replacements
4. Presets & Masking & Text Animation
5. Working with Media Encoder
6. Vfx & Rendering

PREMIEREPRO

1. Basic start
   a. Timeline & New Sequence
   b. Selection & Track Selection tools
   c. Rolling & Ripple Edit
   d. Make Slow Motion
   e. Split\Cut video clip
   f. Transitions
2. Motion Effects control & Animae layers\ Chroma keys
3. Masking and Duplication \ Effects & Adjustments Layer
4. Colour Splash\ Imports & Exports

ANIMATION BLENDER

1. Introduction & fundamentals
2. Viewport Navigation & Transform & Add\Del
3. Modeling Instructions & Creating Meshes
4. Extrude & Loop cut
5. Bevel Tool & Knife Tool & Shading
6. Shading Editor & Texture
7. Rigging & parenting
8. Creating Landscapes & Environments
9. Rain effects & Abstract creation
10. 3D Environment

Lecture Periods:0	Tutorial Periods: 0	Practical Periods:30	Total Periods:30

Reference Books

1. 1Trotter Burt," Mastering Adobe Premiere Pro 2024: Complete Step-by-Step Video Editing Course for Beginners & Veterans ", 1st Edition, Adobe Press, 2024.
2. Maxim Jago, "Adobe Premiere Pro Classroom in a Book", 1st Edition, Adobe Press, 2024.
3. Oscar Baechler and Xury Greer, "Blender 3D By Example", 2nd Edition, Packt Publishing,2020.
4. Joe Dockery, Conrad Chavez, "Learn Adobe After Effects CC for Visual Effects and Motion Graphics", 1st Edition, Peachpit Press, 2019.
5. Chad Perkins, "The After Effects Illusionist: All the Effects in One Complete Guide", 2nd Edition, Routledge, 2017.

Web References

2. A. 3. 24

1. https://www.pdfdrive.com/3d-art-essentials-the-fundamentals-of-3d-modeling-texturing-and-animatione157006123.html
2. https://www.pdfdrive.com/aim-awards-suite-of-games-animation-and-vfx-skills-qualifications-e50802091.html
3. https://www.bloopanimation.com/animation-for-beginners/
4. https://www.rocketstock.com/blog/learn-5-simple-animation-techniques-effects/
5. https://www.premiumbeat.com/blog/text-effect-premiere-pro

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

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.3.80

Department	Computer Science and Engineering	Programme: B. Tech.						
Semester	VI	Course Category Code: PA				*End Semester Exam Type: -		
Course Code	U23CSW602	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	MINI PROJECT	0	0	2	1	100	-	100
CSE								
Prerequisite	Programming Languages, Databases							

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

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.

Lecture Periods: 0	Tutorial Periods: 0	Practical Periods: 30	Total Periods: 30

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	3	-	1	1	1	1
2	3	3	3	2	2	2	2	2	3	3	3	1	2	2	2
3	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

9.D.3.81

2.D.3.82

Department	**Computer Science and Engineering**	Programme : **B. Tech**						
Semester	**VI**	Course Category Code: **AEC**			*End Semester Exam Type: -			
Course Code	**U23CSC6XX**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Certification Course –VI**	0	0	**4**	**-**	**100**	**-**	**100**
CSE								
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

2. A. 3. 84

Department	**Computer Science and Engineering**	Programme: **B. Tech.**						
Semester	**VI**	Course Category: **MC**			End Semester Exam Type: -			
Course Code	**U23CSM606**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CA M	ESE	TM
Course Name	**GENDER EQUALITY**	**2**	**0**	**0**	**-**	**100**	**-**	**100**
CSE								
Prerequisite	-							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Describe the general identity, social construction of gender roles.	**K2**
	CO2 Illustrate the causes and issues of gender discrimination in Indian society.	**K2**
	CO3 Describe the workplace discrimination, media influences on gender and culture.	**K2**
	CO4 Familiarize with international and Indian frameworks on gender equality.	**K2**
	CO5 Illustrate the current challenges in gender equality, including the glass ceiling and the role of technology.	**K2**

UNIT – I	**Introduction to Gender Equality**	**Periods:06**
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.		**CO1**
UNIT – II	**Gender Inequality and Its Manifestations**	**Periods:06**
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.		**CO2**
UNIT – III	**Gender and Culture**	**Periods:06**
Workplace discrimination, Media influences on gender and culture, Gender and power dynamics in society. Strategies for promoting gender equality and cultural understanding.		**CO3**
UNIT – IV	**Promoting Gender Equality**	**Periods:06**
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.		**CO4**
UNIT – V	**Contemporary Challenges and Future Directions**	**Periods:06**
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.		**CO5**

Lecture Periods: 30	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods: 30**

Text Books

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.

Reference Books

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).

Web References

1. https://www.unwomen.org
2. https://ncw.nic.in
3. https://en.unesco.org/themes/gender-equality
4. https://www.weforum.org/reports
5. https://wcd.nic.in

2.A.3.85

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

2.A.3.86

PROFESSIONAL ELECTIVE COURSES

2.D.3.87

2.A.3.88

Department	Computer Science and Engineering	Programme: B.Tech						
Semester	VI	Course Category: PE			End Semester Exam Type: TE			
Course Code	U23CSE610	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	HASKELL PROGRAMMING	3	0	0	3	25	75	100
CSE								
Prerequisite	Basic knowledge in Programming							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the fundamental concepts of functional programming.	K2
CO2	Utilize the process lists using higher-order functions and folding techniques in Haskell.	K3
CO3	Develop the required data types and construct the features of the Haskell.	K3
CO4	Examine the fragmenting and wrapping using Monads	K4
CO5	Apply the reasoning and proofs on programs in functional programming.	K3

UNIT - I	Introduction To Haskell	Periods:09
Introduction to Haskell program – Compilers and Interpreters –. Functional Programming – Expressions and Values, Evaluations, Functions. Basic concepts – Basic datatypes - List types - Tuples types – Polymorphic types – Overloaded types – Operators – Decision Making – String – string concatenation. Type classes: Eq, Ord, Enum, Show, Read, functor. Program: Reads multiple lines of input from the user and concatenates them into a single string – Generate student mark list using basic operators.		CO1

UNIT - II	List and folding Lists	Periods:09
Lists – Pattern matching on lists – Lambda Expressions – Using ranges to construct lists – Extracting portions of lists – List comprehensions – Guards – Transforming lists – Filtering lists – Zipping lists. Folding lists: Folds – Recursive patterns – Fold right – Fold left - How to write fold functions – Scans – Combinatorial functions. Program: Sum and Average of a List - List Operations Using Folding.		CO2

UNIT - III	Tuple, Arrays and Recursive Functions	Periods:09
Tuple – Types – map (), where (), filter () functions. Arrays – Creating arrays – Extracting and updating values – Recovering information from an array – Matrix multiplication. Recursive on lists, Multiple arguments and recursion, Mutual recursion. Program: Sorting an Array – Perform Binary Search using recursive functions-Tuple Operations.		CO3

UNIT - IV	Monads	Periods:09
Functors – Applicative – Monads. Monadic parsing: Parsers as functions - Sequencing parsers – common Monads: Maybe, either, IO. Monad operations: return, >>=, >>, do notation. Program: Building a Simple REPL.		CO4

UNIT - V	Input/output and File concept	Periods:09
Input/Output: IO operations – Actions – Composing actions – Sequencing actions – Promoting values to actions: return – Composing actions recursively – Exception handling – File handling: Reading and writing files. Program: create a file and perform a basic file operation.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. Chris Allen, Julie Moronuki, "Haskell Programming from First Principles", 2nd Edition, Gumroad, 2017.
2. Graham Hutton, "Programming in Haskell",2nd Edition, Cambridge University Press, 2016.
3. Bird, Richard, "Thinking Functionally with Haskell", 1st Edition, Cambridge University Press, 2015.

Reference Books

1. Rebecca Skinner, "Effective Haskell: Solving Real-World Problems with Strongly Typed Functional Programming", 1st edition, Pragmatic Bookshelf, 2023.
2. Will Kurt, "Get Programming with Haskell", 1st Edition, Manning Publications, 2018.
3. Miran Lipovaca, "Learn You a Haskell for Great Good! A Beginner's Guide", 1st Edition, No Starch Press, 2011.
4. Bryan O'Sullivan, Don Stewart, and John Goerzen, "Real World Haskell", 1st Edition, O'Reilly Media, 2008.
5. Simon Thompson, "Haskell: The Craft of Functional Programming", 2nd Edition, Addison Wesley, 1999.

Web References

1. https://www.tutorialspoint.com/haskell/index.htm
2. https://onlinecourses.nptel.ac.in/noc19_cs80/preview
3. https://www.geeksforgeeks.org/what-is-haskell-programming-language/
4. https://www.futurelearn.com/courses/functional-programming-haskell
5. https://www.cmi.ac.in/~spsuresh/teaching/prgh15/

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

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

2.A.3.90

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VI**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE611**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**GAME DESIGN AND DEVELOPMENT**	**3**	**0**	**0**	**3**	25	75	100
	CSE							
Prerequisite	Basic knowledge in Programming							

Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the Basic concepts of Mechanics and Prototyping Techniques.	**K2**
	CO2	Build the Game World.	**K3**
	CO3	Examine the systems and Feedback for game.	**K4**
	CO4	Develop the characters and Game world incorporated with unity.	**K3**
	CO5	Simplify the Iteration in Game Development.	**K4**

UNIT - I	**Core Mechanics and Prototyping Techniques**	**Periods:09**
Designing Core Mechanics - Designing Playtests - Collecting Feedback - Evaluating Prototype Performance.		**CO1**
UNIT - II	**Narrative and Game Worlds**	**Periods:09**
Crafting Engaging Stories - Aligning Story and Gameplay - Creating Game Worlds - Character Archetypes - Using Environment to Convey Story.		**CO2**
UNIT - III	**Systems and Feedback**	**Periods:09**
System Design Principles - Types of Feedback Loops - Collecting Player Feedback - Understanding Dynamic Systems - System Tuning and Balancing.		**CO3**
UNIT - IV	**Game Worlds and characters with Unity**	**Periods:09**
Worldbuilding - Designing Memorable Characters - Crafting Game Environments - Player Interaction with World - Character Evolution- Unity – Unity Models – Unity used in real-time.		**CO4**
UNIT - V	**Iteration and Evaluation**	**Periods:09**
Iterative Design Process - Creating Effective Playtests - Methods for Analyzing Feedback - Techniques for Refining Gameplay - Evaluation Criteria.		**CO5**

Lecture Periods:45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods:45**

Text Books

1. Ernest Adams, Andrew Rollings, "Fundamentals of Game Design", 3rd Edition, Addison-Wesley, 2024
2. Katie Salen, Eric Zimmerman, "Rules of Play: Game Design Fundamentals", 3rd Edition, Mit Pr, 2023.
3. Tracy Fullerton, "Game Design Workshop: A Playcentric Approach to Creating Innovative Games", 2nd Edition, CRC Press, 2023.
4. David M. Perry, Michael J. Perry, "Game Design and Development: An Introduction", 3rd Edition, Addison-Wesley, 2023.
5.. Richard Rouse, "Game Design: Theory and Practice", 2nd Edition, CRC Press, 2022.

Reference Books

1. Steve Rabin, "Game Programming Gems", 3rd Edition, CRC Press, 2024.
2. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, CRC Press, 2023.
3. Michael E. Moore, "The Art of Game Design: A Book of Lenses", 2nd Edition, CRC Press, 2023.
4. Brian Schrank, "Designing Games: A Guide to Engineering Experiences", 1st Edition, MIT Press, 2023.
5. Jason Gregory, "Game Engine Architecture", 3rd Edition, CRC Press, 2018.

2.A.3.91

Web References

1. https://learn.unity.com/tutorials
2. https://dev.epicgames.com/documentation/en-us/unreal-engine/unreal-engine-5-4-documentation
3. https://www.gamedev.net/
4. https://www.codecademy.com/catalog/subject/game-development
5. https://www.geeksforgeeks.org/how-to-get-started-with-game-development/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	-	-	-	-	-	-	-	-	-	2	-	-
2	2	2	2	-	-	-	-	-	-	-	-	-	2	-	-
3	2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
4	2	3	3	-	-	-	-	-	-	-	-	-	2	-	-
5	2	3	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	5	5	5	5	5	75	100

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

2-A.3.92

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VI**	Course Category: **PE**				End Semester Exam Type: **TE**		
Course Code	**U23CSE612**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**NOSQL DATABASE**	3	0	0	3	25	75	100
		CSE						
Prerequisite	Basic Knowledge in Database							

Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand the detailed Architecture, Database properties and Storage Requirements.	**K2**
	CO2	Identify right Database models for Real-time Applications.	**K3**
	CO3	Build the connectivity with NOSQL Data Stores.	**K3**
	CO4	Examine the Non-Relational Databases.	**K4**
	CO5	Make use of the Indexing on MongoDB & Usage of Indexes in MongoDB	**K3**

UNIT - I	**Introduction to NoSQL**	**Periods:09**	
Data base revolutions: First generation, second generation, third generation, Managing Transactions and Data Integrity, ACID and BASE for reliable database transactions, speeding Performance by strategic use of RAM, SSD, and disk- achieving horizontal scalability with Database sharing, Brewers CAP theorem.			**CO1**
UNIT - II	**NoSQL Data Architecture Patterns**	**Periods:09**	
NoSQL Data model: Aggregate Models- Document Data Model- Key-Value Data Model Columnar Data Model, Graph Based Data Model Graph Data Model, NoSQL system ways to handle big data problems, Moving Queries to data, not data to the query, hash rings to distribute the data on clusters, replication to scale reads, Database distributed queries to Data nodes.			**CO2**
UNIT - III	**Interacting with NoSQL Data Stores**	**Periods:09**	
Essential features of key value Databases, Properties of keys, Characteristics of Values, Key-Value Database Data Modeling Terms, Key-Value Database. Document, Collection, Naming, CRUD operation, Creating Records, Accessing Data, Updating and Deleting Data -querying, indexing, Replication, Sharing.			**CO3**
UNIT - IV	**NoSQL Storage Architecture**	**Periods:09**	
Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores in Memcached and Redis, Eventually Consistent Non-Relational Databases.			**CO4**
UNIT - V	**Indexing and Ordering Data Sets**	**Periods:09**	
Indexing and Ordering Data Sets: Essential Concepts Behind a Database Index, Indexing and Ordering in Mongodb, Creating and Using Indexes in Mongodb, Indexing and Ordering in Couchdb, Indexing in Apache Cassandra.			**CO5**

Lecture Periods:45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods:45**

Text Books

1. Andreas Meier and Michael Kaufmann, "SQL and NoSQL Databases: Modeling, Languages, Security and Architectures for Big Data Management", 2nd Edition, Springer, 2023.
2. Dan Sullivan Sullivan, "NoSQL for Mere Mortals", 1st Edition, Addison-Wesley, 2015.
3. Daniel Abadi, Peter Boncz and Stavros Harizopoulas, "The Design and Implementation of Modern Column-Oriented Database Systems", 1st Edition, Now Publishers, 2013.
4. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schtze, "An introduction to Information Retrieval", 1st Edition, Cambridge University Press, 2008.

Reference Books

1. Sadalage P & Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", 1st Edition, Wiley Publications,2019.
2. Andreas Meier, Michael Kaufmann, "SQL & Nosql Databases",1st Edition, Repro Books, 2019.
3. Perkins, Eric Redmond, Jim Wilson, "Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement", 2nd Edition, Pragmatic Bookshelf, 2018.
4. Guy Harrison, "Next Generation Database: NoSQL and big data", 1st Edition, Apress, 2015.
5. Elmasri and Navathe, "Fundamentals of Database Systems", 1st Edition, Pearson Education 2013.

Web References

1. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
2. https://www.geeksforgeeks.org/introduction-to-nosql/
3. https://www.javatpoint.com/nosql-databa
4. https://intellipaat.com/nosql-cassandra-hbase-training/
5. https://www.udemy.com/nosql/online-course

* TE – Theory Exam, LE – Lab Exam

2.A.3.93

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	-	-	-	-	-	-	-	-	-	2	-	-
2	2	2	3	-	-	-	-	-	-	-	-	-	2	-	-
3	2	3	3	-	-	-	-	-	-	-	-	-	2	-	-
4	2	2	2	-	-	-	-	-	-	-	-	-	2	-	-
5	2	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	5	5	5	5	5	75	100

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

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Department	Computer Science and Engineering	Programme: B.Tech					
Semester	VI	Course Category: PE			End Semester Exam Type: TE		
Course Code	U23CSE613	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	IOT CHALLENGES AND FUTURE	3	0	0	3	25	75	100
		CSE						
Prerequisite	-							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Illustrate and understand the fundamentals of IoT Architecture and layer	K2
CO2	Experiment about data processing and analytics	K3
CO3	Examine the IoT Privacy and Security Systems	K4
CO4	Understand the working Principle of IIoT	K2
CO5	Build a Real Time Applications	K3

UNIT - I	Introduction to IOT	Periods:09	
Introduction - Definitions & Characteristics of IoT- IoT Architectures, Physical& Logical Design of IoT- Enabling Technologies in IoT- History of IoT- About Things in IoT- The Identifiers in IoT- About the Internet in IoT- IoT frameworks- IoT and M2M.			CO1
UNIT - II	**Data Acquiring, Organizing, Processing and Analytics**	**Periods:09**	
Data Acquiring and storage - Organizing the Data - Transactions – Business processes – Integration and Enterprise Systems - Analytics –Knowledge Acquiring, Managing and Storing Processes- Knowledge Management Reference Architecture.			CO2
UNIT - III	**IOT Privacy, Security and Vulnerabilities Solutions**	**Periods:09**	
Introduction-Vulnerabilities – Security Requirements and Threat analysis –use case and misuse cases – IoT security Tomography – Layered Attacker Model- Identity Management and Establishment – Access control – Secure Message Communication – Security Models and Protocols for IoT.			CO3
UNIT - IV	**Industrial IOT**	**Periods:09**	
IIoT: Introduction- Business Model and Reference Architecture - Layers -IIoT Sensing - IIoT Processing - IIoT Communication- IIoT Networking-Wireless Medium Access issues-MAC protocol Survey-Survey Routing Protocols.			CO4
UNIT - V	**Applications of IOT**	**Periods:09**	
Home Automation- Smart Cities- Energy- Smart Water-Retail Management- Logistics-Agriculture- Health and Lifestyle- Industrial IoT- Legal challenges- IoT design Ethics- IoT in Environmental Protection-Case studies with architectural analysis of IoT Applications.			CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. D. Hanes, G. Salgueiro, P. Grossetete, R. Barton, J. Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson India Pvt. Ltd., 2018.
2. Raj Kamal, "INTERNET OF THINGS (IOT): Architecture and Design Principles", 2nd Edition, McGraw Hill Education (India) Private Limited,2017.
3. Alasdair Gilchrist," Industry 4.0: The Industrial Internet of Things", 1st Edition, Apress,2017.
4. Arshdeep Bahga, Vijay Madisetti Universities, "Internet of Things-A Hands-on Approach", 1st Edition, Orient Blackswan Private Ltd., 2015.
5.HakimaChaouchi, "The Internet of Things Connecting Objects to the Web", 1st Edition, Wiley Publications,2010.

Reference Books

1. Y. Kanetkar, S. Korde, "21 Internet of Things (IOT) Experiments: Learn IoT, the programmer's way", 1st Edition, BPB Publications, 2018.
2. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B.Rawat, "Industrial Internet of Things : Cyber Manufacturing Systems", 1st Edition, Springer, 2017.
3. Peter Waher, "Learning Internet of Things", 1st Edition, Packt Publishing, 2015.
4. Giacomo Veneri, Antonio Capasso, "Hands-on Industrial Internet of Things: Create a powerful Industrial IoT", 1st Edition, Packt, 2018.
5. Adrian McEwen, "Designing the Internet of Things", 1st Edition, Wiley,2013.

Web References

1. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
2. https://www.tutorialspoint.com/internet_of_things/index.htm
3. https://www.javatpoint.com/iot-internet-of-things
4. https://www.digi.com/blog/category/iot-trends
5. https://archive.nptel.ac.in/courses/106/105/106105166/

* TE – Theory Exam, LE – Lab Exam

2.A.3.25

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	-	
2	2	2	3	-	-	-	-	-	-	-	-	-	2	-	-
3	2	2	3	2	-	-	-	-	-	-	-	-	2	-	-
4	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
5	2	3	3	-	-	-	-	-	-	-	-	-	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	5	5	5	5	5	75	100

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

2.A.3.96

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**VI**	Course Category: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23CSE614**	Periods/Week			Credit	Maximum Marks		
Course Name	**SERVER-SIDE SCRIPTING LANGUAGES**	**L**	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
	CSE	3	0	0	3	25	75	100
Prerequisite	A basic understanding of Client-Server Architecture & what a web server is.							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the basics of scripting languages.	K2
	CO2 Experiment about scripting with respective to reactive web Pages	K3
	CO3 Develop the basic functionality using Pearl scripting.	K3
	CO4 Rephrase the basic functionality using Ruby scripting.	K2
	CO5 Inference the in-depth knowledge of programming features of Angular JS	K4

UNIT - I	**Introduction to scripts and scripting languages** **Periods:09**	
Introduction to Scripts and Scripting Languages – Scripts and Programs, Uses for Scripting Languages, Web Scripting. JavaScript: Variables, Data Types, Operators, Conditional statements, Loops, Arrays, Functions, Objects- Predefined objects, Accessing objects, Object Methods.		**CO1**
UNIT - II	**JavaScript for reactive web pages elements** **Periods:09**	
JavaScript programming of reactive web pages elements: JavaScript Events- Mouse events, Keyboard events, Form events, window events, Event handlers, Frames, Form object, JavaScript Form Validation		**CO2**
UNIT - III	**PEARL** **Periods:09**	
Data Types, Variables, Scalars, Operators, Conditional statements, Loops, Arrays, Strings, Hashes, Lists, Built-in Functions, Pattern matching and regular expression operators.		**CO3**
UNIT - IV	**RUBY** **Periods:09**	
Data types, Variables, Operators, Conditional statements, Loops, Methods, Blocks, Modules, Arrays, Strings, Hashes, File I/O, Ruby Form handling.		**CO4**
UNIT - V	**AngularJS** **Periods:09**	
AngularJS Development Environment, Expressions in AngularJS, AngularJS Directives, Data Binding, AngularJS Model Modes, One Way Binding, Two Way Binding, AngularJS Controller, AngularJS Scope, AngularJS Filters, AngularJS Forms.		**CO5**

Lecture Periods:45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods:45**

Text Books

1. David Flanagan, "JavaScript: The Definitive Guide: Master the World's Most-Used Programming Language", 7th Edition, O'Reilly Publications, 2020.
2. O'Reilly, "Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites", 3rd Edition, O'Reilly Publications, 2014.
3. Tom Christiansen, Brian D Foy, Larry Wall, Jon Orwant," Programming Perl", 4th Edition, O'Reilly Media,2012.
4. David Barron, "The World of Scripting Languages", 1st Edition, Wiley Publications, 2009.

Reference Books

1. Russ Ferguson, Christian Heilmann, "Beginning JavaScript with Dom scripting and AJAX", 2nd Edition, Apress,2013.
2. David Flanagan and Yukihiro Matsumoto, "The Ruby Programming Language", 1st Edition, O'Reilly Publications,2008.
3. J. Lee, B. Ware, "OpenSource Web Development with LAMP using Linux Apache, MySQL, Perl and PHP", 1st Edition, Pearson Education, 2003.

Web References

1. https://www.ruby-lang.org/en/
2. https://www.geeksforgeeks.org/ruby-programming-language/
3. https://www.javatpoint.com/perl-tutorial
4. https://www.tutorialspoint.com/perl/index.htm
5. https://www.perl.org/learn.html
6. https://www.w3schools.com/angular/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

9.A.3.97

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	-	-
2	2	2	3	-	-	-	-	-	-	-	-	-	2	-	-
3	2	2	3	2	-	-	-	-	-	-	-	-	2	-	-
4	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
5	2	3	3	-	-	-	-	-	-	-	-	-	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	5	5	5	5	5	75	100

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

2.A.3.98

OPEN ELECTIVES

2.A.3.99

2.A.3.100

Department	Management Studies	Programme : B.Tech						
Semester	V/VI	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	INTELLECTUAL PROPERTY RIGHTS	3	0	0	3	25	75	100

Common to ALL Branches

Prerequisite	Nil	
Course Outcomes	*On completion of the course, the students will be able to*	BT Mapping (Highest Level)
	CO1 Describe the Concept and Importance of Intellectual Property Rights (IPR).	K2
	CO2 Describe the procedures for patent registration, including recognizing legal remedies for infringement.	K3
	CO3 Apply copyright laws to hypothetical scenarios involving academic integrity and plagiarism.	K3
	CO4 Infer the different types of trademarks and understand the registration process and infringement issues.	K4
	CO5 Explain the legalities surrounding industrial designs, geographical indications, and their protection mechanisms.	K2

UNIT-I	Overview of Intellectual Property	Periods: 9
Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Trade Secret – International protection of IPR- Major International conventions and agreements: WTO/TRIPS Agreement, Paris Convention, The Berne Convention, Universal Copyright Convention, WIPO Convention, Madrid Agreement, Nice Agreement and TRIPS Agreement		CO1
UNIT-II	**Law of Patents**	**Periods: 9**
Meaning and Nature of Patent - Subject matter of Patent - Registration Procedure, Patentable and Non-patentable Inventions - Process and product Patent, Legal Requirements for Patents – Patent document: Specification and Claims - Granting of Patents - Transfer of Patent rights - Infringement of Patents and Remedies - Evergreening of Patents		CO2
UNIT-III	**Law of Copyrights**	**Periods: 9**
Meaning and Nature of Copyright - Subject matter of copyright - Law of Copyrights - Authorship and Ownership of copyright, Registration Procedure, Assignment and Licensing of copyright - Infringement of Copyrights and Remedies - Emerging new trends in Copyrights - Related Rights: Celebrity Rights, Academic Integrity or Plagiarism: An Intellectual Theft - Copyrights with special reference to software.		CO3
UNIT-IV	**Law of Trademarks**	**Periods: 9**
Meaning and Nature of Trademarks - Different kinds of Trademarks - Registrable and Non-Registrable Trademarks - Registration of Trademarks - Grounds for refusal of Registration: Absolute Ground and Relative Ground - Assignment and Licensing of trademarks - Infringement, Remedies and Penalties - Offenses relating to Trademarks - Passing off action – Deceptive similarity - Defenses - Emerging New trends in trademarks		CO4
UNIT-V	**Other Forms of IPR**	**Periods: 9**
Meaning and nature of Industrial Design - Subject Matter - Procedure for registration - Infringement of Copyrights in designs - Remedies for Infringement - Trade secret Law-Determination of Trade Secret Status - Liability for misappropriations of Trade Secrets- Protection for submission-Trade Secret litigation - Meaning and Nature of Geographical Indication (GI) - Procedure for registration - Infringement of Geographical indication - Remedies for Infringement.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods: 45

Text Books

1. Nithyananda, K. V. Intellectual Property Rights: Protection and Management, 2nd edition, Cengage Learning India Private Limited, 2019.
2. Neeraj, P., and Khusdeep, D. Intellectual Property Rights, 2nd edition, PHI Learning Private Limited, 2018.

Reference Books

1. Ahuja, V. K. Law Relating to Intellectual Property Rights, 2nd edition, Lexis Nexis, 2017.
2. Bouchoux, Deborah E. Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, 4th edition., Cengage Learning, 2013.
3. Ganguli P. Intellectual Property Rights: Unleashing the Knowledge Economy. Tata McGraw-Hill Publishing Company; 2022.
4. Jyoti Rattan. Intellectual Property Rights, 2nd edition, Bharat Law House, 2024.

5. Surendra Malik and Sudeep Malik, Supreme Court on Intellectual Property, Eastern Book Company, 2022.

Web References

1. https://www.wipo.int/about-ip/en/
2. https://www.uspto.gov/patents/basics/general-information-patents
3. https://www.wto.org/english/tratop_e/trips_e/trips_e.htm
4. https://www.epo.org/about-us/annual-reports-statistics/annual-report.html
5. https://articles.manupatra.com/article-details/Patent-Types-Laws-related-to-them-in-India
6. https://www.inta.org/trademarks/trademark-basics/.

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	3	2	2	-	2	1	2	1	2	2
CO2	1	2	-	2	-	3	2	2	-	2	1	1	1	1	2
CO3	-	2	-	-	-	2	2	3	-	2	-	1	-	1	3
CO4	1	1	-	-	-	3	2	2	-	2	1	1	1	1	2
CO5	1	2	-	-	-	3	3	2	-	2	1	1	1	1	2

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

Evaluation Methods

Assessment	Internal Assessment Marks (IAM)					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

2.D.3.102

Department	Management Studies	Programme: B. Tech						
Semester	V/VI	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC02	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	NEW PRODUCT DEVELOPMENT	3	0	0	3	25	75	100
Common to ALL Branches								
Prerequisite								

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Explain the stages and importance of new product development (NPD) in modern business contexts.	K2
	CO2	Apply market research to identify customer needs and translate them into product specifications.	K3
	CO3	Illustrate the product concepts using screening and scoring techniques to select the most viable option.	K3
	CO4	Examine product prototype that incorporates principles of product architecture and design for manufacturing.	K3
	CO5	Analyze a business plan and market strategy for the successful launch of a new product.	K4

UNIT-I	Introduction to New Product Development	Periods: 9
Introduction to New Product Development (NPD) - Product Development vs New Product Development - Stages of NPD - Role of Innovation and Creativity in NPD - Reverse Engineering and its Application in NPD - Business Models for New Products - Risk Management in New Product Development - Sustainability and Ethical Considerations in NPD		CO1
UNIT-II	**Market Research and Customer Needs**	**Periods: 9**
Identifying Market Opportunities for New Products - Conducting Market Research for NPD - Translating Customer Needs into Product Specifications - Establishing and Refining Product Specifications - Competitive Analysis and Benchmarking in NPD - Tools for Understanding Consumer Behaviour: Surveys, Focus Groups, and Ethnography		CO2
UNIT-III	**Concept Generation and Evaluation**	**Periods: 9**
Concept Generation Process: Continuous and External Idea Sources - Clarifying the Problem and Brainstorming Solutions - Design Thinking for New Products - Techniques for Concept Generation - Systematic Exploration of Concepts - Screening and Scoring Product Concepts - Concept Evaluation and Selection Methods - Prototyping Techniques		CO3
UNIT-IV	**Product Design and Development**	**Periods: 9**
Product Architecture and its role in NPD - Modular vs. Integral Product Architecture - Design for Sustainability - Environmental Considerations - Organizing Product Development Teams - Stages of team Development - Collaboration and Cross - Functional Teams in Product Development - Tools for Effective Product Design - Agile Product Development Methodologies		CO4
UNIT-V	**Launch, Strategy and Commercialization**	**Periods: 9**
Developing a New Product Strategy - Building Market Demand and Entry Strategies for New Products - Developing a New Product Business Plan - Preparing for Market Launch - Post - Launch Evaluation - Product Life Cycle - Continuous Improvement and Future Product Enhancements		CO5

Lecture Periods: 45	Tutorial Periods:	Practical Periods:	Total Periods: 45

Text Books

1. Ulrich KT, Eppinger SD. Product design and development. 7th edition. McGraw-Hill Education; 2020.
2. Crawford CM, Di Benedetto A. New products management. 11th edition. McGraw-Hill Education; 2014.
3. Cooper RG. Winning at new products: Creating value through innovation. 5th edition. Basic Books; 2017.

Reference Books

1. Trott, P. Innovation management and new product development 6th edition. Pearson Education. 2017
2. Thomke, S. Experimentation works: The surprising power of business experiments. Harvard Business Review Press. 2020
3. Blank, S. G., & Dorf, B. The startup owner's manual: The step-by-step guide for building a great company. Wiley. 2020
4. Brown, T. Change by design: How design thinking transforms organizations and inspires innovation. Harper Business. 2009
5. Kelley, T., & Littman, J. The ten faces of innovation: IDEO's strategies for beating the devil's advocate and driving creativity throughout your organization. Currency/Doubleday. 2006

Web References
1. https://conjointly.com/kb/
2. https://www.entrepreneur.com/article/281999
3. https://www.mindtools.com/pages/article/newSTR_66.htm
4. https://www.interaction-design.org/literature/article/design-thinking-getting-started-with-empathy
5. https://www.productplan.com/glossary/product-architecture/
6. https://hbr.org/2019/09/why-design-thinking-works
7. https://www.smartsheet.com/new-product-development.
8. https://www.ptc.com/en/blogs/cad/best-practices-for-developing-new-products

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

-

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Program Specific Outcomes (PSOs)		
													PSO1	PSO2	PSO3
CO1	3	-	3	-	3	1	1	-	-	1	-	2	3	-	3
CO2	1	-	2	1	3	-	-	1	-	1	-	3	2	1	3
CO3	1	1	3	-	2	-	1	-	2	-	1	2	3	-	2
CO4	3	-	1	1	3	1	-	1	2	-	1	1	1	1	3
CO5	1	-	3	-	3	-	-	-	2	-	1	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

2·A·3·104

Department	Management Studies	Programme : B.Tech						
Semester	V/VI	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC03	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	FINANCE FOR ENGINEERS	3	0	0	3	25	75	100

Common to ALL Branches

Prerequisite	Nil	
Course Outcomes	*On completion of the course, the students will be able to*	BT Mapping (Highest Level)
	CO1 Explain the objectives, scope, and role of financial management in engineering, and differentiate between profit maximization and wealth maximization.	K2
	CO2 Apply the concepts of the time value of money to engineering projects and use investment appraisal techniques such as NPV, IRR, and Payback Period for decision-making.	K3
	CO3 Demonstrate the steps in the capital budgeting process and apply techniques like cost-benefit and sensitivity analysis for evaluating engineering projects.	K3
	CO4 Analyze financial statements, including balance sheets and income statements, from an engineering perspective, and evaluate financial ratios to assess the financial performance of engineering projects.	K4
	CO5 Analyze different types of costs, such as fixed, variable, and marginal costs, and evaluate cost-benefit analysis and break-even analysis for engineering decision-making.	K4

UNIT-I-	Introduction to Financial Management	Periods: 9
Overview of Financial Management: Objectives, Scope, and Role in Engineering - Financial Planning and Strategy: Short-Term and Long-Term Planning - Basic Concepts: Profit Maximization vs Wealth Maximization - Role of Engineering Managers in Financial Decision - Making, Relationship between Finance and Other Engineering Disciplines.		CO1
UNIT-II	**Time Value of Money and Investment Decisions**	**Periods: 9**
Time Value of Money: Concept, Importance and Applications in Engineering Project, Present Value and Future Value Calculations - Investment Appraisal Techniques: Payback Period, Net Present Value (NPV), Internal Rate of Return (IRR) (Theory only) and Profitability Index (PI) - Risk Analysis in Investment Decision Making.		CO2
UNIT-III	**Capital Budgeting for Engineering Projects**	**Periods: 9**
Capital Budgeting Process: Steps and Key considerations, Techniques for Evaluating Engineering Project, Cash-Flow Estimation for Project, Cost - Benefit Analysis in Engineering Project, Sensitivity Analysis, and Decision Trees for Project Evaluation.		CO3
UNIT-IV	**Financial Statements and Ratio Analysis**	**Periods: 9**
Introduction to Financial Statements: Balance Sheet, Income Statement, and an Engineering Perspective on Financial Statement Interpretation - Financial Ratios: Liquidity, Profitability - Engineering Case Studies on Financial Performance Evaluation - Limitations of Ratio Analysis in Engineering Projects.		CO4
UNIT-V	**Cost Estimation and Engineering Economic Analysis**	**Periods: 9**
Introduction to Cost Estimation in Engineering - Types of Costs: Fixed, Variable, Marginal, and Sunk Costs, Cost-Benefit Analysis in Engineering Projects, Break-Even Analysis and Its Application in Engineering Decision Making - Engineering Economic Analysis: Replacement Analysis.		CO5

Lecture Periods: 45	Tutorial Periods: 0	Practical Periods: 0	Total Periods: 45

Text Books

1. Sullivan WG, Wicks EM, Koelling CP. Engineering Economy. 17th edition. Pearson; 2020.
2. Brealey RA, Myers SC, Allen F. Principles of Corporate Finance. 19th edition. McGraw-Hill Education; 2022.
3. Brigham EF, Houston JF. Fundamentals of Financial Management. 15th edition. Cengage Learning; 2019.

Reference Books

1. Ranganath BJ, Sinha KK. Financial Management for Engineers. 4th edition. Vikas Publishing House; 2018.
2. Crundwell F. Finance for Engineers: Evaluation and Funding of Capital Projects. Springer; 2017.

Web References

1. https://www.netsuite.com/portal/resource/articles/financial-management/financial-management.shtml
2. https://www.investopedia.com/ask/answers/033015/why-time-value-money-tvm-important-concept-investors.asp

2.A.3.105

3.	https://omnicard.in/blogs/capital-budgeting-24042024
4.	https://www.linkedin.com/pulse/role-capital-budgeting-process-engineering-studies-ashraf
5.	https://corporatefinanceinstitute.com/resources/accounting/financial-ratios/
6.	https://www.dau.edu/acquipedia-article/engineering-cost-estimation-method

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Program Specific Outcomes (PSOs)		
													PSO1	PSO2	PSO3
CO1	1	2	-	-	-	1	1	1	-	2	1	1	1	1	2
CO2	1	2	1	-	1	2	1	2	-	3	1	-	1	2	3
CO3	-	3	3	-	1	3	1	2	-	3	1	1	1	2	3
CO4	1	2	-	2	1	1	2	1	1	2	1	-	2	1	2
CO5	-	3	-	-	2	3	2	2	1	2	2	3	2	2	2

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

Evaluation Methods

Assessment	Internal Assessment Marks (IAM)					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

2.A.3.106

Department	Management Studies			Programme: B. Tech				
Semester	V/VI			Course Category Code: OE			*End Semester Exam Type: TE	
Course Code	U23HSOC04			Periods/Week			Credit	Maximum Marks
				L	T	P	C	CAM	ESE	TM
Course Name	ECONOMICS FOR ENGINEERS			3	0	0	3	25	75	100
Common to ALL Branches										
Prerequisite	Basics of Economics									
Course Outcomes	*On completion of the course, the students will be able to*							BT Mapping (Highest Level)		
	CO1	Interpret principles of managerial economics to real-world scenarios, utilizing demand analysis and forecasting techniques.						K2		
	CO2	Discuss production functions and cost structures to evaluate their impact on managerial decision-making and market strategies.						K2		
	CO3	Examine various market structures and pricing strategies, synthesizing their effects on market behavior and competitive dynamics.						K3		
	CO4	Apply macroeconomic policies and their implications on business cycles, investment decisions, and economic stability.						K3		
	CO5	Analyze recent economic trends, such as technological advancements and income inequality.						K4		
UNIT-I	Introduction to Managerial Economics						Periods: 9			
Managerial Economics: Meaning, Scope, and Importance - Functions of a Managerial Economist - Demand Analysis: Law of Demand, Elasticity of Demand, Law of Supply, Elasticity of supply and Market Equilibrium - Comparative statistics: Shift of a curve and movement along with the curve - Demand Forecasting: Criteria for Effective Forecasting - Qualitative Methods - Quantitative Methods.								CO1		
UNIT-II	Production Function and Cost Concepts						Periods: 9			
Production Function: Meaning, Types, Applications in Managerial Decision Making - Law of variable proportion and law of returns to scale - ISO Quants - Producer Surplus: Price ceiling and price floor - Cost concept: Types of Costs - Total, average and marginal cost - Revenue Concepts: Total Revenue (TR) - Marginal Revenue (MR) and Average Revenue (AR).								CO2		
UNIT-III	Market Structure						Periods: 9			
Market structure: Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly and Duopoly - Pricing policies: Cost-Based Pricing, Demand - Based Pricing, Competition - Based Pricing, Psychological Pricing, Geographical Pricing, Dynamic Pricing, Bundle Pricing, Price Discrimination, Premium Pricing and practices.								CO3		
UNIT-IV	Macroeconomics						Periods: 9			
Globalization and Economic Policies - National Income Concepts: Methods of measuring national income - circular flow of income - Monetary policy and Fiscal Policy - Business Cycles concepts - Inflation, deflation and its types - Foreign Direct Investment (FDI) - Foreign Institutional Investment (FII).								CO4		
UNIT-V	Recent Trends in Economics						Periods: 9			
Digital Economy : E-commerce, Fintech, and Online Services - Role of Technology : Big Data, Artificial Intelligence and Automation in Economic Decision-Making - Gig Economy : Growth of Freelance and Contract Work - Impact on Global Economies - Income In - equality : Causes, Effects, and Socio - political Impact								CO5		
Lecture Periods: 45		Tutorial Periods:		Practical Periods:			Total Periods: 45			

Text Books

1. Samuelson, William F., and Marks, Stephen G. Managerial Economics: Theory, Applications, and Cases, 10th edition, Wiley, 2020.
2. Ahuja, H. L. Principles of Managerial Economics, 7th edition, Tata McGraw-Hill, 2017
3. Mithani, D. M. Managerial Economics, 3rd edition., Himalaya Publishing House,2021.

Reference Books

1. Varian, Hal R. Intermediate Microeconomics: A Modern Approach, 9th edition., W.W. Norton & Company, 2014.
2. Brickley, James A., Smith Jr., Clifford W., and Zimmerman, Jerold L. Managerial Economics and Organizational Architecture, 7th edition., McGraw-Hill Education, 2016.
3. Samuelson, Paul, and Nordhaus, William. Economics, 20th edition., McGraw-Hill Education, 2019.
4. Schiff, Peter, and Schotter, Andrew J. Introduction to Microeconomics, 3rd edition., Cengage Learning, 2012.

9.A.3.107

5. Moore, James C. Economic Theory and Operations Analysis, 2nd edition., Academic Press, 1970.

Web References

1. https://www.jaroeducation.com/blog/nature-and-types-of-managerial-economics/
2. https://psu.pb.unizin.org/introductiontomicroeconomics/chapter/chapter-6-costs-and-production/
3. https://corporatefinanceinstitute.com/resources/economics/market-structure.
4. https://www.britannica.com/money/macroeconomics
5. https://www2.deloitte.com/us/en/insights/economy/global-economic-outlook/weekly-update.html

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Program Specific Outcomes (PSOs)		
													PSO1	PSO2	PSO3
CO1	1	1	1	--	1	1	--	--	--	2	2	--	1	1	1
CO2	1	1	1	2	2	2	2	--	--	3	3	3	1	1	1
CO3	1	1	1	2	-	2	2	--	--	3	-	3	1	1	1
CO4	1	1	-	2	2	2	2	2	--	3	3	3	1	1	-
CO5	1	1	1	2	2	-	2	2	--	3	3	3	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

2.A.3.108

Department	Computer Science and Engineering	Programme: B. Tech						
Semester	Management Studies	Course Category Code: OE			*End Semester Exam Type: TE			
Course Code	U23HSOC05	Periods/Week			Credit	Maximum Marks		
Course Name	MARKETING MANAGEMENT	L	T	P	C	CAM	ESE	TM
		3	0	0	3	25	75	100

Common to ALL Branches

Prerequisite		
Course Outcomes	*On completion of the course, the students will be able to*	BT Mapping (Highest Level)
	CO1 Explain the importance of marketing and differentiate between marketing and selling.	K2
	CO2 Apply the consumer decision-making process and differentiate between industrial and consumer buying behavior.	K3
	CO3 Examine product life cycle management strategies and demonstrate the steps involved in new product development.	K3
	CO4 Illustrate the role of distribution channels and design an effective channel distribution strategy for both consumer and industrial goods.	K3
	CO5 Analyze emerging trends in marketing, including Customer Relationship Management and experiential marketing strategies.	K4

UNIT-I	Introduction to Marketing	Periods: 9	
Marketing - Importance of Marketing - Difference between Marketing and Selling - Marketing Environment: The Macro and Micro Environment factors, Importance of environment analysis – Strategic Marketing planning: Introduction, Need, Framework of Strategic planning process and Steps in strategic planning - Ethical and Social Responsibility of Marketing - 4 Ps of Marketing			CO1
UNIT-II	**Consumer Behaviour and Marketing Strategy**	**Periods: 9**	
Role of buyer - Types of Buying behavior - Factors influencing buying decisions - Consumer decision making process: Meaning and Steps in Consumer decision making Process – Organizational buying behaviour: Classification of organizational markets, Characteristics, Difference between Industrial and Consumer buying - Market Segmentation - Needs, Classification and Significance – Targeting, Positioning and Competitive Strategies.			CO2
UNIT-III	**Product and Pricing Mix**	**Periods: 9**	
Product classifications - Product Life cycle - Strategies for managing Product Life cycle – Categories of New product, Importance and Steps in New Product Development – Packaging: Need for packaging, Essential qualities of packaging, kinds of packaging and advantages of packaging – Labelling: Functions, Types of labelling, advantages and disadvantages of labelling – Pricing objectives – Pricing strategies			CO3
UNIT-IV	**Place and Promotion Mix**	**Periods: 9**	
Distribution Channel and Physical distribution: Meaning and Importance of distribution channel - Channel design decisions – Channels of distribution for consumer and industrial goods – Physical Distribution: Meaning, Objectives and components of physical distribution - Promotion: Objectives, Types of sales promotion: Consumer, Salesperson and Dealer sales promotion – Introduction to Integrated Marketing Communication			CO4
UNIT-V	**Trends in Marketing**	**Periods: 9**	
Emerging trends in Marketing - Customer Relationship Management: Definition, features, Types and importance - Experiential Marketing: Meaning, strategies and benefits - Mobile Marketing: Definition and types of mobile marketing - Digital Marketing: Meaning, types of digital marketing – Inbound marketing: Meaning, fundamentals and difference between inbound and outbound marketing - Marketing Analytics: Meaning, importance, metrices of marketing analytics – An overview of Sustainable Marketing			CO5
Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods:**	**Total Periods: 45**

Text Books

1. Keller, Philip and Kevin Lane Kotler "Marketing Management" 16th Edition, Pearson Education Limited, 2022.
2. V.S.Ramaswamy, S.Namakumari, 6th Edition, Sage Publications India Pvt Ltd, 2018

Reference Books
1. Prachi Gupta, Ashita Aggarwal, et al. "Marketing Management: Indian Cases" Pearson Education Limited, 2024
2. Arunkumar, Meenakshi.N, "Marketing Management" 3rd Edition, Vikas Publishing House, 2016
3. Rajan Saxena, "Marketing Management" 5th Edition, MacGraw Hill Publications, 2017
Web References
1. https://www.ama.org/
2. https://www.marketingprofs.com/
3. https://indianjournalofmarketing.com/
4. http://www.publishingindia.com/ijamm/
5. https://onlinecourses.swayam2.ac.in/imb20_mg36/preview

***TE-Theory Exam, LE-Lab Exam**

COs/POs/PSOs Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Program Specific Outcomes (PSOs)		
													PSO1	PSO2	PSO3
CO 1	1	2	-	-	-	2	1	1	-	2	1	1	2	2	2
CO 2	1	2	1	-	1	2	1	2	-	2	1	1	2	2	2
CO 3	1	2	3	-	1	2	1	2	-	2	1	1	2	2	2
CO 4	1	1	3	-	2	1	2	1	1	2	2	1	2	2	2
CO 5	1	3	2	2	2	3	2	2	1	2	2	3	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	5	5	5	5	5	75	100

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

2. A.3. 110

OPEN ELECTIVES

2. A. 3. III

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**V**	Course Category: **OE**				End Semester Exam Type: **TE**		
Course Code	**U23CSOC01**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**STRUCTURED QUERY LANGUAGE**	3	0	0	3	25	75	100

(Offered to ECE, EEE, ICE, MECH, CIVIL, BME and MECHTRONICS)

Prerequisite	Basic Computer Knowledge	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Develop the core concepts of SQL Queries.	**K3**
	CO2 Examine DDL and DML Commands.	**K4**
	CO3 Examine DCL, DQL and TCL.	**K4**
	CO4 Simplify Joins and Subqueries	**K4**
	CO5 Develop DCL and TCL commands.	**K3**

UNIT - I	**SQL Basics**	**Periods:09**	
Introduction to database – History- Installation - Syntax -Data Types - Select – Select distinct – Where – And – Or – Not – Constraints and its types.			**CO1**
UNIT - II	**DDL and DML**	**Periods:09**	
Data Definition Language (DDL): Create – Alter: Add – Modify – Rename –Truncate - Drop. **Data Manipulation Language (DML):** Insert – Types of Insertion Method - Update – Delete.			**CO2**
UNIT - III	**DQL, Order by and Group by**	**Periods:09**	
DQL: Select - Types of Selection – Aggregate Functions - Pattern Matching. **Order by:** asc – desc. Group by function.			**CO3**
UNIT - IV	**Joins, Subquery and Views**	**Periods:09**	
Joins : Inner Join – Outer Join. Subquery – Set Operations – Views.			**CO4**
UNIT - V	**DCL and TCL**	**Periods:09**	
DCL: Grant – Revoke, **TCL:** Commit – Rollback – Savepoint - Built-in Functions.			**CO5**

Lecture Periods:45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods:45**

Text Books

1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan," Database System Concepts", 7th Edition, McGraw-Hill Education,2020.
2. Markus Winand, "SQL Performance Explained",1st Edition, Markus Winand Publishing,2012.
3. James R. Groff and Paul N. Weinberg, "SQL: The Complete Reference",3rd Edition, McGraw-Hill Education,2010.

Reference Books

1. Anthony DeBarros, "Practical SQL: A Beginner's Guide to Storytelling with Data", 2nd Edition, No Starch Press,2022.
2. Peter Carter, "Pro SQL Server 2022 Administration: A Guide for the Modern DBA",1st Edition, Apress,2022.
3. Renee M. P. Teate, "SQL for Data Scientists: A Beginner's Guide for Building Datasets for Analysis",1st Edition, Wiley,2021.
4. Kristina Chodorow, Shannon Bradshaw, "MongoDB: The Definitive Guide", 3rd Edition, O'Reilly Media, Inc., 2018.
5. Alan Beaulieu, "Mastering SQL Fundamentals", 2nd Edition, O'Reilly,2009.

Web References

1. https://www.digitalocean.com/community/conceptual-articles/an-introduction-to-databases.
2. https://www.techopedia.com/6/28832/enterprise/databases/introduction-to-databases.
3. https://www.bmc.com/blogs/dbms-database-management-systems/.
4. https://www.coursera.org/learn/introduction-to-databases.
5. https://maharatech.gov.eg/course/view.php?id=740.

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

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

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

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

Evaluation Methods

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

Department	Computer Science and Engineering	Programme: B.Tech						
Semester	V	Course Category: OE				End Semester Exam Type: TE		
Course Code	U23CSOC02	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	COMPUTER PERIPHERALS AND NETWORKING	3	0	0	3	25	75	100

(Offered to ECE, EEE, ICE, MECH, CIVIL, BME and MECHTRONICS)

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Organize the system components and memory.	K3
	CO2 Develop the motherboard designs and its components.	K3
	CO3 Classify the various Storage devices.	K4
	CO4 Examine the purpose of various I/O peripherals.	K4
	CO5 Categorize various Networking Components.	K4

UNIT - I	Introduction to PC and Memory	Periods:09
Evolution of Personal Computers - Overview of Systems and Components - Processor Modes - Modern CPU Concepts - Architectural Performance Features - Intel Core X-Series Processor - CPU Over Clocking - Essential Memory Concepts - Memory Packages - Logical Memory Organizations - Memory Considerations - Memory Types - OPTANE Memory - Memory Techniques - Selecting and Installing Memory - CPU Coolers.		CO1

UNIT - II	Motherboard Designs	Periods:09
Motherboard Form Factors - IBM PC XT -IBM PC AT - The Baby AT - Micro-AT -LPX and Mini-LPX - ATX - Mini-ATX - NLX - Active Motherboards – Sockets. Expansion Slots – DIMM.2 - M.2 Expansion Card – PCIE GEN3 M.2 - Intel D850GB - Upgrading a Mother Board -DDR4 BOOST - Chipsets - Intel -Non-Intel Chipsets - North Bridge - South Bridge - CMOS - Motherboard BIOS - RGB Headers - Live Dash OLED - NEXT GEN Connectivity 802.11 AD WIFI - USB 3.1 GEN2 Controller.		CO2

UNIT - III	Power supplies and storage devices	Periods:09
Power Supplies and Power Management - Modular – Non-Modular - Concepts of Switching Regulation - Potential Power Problems - Power Management -The Floppy Disk Drive - Magnetic Storage - Hard Drive - SSD- CD-ROM Drive - DVD-ROM - DVD Media - DVD Drive.		CO3

UNIT - IV	I/O Peripherals and Bus Architecture	Periods:09
Parallel Port - Signals and Timing Diagram - IEEE1284 Modes - Asynchronous Communication - Serial Port Signals - Video Adapters - Mice - Keyboards - Sound Cards – ISA - PCI – AGP.		CO4

UNIT – V	Network Components	Periods:09
Introduction of Network Cable - Ethernet Cable - FIBER Optics – HUB - Unmanageable Switch - Manageable Switch – Router – Modem - Wi-Fi - Access Point - PCI Wireless Card - USB Wireless Device - Print Server.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1.Stephen J Bigelow, "Trouble Shooting, maintaining and Repairing PCs", 5th Edition ,Tata McGraw-Hill, 2017.
2. Craig Zacker and John Rourke, "The complete reference: PC hardware", 1st Edition,Tata McGraw-Hill,2002.
3. Mike Meyers, "Introduction to PC Hardware and Troubleshooting", 1st Edition, Tata McGraw-Hill,2002.
4. B. Govindarajulu, "IBM PC and Clones hardware trouble shooting and maintenance",1st Edition, Tata McGraw-Hill ,2002.
5. Ron Gilster, "PC Hardware: A Beginner's Guide",1st Edition, Tata McGraw-Hill , 2001.

Reference Books

1.Vishnu P," Computer hardware & networking",2nd Edition, computech Publications, 2021.
2." Mastering Pc Hardware And Networking",1st Edition, big Book ,2014.
3. Scott Mueller, "Upgrading and Repairing PCs",21st Edition, Pearson Education, 2013.
4. Scott Mueller, "Upgrading and Repairing Laptops", 3rd Edition, Pearson Education, 2012.
5.Hans Peter Messmer, "The Indispensable PC Hardware Book",4th Edition, Addison-Wesley, 2001.
6."The undocumented PC: A Programmer's Guide to I/O, CPUs, and Fixed Memory Areas",2nd Edition, Pearson Education,2000.

Web References

1.https://www.coursera.org/courses?query=computer%20hardware
2.https://www.javatpoint.com/computer-hardware-and-networking-course
3.https://www.udemy.com/course/learn-computer-basics-hardware-network-complete-tutorials
4.https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm
5 https://www.udemy.com/course/computer-hardware-operating-system-and-networking.

* TE – Theory Exam, LE – Lab Exam

2.A.3.115

COs/POs/PSOs Mapping

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	2	1	1	-	-	-	-	-	2	2	2	1	1
CO 2	2	3	2	2	2	-	-	-	-	-	2	2	2	1	1
CO 3	2	3	3	2	2	-	-	-	-	-	2	2	2	1	1
CO 4	2	3	3	2	2	-	-	-	-	-	2	2	2	1	1
CO 5	2	3	3	2	3	-	-	-	-	-	2	2	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	5	5	5	5	5	75	100

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

2.A.3.116

ANNEXURE-II

(Honours-Curriculum and Syllabi)

2.A.3. 117

2.A.3.118

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

25 YEARS

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

HONOURS/MINOR

in

Cyber Security

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

Curriculum and Syllabus

2.A.3.119

2. A-3 120

ANNEXURE – II

DETAILS OF HONOURS/MINOR DEGREE

HONORS/MINOR IN CYBER SECURITY

SEMESTER – VIII											
Sl. No.	Semester	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
					L	T	P		CAM	ESM	Total
Theory											
1	IV	U23CSX401	Cyber Security Essentials	PC	3	1	0	4	25	75	100
2	V	U23CSX502	Cryptography	PC	3	1	0	4	25	75	100
3	VI	U23CSX603	Malware Analysis and Reverse Engineering	PC	3	1	0	4	25	75	100
4	VII	U23CSX704	Security Incident and Response Management	PC	3	1	0	4	25	75	100
5	VIII	U23CSX805	Artificial Intelligence for Cyber Security	PC	3	1	0	4	25	75	100
Total								**20**	**125**	**375**	**500**
Equivalent NPTEL courses##											
1	IV to VIII	U23CSXN01	**Cyber Security Equivalent NPTEL courses**	**3**					**12 WEEK Course**		

The student shall be given an option to earn 3 credits through one 12 week NPTEL course (equivalent) instead of any one course listed for honours degree programme and shall be completed before the commencement of eighth semester. The equivalent courses are subject to change based on its availability as per NPTEL course list.

2.A.3.121

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**II / IV**	Course Category: **ES**				End Semester Exam Type: **TE**		
Course Code	**U23CSX401**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Cyber Security Essentials**	**3**	**1**	**0**	**4**	**25**	**75**	**100**

(Common to All Branches)

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the basics of cyber security, cyber-crime and cyber law.	**K2**
	CO2 Analyze attack vectors and countermeasures for various cyber threats.	**K4**
	CO3 Use scanning techniques and reconnaissance tools to extract information from network systems	**K3**
	CO4 Describe different types of intrusion detection systems.	**K2**
	CO5 Configure firewalls and intrusion prevention systems.	**K3**

UNIT - I	**Introduction**	**Periods:12**	
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**
UNIT - II	**Attacks and Counter Measures**	**Periods:12**	
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**
UNIT - III	**File System and Peer to Peer Service**	**Periods:12**	
Harvester – Who is – 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**
UNIT - IV	**Intrusion Detection**	**Periods:12**	
Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.			**CO4**
UNIT - V	**Intrusion Prevention**	**Periods:12**	
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**

Lecture Periods:45	**Tutorial Periods: 15**	**Practical Periods: 0**	**Total Periods:60**

Text Books

1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", 1st Edition, Notion Press, 2021.
2. J. Brooks and Christopher Grow, "Cyber security Essentials",1st Edition, Jones & Bartlett Learning Publishers, 2018.
3. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", 1st Edition, Wiley Publishers, 2011.

Reference Books

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security",4th Edition, Jones & Bartlett Learning Publishers, 2021.
2. William Stallings, Lawrie Brown, "Computer Security Principles and Practice",4th Edition, Pearson Education, 2020.
3. Timothy J. Shimeall, Jonathan Spring, Vincent Nestler ,"Introduction to Cybersecurity",2nd Edition, CRC Press, 2018.
4. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy",2nd Edition, Elsevier, 2013.
5. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", 2nd Edition, Wiley Publishers, 2010.

Web References

1. https://www.geeksforgeeks.org/cyber security
2. www.tutorialspoint.com/cyber security
3. https://owasp.org/www-project-top-ten/
4. https://www.nist.gov/cyberframework
5. https://www.cisa.gov/cybersecurity

* TE – Theory Exam, LE – Lab Exam

2.A.3.23

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

2-A-3-124

Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	III/V	Course Category: ES				End Semester Exam Type: TE		
Course Code	U23CSX502	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Cryptography	3	1	0	4	25	75	100

(Common to All Branches)

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand cryptography and its need to various applications.	K1
	CO2 Design public and private key cryptosystems	K2
	CO3 Understand cryptanalysis and implement various cryptosystems.	K3
	CO4 Implement cryptographic algorithms	K4
	CO5 Analyze different types of attacks on various cryptosystems.	K4

UNIT - I	Introduction to Security	Periods:12
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).		CO1

UNIT - II	Traditional Cryptography	Periods:12
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.		CO2

UNIT - III	Data Encryption Standard	Periods:12
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).		CO3

UNIT - IV	Public Key Cryptography	Periods:12
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.		CO4

UNIT - V	Secure Electronic Records	Periods:12
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		CO5

Lecture Periods:45	Tutorial Periods: 15	Practical Periods: 0	Total Periods:60

Text Books

1. Jonathan Katz and Yehuda Lindellv,"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.

Reference Books

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.

Web References

1. https://www.geeksforgeeks.org/cryptography
2. www.tutorialspoint.com/crytography
3. https://www.geeksforgeeks.org/network security

9.9.3.125

:Os/POs/PSOs Mapping

:Os	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

2.A.3.126

Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	IV/VI	Course Category: ES				End Semester Exam Type: TE		
Course Code	U23CSX603	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Malware Analysis and Reverse Engineering	3	1	0	4	25	75	100

(Common to all branches)

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the reverse engineering process, tools, and typical malware behavior	K2
	CO2 Explain the basic concepts of binary numbers and x86 architecture.	K2
	CO3 Analyze files and extract useful information using file types, disassemblers, and decompilers.	K4
	CO4 Explain Windows/Linux emulation and binary obfuscation techniques	K2
	CO5 Analyze anti-debugging, anti-VM, and anti-emulation techniques	K4

UNIT - I	**Preparing to Reverse Engineer**	**Periods:12**	
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**
UNIT - II	**The Low-level Language**	**Periods:12**	
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- Ollydebug- 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**
UNIT - III	**Static and Dynamic Reversing**	**Periods:12**	
Assessment and static analysis: Static analysis- File types and header analysis: Extracting useful information from file- Other information: PE executables. Dead listing: 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**
UNIT - IV	**Sandboxing and Binary Obfuscation Techniques**	**Periods:12**	
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**
UNIT - V	**Anti-analysis Tricks**	**Periods:12**	
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**
Lecture Periods:45	**Tutorial Periods: 15**	**Practical Periods: 0**	**Total Periods:60**

Text Books

1. Reginald Wong," Mastering Reverse Engineering",2nd Edition, Packt Publishing,2021.
2. Bruce Dang, Alexandre Gazet, Elias Bachaalany, "Practical Reverse Engineering", 1st Edition, Wiley, 2014.
3. Eldad Eilam ,"Reversing: Secrets of Reverse Engineering",2nd Edition, Wiley,2012.

Reference Books

1. Jitender Narula, "Implementing Reverse Engineering: The Real Practice of X86 Internals",1st Edition, BPB Publications, 2021.
2. A. P. David ,"Ghidra Software Reverse Engineering for Beginners: Analyze, identify, and avoid malicious code and potential threats in your networks and systems", 1st Edition,Packt Publications, 2021.
3. Andrew Case, Jamie Levy, and AAron Walters,"The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory" ,1st Edition, Wiley Publication, 2014.
4. Michael Sikorski and Andrew Honig, "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software" ,1st Edition, No Starch press, 2012.
5. Justin Seitz ,"Gray Hat Python: Python Programming for Hackers and Reverse Engineers" ,1st Edition, No Starch Press, 2009.

Web References

1. https://www.geeksforgeeks.org/distributed systems
2. www.tutorialspoint.com/distributed systems
3. www.splunk.com
4. https://www.sans.org/cyber-security-courses/malware-analysis-reverse-engineering/
5. https://www.cybintsolutions.com/resources/malware-analysis-guide/

* TE – Theory Exam, LE – Lab Exam

9.A.3.127

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

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

2-A-3. 128

Department	Computer Science and Engineering	Programme: B.Tech.					
Semester	IV /VII	Course Category: ES			End Semester Exam Type:TE		
Course Code	U23CSX704	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	SECURITY INCIDENT AND RESPONSE MANAGEMENT	3	1	0	4	25	75	100

(Common to All Branches)

Prerequisite	Information security and applied cryptography	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understanding inevitable incident and incident detection and characterization	K1
	CO2 Get an exposure to live data collection, Forensic duplication.	K2
	CO3 Understanding network evidence	K1
	CO4 Analyze the concept of data analysis in various file system	K4
	CO5 Gain knowledge on Investigation including Windows and Mac OS Systems	K4

UNIT - I	Introduction	Periods:12
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

UNIT - II	Data Collection	Periods:12
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

UNIT - III	Network Evidence	Periods:12
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

UNIT - IV	Data Analysis	Periods:12
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

UNIT - V	Investigation	Periods:12
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

Lecture Periods:45	Tutorial Periods: 15	Practical Periods: 0	Total Periods:60

Text Books

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

Reference Books

11. Nadean H. Tanner, "Cybersecurity Incident Response: How to Contain, Eradicate, and Recover from Incidents," Wiley, 2020
12. Gerard Johansen, "Digital Forensics and Incident Response: Incident response techniques and procedures to respond to modern cyber threats," Packt Publishing, 2020.
13. Jason Luttgens, Matthew Pepe, and Kevin Mandia, "Incident Response & Computer Forensics," McGraw-Hill Education, 2014.
14. Steve Anson, "Applied Incident Response," Wiley, 2020.
15. Andrew Gorecki, "Effective Cybersecurity Incident Response: Expert tools and techniques for defending the network infrastructure and responding to cybersecurity incidents," Packt Publishing, 2018.

Web References

7. www.ibm.com/ incident response
8. https://www.coursera.org/cyber-incident response
9. https://www.crowdstrike.com/cybersecurity-101/incident-response/

* TE – Theory Exam, LE – Lab Exam

9.9.3.129

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

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Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	IV /VIII	Course Category: ES			End Semester Exam Type: TE			
Course Code	U23CSX805	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Artificial Intelligence for Cyber security	3	1	0	4	25	75	100

(Common to all Branches)

Prerequisite	Artificial Intelligence	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the cyber threats, attacks and vulnerabilities and its defensive mechanism	K2
CO2	Apply various AI techniques to detect cyber attacks	K3
CO3	Analyze malicious web pages and URLs using heuristics and feature extraction methods	K4
CO4	Understand the various applications of AI to detect cyber-attacks.	K2
CO5	Understand mail server to detect spam.	K2

UNIT - I	Fundamentals of AI	Periods:12	
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.			CO1
UNIT - II	**AI and DDoS**	**Periods:12**	
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.			CO2
UNIT - III	**Detection of Malicious Web Pages, Urls**	**Periods:12**	
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.			CO3
UNIT - IV	**Scan Detection and Malicious Event Detection**	**Periods:12**	
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.			CO4
UNIT - V	**AI and Mail Server**	**Periods:12**	
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.			CO5
Lecture Periods:45	**Tutorial Periods: 15**	**Practical Periods: 0**	**Total Periods:60**

Text Books

1. Soma Harder, Sinan Ozdemir ,"Hands-On Machine Learning for Cyber Security: Safeguard your system by making your machine intelligence using the python ecosystem", 2nd Edition, Packt Publishing Ltd, 2023.
2. Al-Sakib Khan Pathan ,"The state of the Art in Intrusion Detection System", 2nd Edition, CRC Press, 2018
3. Sumeet Dua and Xian Du , "Data Mining and Machine Learning in Cyber Security", 2nd Edition, CRC Press, 2011.

Reference Books

1. Brian Underdahl ,"Cybersecurity for Dummies",2nd Edition , Wiley, 2023.
2. Anne-Laure Jousselme, Quentin Bernhard, and Dorothée Lahalle, "Artificial Intelligence for Cybersecurity: A Comprehensive Guide",1st Edition, Wiley Publication, 2021.
3. Leslie F. Sikos,"Artificial Intelligence in Cybersecurity: Risk Management" , 1st Edition, Springer Publication, 2020.
4. S. S. Rajput, Suman Bhattacharya, and Sushil Kumar Sharma, "Deep Learning for Cybersecurity" ,1st Edition, CRC Press,2019
5. Behrouz A. Forouzan , Debdeep Mukhopadhyay, "Cryptography and Network security", 2nd Edition, Mcgraw Hill Education, 2011.

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Web References

1. https://www.geeksforgeeks.org/AI for cybersecurity
2. www.tutorialspoint.com/cybersecurity
3. www.tutorialspoint.com/AI
4. https://ieeexplore.ieee.org/Xplore/home.jsp
5. https://www.wiley.com/en-us/Artificial+Intelligence+for+Cybersecurity%3A+A+Comprehensive+Guide-p-9781119770031

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

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ANNEXURE-III

(List of Examiners)

O.A-3.133

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)
Puducherry - 605 107

Panel of Examiners for Valuation of End Semester Examinations Nov-Dec 2024

Department of Computer Science and Engineering

SMVEC/ Dept/ Exam-Cell/Valuation/2024-2025/0051 Date:25.07.2024

Sl.No	Name of the Examiner	Specialization	Designation, Department and Institution in which currently working	Contact number and mail id	Experience
External Examiners					
1	**Dr. L.Arun raj**	Wireless Networks, Theory of Computation, Multimedia Applications, Python	Associate Professor Department of Computer Science and Engineering B.S. AbdurRahman Crescent Institute of Science and Technology |Vandalur |Chennai-48	**E-Mail ID:**arunraj@crescent.education **Contact No:**9941169805	**15Years**
2	**Dr. S. Thamizharasan**	Design and Analysis of Algorithms, Artificial Intelligence	**Assistant Professor / CSE RGCET, Puducherry.**	**E-Mail ID:**thamizharasans@rgcetpdy.ac.in, **Contact No:**9500211888	**17 Years**
3	**Dr. N. Manjunathan**	DBMS, Data Structures	Associate Professor / CSE, Vel Tech Rangarajan Dr. Sagunthala R & D institute of Science and Tecnology, Chennai	**E-Mail ID:**nmanjunathan@veltech.edu.in **Contact No:**9791060024	**16 Years**
4	**Dr T SENTHIL KUMAR**	DBMS, Computer Graphics	Associate Professor/ CSE, SRM Institute of Science and Technology Chennai	**E-Mail ID:**senthilt2@srmist.edu.in **Contact No:**9787565565	**15 Years**
5	**Dr.G.Balamurugan**	AI, Deep Learning	Assistant Professor Department of Computing	**E-Mail ID:** balamurg1@srmist.edu.in **Contact No:9629308990**	**6 Years**

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			Technologies SRM Institute of Science and Technology Kattankulathur Campus Chengalpattu-603203		
6	**Dr. KISHORE KUMAR K**	DBMS, Data Structures	Assistant Professor / CSE, Vel Tech Rangarajan Dr. Sagunthala R & D institute of Science and Tecnology, Chennai	**E-Mail ID:**kisorekumar@veltech.edu.in **Contact No:**9092330191	**15 Years**
7	**Dr. A.PUNITHA**	Wireless communication Networks, Network Security	Associate Professor Dept. of CSE Annamalai University	**E-Mail ID:**12charuka17@gmail.com **Contact No:**9487379388	**18 Years**
8	**Dr. S. SATHIYA**	Artificial Intelligence, Operating Systems, Programming in Python	Associate Professor Dept. of CSE Annamalai University	**Contact No:**9865032026 **E-Mail ID:**Sathiya.sep05@gmail.com	**18 Years**
9	**Dr. K. T. MEENAABARNA**	Design and Analysis of Algorithms, Artificial Intelligence	Associate Professor Dept. of CSE Annamalai University	**Contact No:**9489229350 **E-Mail ID:**abarnakt@gmail.com	**18 Years**
10	**Dr. P. Seenuvasan**	Design and Analysis of Algorithm Java Programming	HOD / Assistant professor (SR), Anna university college of engineering, Villupuram	**Contact No:** 9894122253 **E-Mail ID:** psvasanucev@gmail.com	**15 Years**
11	**DR.S.SENTHILKUMAR**	Data Science Object oriented Analysis	Associate Professor Department of Computer Science and Engineering University College of Engineering Pattukottai	**Email ID:** senthilucepkt@gmail.com **Contact No :8838497277**	**18 Years**

12	**Dr S. Sivanesh**	Data Structures Python Programming	Assistant Professor Department of Computer Science and Engineering University College of Engineering, Panruti	**Email ID:** sivanesh.s@gmail.com **Contact No :** 95788 99988	**16 Years**
13	**Dr. K. Selvakumar**	Design and Analysis of Algorithm Java Programming	Professor and Head./CSE, Annamalai University	**Email ID:** kskaucse@gmail.com **Contact No :** 9443185363	**25 years**
14	**Dr. N. Sivakumar**	Python Programming Artificial Intelligence	Professor / CSE Pondicherry Technological University	**Email ID:** sivakumar@ptuniv.edu.in **Contact No :** 9840901054	**18 years**
Board Chairman					
1	**Dr. K. Premkumar**	Data Structures, Object Oriented Programming, Mobile Computing	Professor and Head /CSE, Sri ManakulaVinayagar Engineering College,	**Email ID:** hodcse@smvec.ac.in **Contact No.:** 9842127679	**23 Years**
Chief Examiners					
1	**Dr. M. GANESAN**	Software Engineering, IoT, Deep Learning	Associate Professor, CSE, Sri ManakulaVinayagar Engineering College, Puducherry	**Email ID:**ganesan@smvec.ac.in **Contact No**:9486341535	**15 Years**
2	**Dr. T. MEGALA**	Database Management	Assistant Professor, CSE, Sri ManakulaVinayagar Engineering	**E-Mail ID:** megalacse@smvec.ac.in **Contact No**:9789722271	**8 Years**
Internal Valuators					
1	**Dr. M.SHANMUGAM**	Microprocessors and Microcontrollers Artificial Intelligence	Assistant Professor, CSE, Sri ManakulaVinayagar Engineering College, Puducherry	9444370963 shanmugam.mm@smvec.ac.in	**15 Years**

2	**Mr. P.KARTHIKEYAN**	DBMS Mobile Computing	Assistant Professor, CSE, Sri ManakulaVinayagar Engineering College, Puducherry	**E-Mail ID:** mails2karthy@gmail.com **Contact No:**9791553404	**14 Years**
3	**Mr. B. THIYAGARAJAN**	Artificial Intelligence, Programming in C	Assistant Professor, CSE, Sri ManakulaVinayagar Engineering College, Puducherry	**E-Mail ID:**thiyagarajan@smvec.ac.in **Contact No:**9791857984	**12 Years**
4	**Mr. D. RAJESH**	OOPS, Programming in Python	Assistant Professor, CSE, Sri ManakulaVinayagar Engineering College, Puducherry	**E-Mail ID:** successraju06@gmail.com **Contact No:**9600551422	**12 Years**
5	**Mrs. R. DEEPA**	Software Engineering	Assistant Professor, CSE, Sri ManakulaVinayagar Engineering College, Puducherry	**E-Mail ID:** deepa.cse@smvec.ac.in ***Contact No:***:6380 547 250	**10 Years**

Exam Coordinator
(Mr.B.Thiyagarajan)

HOD/CSE
Dr,K. Premkumar

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SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CSE OFFERING COMMON COURSES

SL.NO	Offering	Course Code	Course Name	CSE	Remark
1	CSE	U23CSTC01	Programming in C	I/I,I/II	COMMON TO ALL EXCEPT(CSBS and FT)
2	CSE	U23CSTC02	Problem Solving Approach	I/I	COMMON TO CSE, CCE and ICE
3	CSE	U23CSPC01	Programming in C Laboratory	I/I,I/II	COMMON TO ALL EXCEPT(CSBS and FT)
4	CSE	U23CSTC03	Data Structures	I/II, II/III	COMMON TO ALL EXCEPT(CSBS and FT)
5	CSE	U23CSPC02	Data Structures Laboratory	I/II, II/III	COMMON TO ALL EXCEPT(CSBS and FT)
6	CSE	U23CSBC01	Design and Analysis of Algorithms	II/III	COMMON TO CSE and AI&DS
7	CSE	U23CSDC01	Automata and Compiler Design	II/III	COMMON TO CSE and AI&DS
8	CSE	U23CSTC04	Database Management Systems	II/IV	COMMON TO CSE, IT and CCE
9	CSE	U23CSTC05	Operating Systems	II/IV	COMMON TO CSE and IT
10	CSE	U23CSPC03	Database Management Systems Laboratory	II/IV	COMMON TO CSE, IT and CCE
11	CSE	U23CSPC04	Operating Systems Laboratory	II/IV	COMMON TO CSE and IT
12	CSE	U23CSTC06	Artificial Intelligence	III/V	COMMON TO CSE, IT and CCE
13	CSE	U23CSPC05	Artificial Intelligence Laboratory	III/V	COMMON TO CSE, IT and CCE
14	CSE	U23CSTC07	Web Designing	III/V	COMMON TO CSE and AI&DS
15	CSE	U23CSPC06	Web Designing Laboratory	III/V	COMMON TO CSE and AI&DS
ELECTIVES					
16	CSE	U23CSEC02	Introduction to Industry 4.0	IV/VIII	COMMON TO CSE and MECHTRONICS

Curriculum Cordinator
(Mr. P. Karthikeyan)

HOD
(Dr. K. Premkumar)

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Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	I / II	Course Category: ES				End Semester Exam Type: TE		
Course Code	U23CSTC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Programming in C	3	0	0	3	25	75	100

(Common to All Branches Except CSBS and FT)

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Comprehend the basics of Computers.	K2
CO2	Illustrate the concepts of control structures and looping.	K2
CO3	Implement programs using arrays and functions.	K3
CO4	Demonstrate programs using Structure and Pointers.	K3
CO5	Build the programs using Union and File management Operations.	K3

UNIT - I	Introduction	Periods:09
Generation and Classification of Computers - Block Diagram of a Computer –Categories of Software – Network Structure - Number System – Binary – Decimal – Conversion – Algorithm – Pseudo code – Flow Chart.		CO1

UNIT - II	C Programming Basics	Periods:09
Introduction to 'C' Programming – Basic structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements.		CO2

UNIT - III	Arrays and Functions	Periods:09
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple Programs- sorting- searching – matrix operations- Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion		CO3

UNIT - IV	Structure and Pointers	Periods:09
Structure Introduction – Structure definition – Structure declaration – Structure within a structure –Self Referential Structure. Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays -Pointer to Function –Pointer and Structure- Simple Programs.		CO4

UNIT - V	Unions and Files	Periods:09
Union Introduction - Programs Using Structures and Unions – Introduction to File - File Operations - File Input and Output Functions Random Access to Files - File System Functions - Command Line Arguments- Storage Classes - Pre-Processor Directives- Dynamic Memory Functions.		CO5

Lecture Periods:45	Tutorial Periods: -	Practical Periods: -	Total Periods:45

Text Books

1. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, 8thEdition,2019.
2. Yashvant Kanetkar, "Let us C", BPB Publications, 16th Edition, 2017.
3. Herbert Schildt," C: The Complete Reference", McGraw Hill, FourthEdition,2014.

Reference Books

1. Vikas B. Agarwal Jyoti P. Mirani, "Computer Fundamentals, Nirali Prakashan Aug-2019.
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression,2012.
3. Vikas Verma, "A Workbook on C ", Cengage Learning, Second Edition,2012.
4. P. Visu, R.Srinivasan and S. Koteeswaran, "Fundamentals of Computing and Programming", Fourth Edition, Sri Krishna Publications, 2012.
5. PradipDev, ManasGhoush, "Programming in C", Second Edition, Oxford University Press, 2011.

Web References

1. https://www.programiz.com/c-programming
2. https://www.geeksforgeeks.org/c-language-set-1-introduction/
3. https://www.tutorialspoint.com/cprogramming
4. https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c
5. https://nptel.ac.in/courses/106/104/106104128/

* 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	-	-	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 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

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Department	**Computer Science and Engineering**	Programme: **B.Tech.**					
Semester	**I / II**	Course Category: **ES**			End Semester Exam Type: **LE**		
Course Code	**U23CSPC01**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Programming in C Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to All Branches Except CSBS and FT)

Prerequisite	NIL	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Implement logical formulations to solve simple problems leading to specific applications.	**K3**
	CO2 Execute C programs for simple applications making use of basic constructs, arrays and strings.	**K3**
	CO3 Experiment C programs involving functions, recursion, pointers, and structures.	**K3**
	CO4 Demonstrate applications using sequential and random access file processing.	**K3**
	CO5 Build solutions for online coding challenges.	**K3**

List of Exercises

1. Write a C program to find the Area of the triangle.
2. Develop a C program to read a three digit number and produce output like
   1 hundreds
   7 tens
   2 units
   For an input of 172.
3. Write a C program to check whether a given character is vowel or not using Switch – Case statement.
4. Write a C program to Print the numbers from 1 to 10 along with their squares.
5. Demonstrate do—While loop in C to find the sum of 'n' numbers.
6. Find the factorial of a given number using Functions in C.
7. Write a C program to check whether a given string is palindrome or not?
8. Write a C program to check whether a value is prime or not?
9. Develop a C program to swap two numbers using call by value and call by reference.
10. Construct a C program to find the smallest and largest element in an array.
11. Implement matrix multiplication using C program.
12. Write a C program to perform various string handling functions like strlen, strcpy, strcat, strcmp.
13. Develop a C program to remove all characters in a string except alphabets.
14. Write a C program to find the sum of an integer array using pointers.
15. Write a C program to find the Maximum element in an integer array using pointers.
16. Construct a C program to display Employee details using Structures
17. Write a C program to display the contents of a file on the monitor screen.
18. Write a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands.
19. Write a C program to create two files with a set of values. Merge the two file contents to form a single file
20. Write a C program to pass the parameter using command line arguments.

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

Reference Books

1. Zed A Shaw," Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)", Addison Wesley,2016.
2. Anita Goel and Ajay Mittal," Computer Fundamentals and programming in C", Pearson Education, First edition, 2011.
3. Maureen Sprankle, Jim Hubbard," Problem Solving and Programming Concepts," Pearson, 9th Edition, 2011.
4. Yashwanth Kanethkar, "Let us C", BPB Publications, 13th Edition, 2008.
5. B.W. Kernighan and D.M. Ritchie, "The C Programming Language", Pearson Education, 2nd Edition, 2006.

Web References

1. https://alison.com/course/introduction-to-c-programming
2. https://www.geeksforgeeks.org/c-programming-language/
3. http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf
4. https://www.tenouk.com/clabworksheet/clabworksheet.html
5. https://fresh2refresh.com/c-programming/

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	-	-	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 Methods

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

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Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**I**	Course Category: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23CSTC02**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Problem Solving Approach**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to CSE, ICE and CCE)

Prerequisite	NIL	
Course Outcomes	**After completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the basic concepts of computational thinking and problem solving.	**K2**
	CO2 Explain basic concepts of algorithm and data organization.	**K2**
	CO3 Illustrate algorithmic solution to problem solving.	**K3**
	CO4 Explain the concepts of array, merging, sorting & searching.	**K2**
	CO5 Implement recursive algorithm to solve problems.	**K3**

UNIT-I	**Computational Thinking and Logic-Solving Problems**	**Periods:9**
Computational Thinking – Information and Data – Converting Information into Data – Data Capacity – Data Types and Encoding – Logic-Solving Problems – Limits of Computation – Pseudocode and Flow Chart.		**CO1**

UNIT-II	**Algorithmic Thinking and Data Organization**	**Periods:9**
Algorithmic Thinking: Algorithms – Software and Programming Languages – Actions. Data Organization: Name list, Graph Hierarchies – Spread Sheets – Text processing – Patterns – Pseudocode and Flow Chart.		**CO2**

UNIT-III	**Fundamental Algorithms and Factoring Methods**	**Periods:9**
Fundamental Algorithms: Exchanging – Counting – Summing – Factorial Computation – Fibonacci Sequence – Reversing the Digit-Base Conversion – Character to number conversion. Factorial Methods: Finding Square Root – Greatest Common Divisor – Prime Number – Prime Factor – Pseudocode and Flow Chart.		**CO3**

UNIT-IV	**Array, Merging, Sorting and Searching**	**Periods:9**
Array Techniques: Introduction – Array order reversal – Array Counting or Histogramming – Maximum and Minimum of a Set – Removal of Duplicate – Partitioning – Longest monotone. Sorting and searching: Sorting by Bubble, Selection, Insertion. Searching: Linear, Binary – Pseudocode and Flow Chart.		**CO4**

UNIT-V	**Text Processing, Pattern Searching and Recursive Algorithms**	**Periods:9**
Key word Searching – Text Line Adjustment – Linear Pattern Search – Sub Linear Pattern Search. Recursion:Towers of Hanoi—Sample Generation – Combination Generation – Permutation Generation – Pseudocode and Flow Chart.		**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. David Riley and Kenny Hunt, "Computational Thinking for Modern Problem Solver", Chapman & Hall/CRC Text Books in Computing, 2014.
2. R.G. Dromey, "How to solve it by Computer", PHI,2008.
3. Vickers Paul, "How to Think like a Programmer: Problem Solving for the Bewildered", Cengage Learning EMEA,2008.

Reference Books

1. Kathryn Rentz, Paula Lentz, "A Problem-solving Approach", McGraw-Hill Education,2018.
2. Don McAdam, Roger Winn, "A Problem-solving Approach", Prentive Hall Canada; 2nd Edition, 2017.
3. V Anton Spraul, "Think Like a Programmer: An Introduction to Creative Problem Solving", Cengage Learning EMEA, 2012.
4. Sham Tickoo "A Problem-solving Approach", Delmar/Cengage Learning, 2009.
5. Harold Abelson & Gerald Jay Sussman, "Structure and Interpretation of Computer Programs", McGraw-Hill Book Company, 1997.

Web References

1. https://www.edx.or g/learn/problem-solving
2. https://www.lynda.com/Business-Skills-tutorials/Problem-Solving-Techniques/553700-2.html
3. https://www.classcentral.com/course/problem-solving-skills-6687

TE – Theory Exam, LE – Lab Exam

2.A.3.145

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

2.A.3. 146

Department	**Computer Science and Engineering**	Programme: B.Tech						
Semester	**II/III**	Course Category: **ES**			End Semester Exam Type: **TE**			
Course Code	**U23CSTC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Structures**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to All Branches except CSBS and FT)

Prerequisite	Any Programming Knowledge	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Compute time and space complexity for given problems	**K2**
	CO2 Demonstrate stack, queue and its operation.	**K2**
	CO3 Illustrate the various operations of linked list.	**K3**
	CO4 Use the concepts of tree for various applications.	**K3**
	CO5 Outline the various Tables, Graphs and Sets techniques.	**K3**

UNIT - I	**Basic Terminologies of Data Structures**	**Periods:09**
Introduction: Basic Terminologies – Asymptotic Notations: Complexity analysis. Array and its operations - Searching: Linear Search and Binary Search Techniques. Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort. Performance and Comparison among the sorting methods.		**CO1**
UNIT - II	**Stack and Queue Operations**	**Periods:09**
Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Deque.		**CO2**
UNIT - III	**Linked List Operations**	**Periods:09**
Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing - Searching - Insertion - Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.		**CO3**
UNIT - IV	**Trees**	**Periods:09**
Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree - Threaded Binary Tree - Binary Search Tree - Binary Tree Traversals - AVL Tree- Red Black Tree.		**CO4**
UNIT - V	**Graphs, Tables and Sets**	**Periods:09**
Graph: Basic Terminologies and Representations - Graph traversal algorithms. Tables: Different types of tables - Hash Table and its operations - Applications. Sets: Representation of Sets- Operations and its applications.		**CO5**

Lecture Periods:45	**Tutorial Periods:**	**Practical Periods:-**	**Total Periods:45**

Text Books

1. Ellis Horowitz, Sartaj Sahni," Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.
2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

1. D. Samanta, "Classic Data Structures", Prentice-Hall of India, Second Edition, 2012.
2. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in c" . Prentice-Hall of India, Second Edition, 2007.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second. Edition,2006.
4. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Illustrated Edition, Addison-Wesley Publishing Company, 1995.
5. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Addison- Wesley Publishing Company, Illustrated Edition, 1995.

Web References

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial/
3. https://www.studytonight.com/data-structures/
4. https://www.tutorialspoint.com/data_structures_algorithms/
5. https://www.w3schools.in/data-structures-tutorial/intro/

* TE – Theory Exam, LE – Lab Exam

2.D.3. 147

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

2.A.3.148

Department	Computer Science and Engineering	Programme: **B.Tech.**						
Semester	II/III	Course Category: **PC**			*End Semester Exam Type: **LE**			
Course Code	U23CSPC02	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data Structures Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to all Branches Except CSBS and FT)

Prerequisite	Basic Programming Knowledge	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Analyse the algorithm's / program's efficiency in terms of time and space complexity.	**K3**
	CO2 Solve the given problem by identifying the appropriate Data Structure.	**K3**
	CO3 Solve the problems of searching and sorting techniques.	**K3**
	CO4 Solve problems in linear Data Structures.	**K4**
	CO5 Solve problems in non-linear Data Structures.	**K4**

List of Exercises:

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. a) Delete an element from list b) Search for a key element in list c) count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
6. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.
7. Write a C program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.
8. Write a C program that use recursive functions to traverse the given binary tree in
   a) Preorder b) Inorder c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.
11. Write a C program to implement the Set operations.
    a) Union b) Intersection c) Difference.

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

Reference Books

1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd Edition, 2019.
2. Tenebaum Aaron M, "Data Structures using C', Pearson Publisher, 1st Edition, 2019.
3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st Edition, 2017.
4. Reema Thareja, "Data structures using C", Oxford University, 2nd Edition, 2014.
5. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st Edition, 2013.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/
2. https://www.w3schools.in/data-structures-tutorial/intro/
3. https://nptel.ac.in/courses/106103069/
4. https://swayam.gov.in/nd1_noc20_cs70/preview
5. https://nptel.ac.in/courses/106103069

* TE – Theory Exam, LE – Lab Exam

9.A.3.149

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

2.0.3.150

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**III**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CSBC01**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Design and Analysis of Algorithms**	**2**	**0**	**2**	**3**	**50**	**50**	**100**

(COMMON TO CSE and AI&DS)

Prerequisite: Problem Solving Approaches

Course Outcomes

	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Analyze and improve the efficiency of algorithms and estimate the performance of algorithm and Divide and Conquer.	K2
CO2	Determine the Greedy paradigms, Dynamic Programming and explain when an algorithmic design situation calls for it.	K3
CO3	Interpret the Backtracking paradigms, Branch and Bound, NP-Hard paradigms and explain when an algorithmic design situation calls for it.	K3
CO4	Demonstrate programs using Divide and Conquer, Greedy paradigms.	K3
CO5	Build the programs using Dynamic Programming, Backtracking and Branch and Bound.	K2

UNIT - I **Introduction To Algorithm and Divide and Conquer** **Periods:10**

ntroduction – Algorithm – Pseudo code for expressing algorithms – Performance Analysis – Time complexity – Space complexity – Asymptotic Notation – Big oh notation – Omega notation – Theta notation and Little oh notation.
Divide and Conquer method: Binary search – Merge sort – Quick sort — **CO1**

UNIT - II **Greedy Method and Dynamic Programming** **Periods:10**

Greedy method: General method – applications– Knapsack problem – Minimum cost spanning trees –Single source shortest path problem.
Dynamic Programming: Applications – Multistage graphs – 0/1 knapsack problem, All pairs shortest path problem – Traveling sales person problem — **CO2**

UNIT - III **Backtracking and Branch and Bound** **Periods:10**

Backtracking: General method. Applications – N – queen problem – Sum of subsets problem – Graph coloring – Hamiltonian cycle - 0/1 Knapsack Problem.
Branch and Bound: General method – Applications – Traveling sales person problem – 0/1 knapsack problem – LC Branch and Bound solution –FIFO Branch and Bound solution — **CO3**

UNIT - IV **Laboratory Exercises** **Periods:15**

- Implementation of binary search using Divide-and-Conquer technique
- Implementation of Finding Maximum and Minimum using Divide-and-Conquer technique.
- Implementation of Knapsack using Greedy technique.
- Implementation of Minimum Spanning Tree using Prim's and Kruskal's Algorithm using Greedy technique.
- Implementation of Single-Source Shortest Paths algorithms using Greedy technique.

— **CO4**

UNIT - V **Laboratory Exercises** **Periods:15**

- Implementation of All Pairs Shortest Paths using Dynamic Programming technique.
- Implementation of Traveling Salesman Problem using Dynamic Programming technique.
- Implementation of 8 Queens Problem with the approach of Backtracking.
- Implementation of sum of subsets with the approach of Backtracking.
- Implementation of Traveling Salesman problem with Branch-and-Bound technique.

— **CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods:60**

Text Books

1. Levitin Anany," Introduction to the Design and Analysis of Algorithms", Pearson Education India,1st Edition,2019.
2. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", Galgotia Publications, 2nd Edition, 2010.
3. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms", PHI/Pearson Education, 3rdEdition,2009.

Reference Books

1. Aho Alfred V.,"Design & Analysis of Computer Algorithms", Pearson Education India,2nd Edition,2018
2. Basu S. K.," Design Methods and Analysis of Algorithms", PHI Learning,3rd Edition, 2018.
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.
4. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", 2nd Edition, Galgotia Publications, 2010.
5. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms, 3rd Edition, PHI/Pearson Education, 2009.

2.A.3.151

Web References

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
2. https://www.javatpoint.com/daa-tutorial
3. https://www.guru99.com/design-analysis-algorithms-tutorial.html
4. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
5. https://swayam.gov.in/nd1_noc20_cs71/preview

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

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

Evaluation Method

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks									#End Semester Examination (ESE) Marks (Theory)	Total Marks
	Continuous Assessment (Theory)					Continuous Assessment (Practical)					
	CAT 1	CAT 2	Model	Attendance	Total	Conduction of Practical	Report	Viva	Total	#End Semester Examination (ESE) Marks (Practical-Internal Evaluation)	
Marks	5	5	5	5	20*	15	10	5	30*	30	75**	100
*To be weighted for 10 Marks					10	*To be weighted for 10 Marks			10		*To be weighted for 50 Marks	

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

2.A.3.152

Department	Computer Science and Engineering	Programme: B.Tech.						
Semester	III	Course Category: PC			End Semester Exam Type: TE			
Course Code	U23CSDC01	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Automata and Compiler Design	3	0	0	3	25	75	100

(Common to CSE and AI&DS)

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the concept of Finite Automata, NFA and DFA.	K2
CO2	Understand about Context Free Language and Normal Forms	K2
CO3	Construct Push Down Automata and Turing Machine	K3
CO4	Explain the concept of Lexical Analysis and Syntax Analysis	K3
CO5	Describe the Intermediate code generation, Code Optimization and Code Generation	K3

UNIT - I	Finite Automata and Regular Expressions	Periods:09

troduction: Finite Automata – Deterministic Finite Automata – Non-Deterministic Finite Automata – Conversion from NFA to DFA NFA with epsilon transition - Eliminating epsilon transition -Regular Expression- Conversion from Regular Expression to NFA- onversion from Regular Expression to DFA (Direct / Indirect method) – Minimized DFA. **CO1**

UNIT - II	Context-Free Grammar and Normal Forms	Periods:09

ypes of Grammar - Chomsky's hierarchy of languages -Context-Free Grammar (CFG) – Derivations and Parse trees – Ambiguity grammars – Normal Forms – Chomsky Normal Form – Greibach Normal Form. **CO2**

UNIT - III	Pushdown Automata and Turing Machines	Periods:09

ush Down Automata (PDA): Definition of the Pushdown Automata - Languages of pushdown automata – CFG to PDA -Turing lachine - Turing machines for regular languages- Turing machine construction for Palindrome, Addition, Subtraction. **CO3**

UNIT - IV	Lexical Analysis and Syntax Analysis	Periods:09

ompilers: The Phases of compiler – Lexical analysis – The role of the lexical analyser – Input buffering – Parser: Top-Down Parser Predictive Parser, Bottom up Parser – Shift Reduce Parser - Operator Precedence Parser-SLR Parser. **CO4**

UNIT - V	Intermediate Code Generation, Code Optimization and Code Generation	Periods:09

ıtermediate Code Generation: Intermediate Languages. Code Optimization: Principle sources of optimization – Loop Optimization. ode Generation: Issues in the design of code generator – Simple code generator – Basic blocks and flow graphs – The DAG epresentation of Basic Block - Generating code form DAGs - Peephole optimization. **CO5**

ecture Periods:45	Tutorial Periods: -	Practical Periods: -	Total Periods:45

ext Books

. Hopcroft, 'Introduction to Automata Theory, Languages, and Computation", Pearson, 3rd Edition, 2008.
. Alfred Aho, V. Ravi Sethi, and D. Jeffery Ullman, "Compilers Principles, Techniques and Tools", Addison-Wesley, 2nd Edition, 2007.
. John C. Martin, "Introduction to Languages and the Theory of Computations", McGraw Hill, 3rd Edition, 2007.

eference Books

. Kamala Krithivasan, Rama R, "Introduction to Formal languages Automata Theory and Computation", Pearson, 2019.
. Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett, 6th Edition, 2016.
. Anil Malviya, Malabika Datta, "Theory of Computation & Applications - Automata Theory Formal Languages", BPB publications, 2015.
. Charles N. Fischer and Richard J. Leblanc, "Crafting a Compiler with C", Benjamin Cummings, 2009.
. Mishra K.L.P, "Theory of Computer Science: Automata, Languages and Computation", Prentice Hall India Learning, 1st Edition, 2006.

Web References

1. https://www.cse.iitb.ac.in/~akg/courses/2019-cs310/index.html
2. https://www.cse.iitm.ac.in/~krishna/cs3300/
3. https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/
4. https://www.javatpoint.com/automata-tutorial
5. https://www.tutorialspoint.com/automata_theory/index.htm

* TE – Theory Exam, LE – Lab Exam

2.A.3.153

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

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

Evaluation Method

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

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

2.A.3. 54

Department	**Computer Science and Engineering**	Programme: **B.Tech**						
Semester	**IV**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CSTC04**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**Database Management Systems**	3	0	0	3	25	75	100

(Common to CSE, IT and CCE)

Prerequisite	**Computer Programming and Data Structures**		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Explain the concepts of Database Management System and develop Entity Relationship model and Relational Models for a given application	**K2**
	CO2	Manipulate and build database queries using Structured Query Language and relational algebra	**K3**
	CO3	Use data normalization principles to develop a normalized database for a given application	**K3**
	CO4	Illustrate various transactions and recovery techniques	**K2**
	CO5	Apply tools like NoSQL, MongoDB, Cassandra on real time applications	**K3**

UNIT - I	**Introduction**	**Periods:09**	
Database Systems - Data Models – System Structure-Database System Architecture - Entity-Relationship Model - ER Diagram - Extended ER Model - ER into Relational Model - Relational Model: Structure of Relational Databases, Database Schema, Keys, Tables.			**CO1**
UNIT - II	**Database Languages**	**Periods:09**	
Relational Algebra - Extended-Relational Algebra - Relational Calculus - SQL: Introduction - DDL - DML - Integrity Constraints - Set Operations - Joins - Nested Queries - View- Trigger - Stored Procedures.			**CO2**
UNIT - III	**Relational-Database Design and Data Storage**	**Periods:09**	
Relational Database Design: Domain and Data Dependency - Lossless Design - Armstrong's axioms - Functional Dependencies - Normal Forms - 1NF, 2NF, 3NF, BCNF and 4NF. **Data Storage:** RAID - File Organization - Indexing: Types of Indexing.			**CO3**
UNIT - IV	**Transactions**	**Periods:09**	
Transaction concepts and states- Concurrent Execution - Serializability -Query Processing- Concurrency Control: Lock based Protocol - Timestamp based Protocol - Recovery System: - Log-Based Recovery - Shadow Paging.			**CO4**
UNIT - V	**NoSQL Databases**	**Periods:09**	
NoSQL - Document Database: MongoDB - Multi-dimensional: Cassandra.			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. Silberschatz, Korth, Sudarshan, Database System Concepts, 7th Edition - McGraw-Hill Higher Education, International Edition, 2019.
2. Ramez Elmasri, and Shamkant B. Navathe, Fundamentals of Database Systems (7th edition), Publisher: Pearson,2016.
3. Raghu Ramakrishnan, —Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.

Reference Books

1. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill College Publications, 2015.
2. Date C J, Kannan A and Swamynathan S, "An Introduction to Database Systems", 8th Edition, Pearson Education, New Delhi, 2006.
3. Alan Beaulieu, "Mastering SQL Fundamentals", Second Edition, O'Reilly,2009
4. Kristina Chodorow; Shannon Bradshaw, "MongoDB: The Definitive Guide", 3rd Edition, O'Reilly Media, Inc., 2018.
5. Pramod J. Sadalage (Author), Martin Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", 1stEdition, Kindle Edition.

9.A.3.155

eb References

1. http://www.database.com/
2. http://cassandra.apache.org/
3. https://www.mongodb.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
2	1	-	-	-	-	-	-	-	-	-	-	-	3	3	2
3	2	1	1	3	-	-	-	-	-	-	-	-	3	3	2
3	2	1	1	-	-	-	-	-	-	-	-	-	3	3	2
2	1	-	-	-	-	-	-	-	-	-	-	-	3	3	2
3	2	1	1	3	-	-	-	-	-	-	-	-	3	3	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	5	5	5	5	5	75	100

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

2.A.3.156

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSPC03**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Database Management Systems Laboratory**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE, IT and CCE)

Prerequisite	Data Structures and Algorithms

			BT Mapping (Highest Level)
Course Outcomes	**On completion of the course, the students will be able to**		
	CO1	Implement relational database systems using SQL statements.	**K3**
	CO2	Use typical data definitions and manipulation commands in various applications.	**K3**
	CO3	Demonstrate applications using Nested and Join Queries	**K3**
	CO4	Execute various advance SQL queries related to Transaction Processing.	**K3**
	CO5	Build commercial relational database systems using trigger and cursor concept.	**K3**

List of Exercises

Structured Query Language:

1. Data Definition Language
2. Data Manipulation Language
3. Data Selection and Projection statements
4. Aggregate Functions
5. Joins
6. Built in Functions
7. Nested Queries
8. Set Operations
9. View
10. Transaction Control Language
11. Data Control Language

PL/SQL:

12. Simple PI/SQL Programs
13. Trigger

Cursor : Implicit Cursor and Explicit Cursor

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

Reference Books

1. Oracle Developer Handbook.
2. SQL/PL/SQL for Oracle by P.S. Deshpande, IIT Madras, Dream Tech Press.
3. Alan Beaulieu, Mastering SQL Fundamentals, 2nd Edition, O"Reilly,2009
4. Silberschatz, Korth, Sudarshan, Database System Concepts, 7thEdition - McGraw-Hill Higher Education, 2019

Web References

1. www.oracle-developer.net
2. www.oracle.com/DBA

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

2.A.3.158

Department	Computer Science and Engineering			Programme: **B.Tech.**			
Semester	IV			Course Category Code: **PC**		*End Semester Exam Type: **TE**	
Course Code	U23CSTC05	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Operating Systems**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to CSE and IT)

Prerequisite	Nil	
Course Outcome	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the various OS functionalities, structures, and layers	**K2**
	CO2 Usage of system calls related to OS management and interpreting different stages of various process states and process scheduling	**K4**
	CO3 Apply and explore the communication between inter process and Deadlock avoidance.	**K3**
	CO4 Implement page replacement algorithms, memory management problems and segmentation	**K2**
	CO5 Apply various disk scheduling algorithms and I/O Hardware	**K4**

Unit- I	**Introduction to Operating Systems**	**Periods: 09**

Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS. **CO1**

Unit- II	**Process Management and Scheduling Algorithms**	**Periods: 09**

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.
Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR. **CO2**

Unit- III	**Process Synchronization, Threads and Deadlocks**	**Periods: 09**

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem.
Concurrent Programming: Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection, and recovery. **Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads. **Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention and **Deadlock Avoidance:** Banker's algorithm, Deadlock detection and Recovery. **CO3**

Unit- IV	**Memory Management**	**Periods: 09**

Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction.
Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First In First Out (FIFO, Not Recently Used (NRU) and Least Recently Used (LRU). **CO4**

Unit- V	**File, I/O and Device Management**	**Periods: 09**

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.
I/O Hardware: I/O devices, Device controllers, Direct Memory Access, Principles of I/O. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN. **CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

9.A.3.159

Text Books

1.Abraham Silberschatz, Peter B. Galvin, "Greg Gagne-Operating System Concepts", Wiley, 10th Edition, 2019.

2. William Stallings, "Operating Systems: Internals and Design Principles", Pearson, 9th Edition, 2018.

3. Andrew S. Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition,2016.

4. Tanenbaum, Andrew S., and Albert S. Woodhull. "Operating systems: design and implementation", Vol. 68. Englewood Cliffs: Prentice Hall, 1997.

Reference Books

1.Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, "Operating Systems: Three Easy Pieces", Arpaci-Dusseau Books, Inc 2015.

2. Thomas Anderson and Michael Dahlin, "Operating Systems principles and practicell", Wiley, 2nd Edition, 2014.

3. Gary Nutt," Operating System, A modern perspective", 3rd Edition, Addison Wesley, 2004.

4. B.L. Stuart, "Principles of Operating Systems Cengage learning", India Edition, 2004.

5. Deitel, Harvey M., Paul J. Deitel, and David R. Choffnes, "Operating systems", Delhi. Pearson Education: Dorling Kindersley, 2004.

Web References

1. https://nptel.ac.in/courses/106108101/

2. http://www.tcyonline.com/tests/operating-system-concepts

3. http://www.galvin.info/history-of-operating-system-concepts-textbook

4. https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/index.html

5. https://www.cse.iitk.ac.in/pages/CS330.html

Os/POs/PSOs Mapping

Os	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	-	-	-	-	-	2	1	2
2	-	2	-	2	2	2	2	-	-	-	-	2	2	1	2
3	2	2	2	2	2	-	-	-	-	-	2	-	2	1	2
4	3	3	-	3	3	3	3	3	-	-	3	3	2	1	2
5	3	3	3	3	3	3	3	3	-	3	-	3	2	1	2

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

aluation Method

ssessment	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

plication oriented / Problem solving / Design / Analytical in content beyond the syllabus

2-A-3-160

Department	**Computer Science and Engineering**	Programme: **B.Tech.**						
Semester	**IV**	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	**U23CSPC04**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**OPERATING SYSTEMS LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE and IT)

Prerequisite: NIL

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand the basic commands for Linux.	K2
CO2	Develop simple shell programs.	K2
CO3	Implement different Scheduling Algorithms	K5
CO4	Apply the basic concepts of Deadlock Handling procedures.	K4
CO5	Simulate Disk Scheduling Algorithms.	K4

List of Exercises

1. Study of Basic commands to understand the system and working of Linux.
2. Shell scripting (I/O, decision making, looping)
3. Creating Child process (using fork), Zombie, Orphan. Displaying system information using C.
4. Write C programs to simulate the following CPU Scheduling algorithms
   a) FCFS b) SJF c) Round Robin d) priority
5. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
6. IPC (Threads, Pipes)
7. Process synchronization (Producer Consumer / Reader Writer/Dining Philosopher using semaphores)
8. Dynamic Memory Allocation Algorithms (First fit, Best fit, Worst fit)
9. Page Replacement Algorithms. (FIFO, LRU, Optimal)
10. Disk Scheduling Algorithms.

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

Reference Books

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.
3. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, Operating Systems, Three Easy Pieces, Arpaci- Dusseau Books, Inc, 2015.
4. Dhamdhere, Dhananjay M. Operating systems: a concept-based approach, 2E. Tata McGraw-Hill Education, 2006.
5. Deitel, Harvey M., Paul J. Deitel, and David R. Choffnes. Operating systems. Delhi. Pearson Education: Dorling Kindersley, 2004.

Web References

1. https://www.geeksforgeeks.org
2. http://avanthioslab.blogspot.com/2016/08/file-organization-techniques.html
3. https://www.programming.com/programs/c-programs/285-page-replacement-programs-in-c

TE-Theory Exam, LE – Lab Exam

9.A.3.161

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	-	-	-	-		-	-	2
2	-	2	-	2	2	2	2	-	-	-	-	2	-	-	2
3	2	2	2	2	2	2	-	-	-	-	2	-	-	-	2
4	2	2	2	2	3	2	-	-	-	-	2	-	-	-	2
5	2	2	2	2	3	2	-	-	-	-	2	-	-	-	2

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

Evaluation Method

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

2.A.3. 162

Department	Computer Science and Engineering	Programme: B.Tech						
Semester	V	Course Category: PC			End Semester Exam Type: TE			
Course Code	U23CSTC06	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	ARTIFICIAL INTELLIGENCE	3	0	0	3	25	75	100

(Common CSE, IT and CCE)

Prerequisite	Basics of Algorithms and Probability	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand AI fundamentals and apply search strategies to solve complex problems	K2
CO2	Apply the fundamentals of knowledge representation	K3
CO3	Build and Apply Fuzzy logic and Predicate logic.	K3
CO4	Categorize models and manage uncertainty using probabilistic reasoning techniques.	K3
CO5	Apply the AI in different fields	K3

UNIT - I	Introduction to AI and Problem Solving	Periods:09
Overview of AI - Foundations of AI - History of AI - Agents Structure and its types. Problem Solving by Searching: Uninformed search - BFS - DFS - Informed search - Greedy Best First Search - A* Search - AO* Search - Constraint Satisfaction Problem(CSP) - Backtracking search for CSP.		CO1

UNIT - II	Knowledge Representation	Periods:09
Introduction to Knowledge Representation: Types - Approaches - Knowledge representation using Semantic Network – Extended semantic networks - Frames – Conceptual dependencies – Scripts.		CO2

UNIT - III	Fuzzy and Predicate Logic	Periods:09
Basic Concepts of Fuzzy Set Theory – Operations of Fuzzy Sets – Properties of Fuzzy Sets – Crisp Relations – Fuzzy Relational Equations – Operations on Fuzzy Relations – Fuzzy Systems – Logical Agents, Predicate Logic – First-Order Logic, Inference in First-Order Logic, Forward and Backward Chaining.		CO3

UNIT - IV	Probabilistic Reasoning	Periods:09
Probabilistic Notations - Bayes rule - Bayesian Network - Probabilistic reasoning over time: Time and Uncertainty - Understanding Partially Observable Environments - Inference in Temporal Models - Hidden Markov Models - Kalman Filters - Dempster and Shafer Theory.		CO4

UNIT - V	Applications of AI	Periods:09
AI in healthcare: Disease Diagnosis and Prediction.AI In Finance: Automated trading and Portfolio Management – AI in Education: Adaptive Learning and Assessment – AI in Customer service: Chatbot and Virtual Assistance.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson Education, 2020.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, McGraw Hill, 2017.
3. S. Rajasekaran, G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms synthesis and applications",15th Edition, PHI Learning Private Limited,2011.

Reference Books

1. Cherry Bhargava," Artificial Intelligence Fundamentals and Applications", 1st Edition, CRC Press,2021.
2. S. Kanimozhi Suguna, M.Dhivya,Sra Paiva, "Artificial Intelligence Recent Trends and Applications, 1st Edition, "CRC Press,2021.
3. Wolfgang Ertel," Introduction to Artificial Intelligence", 2nd Edition, Springer, 2018.
4. David Poole and Alan Mackworth," Artificial Intelligence: Foundations of Computational Agents", 2nd Edition, Cambridge University Press, 2017.
5. Chris Thornton, Benedict Du Boulay," Artificial Intelligence through Search",4th Edition, Springer Netherlands, 2012.

Web References

1. https://www.tutorialspoint.com/artificial_intelligence/index.htm
2. https://www.javatpoint.com/artificial-intelligence-ai
3. https://www.geeksforgeeks.org/artificial-intelligence/
4. https://towardsdatascience.com/
5. https://www.coursera.org/

* TE – Theory Exam, LE – Lab Exam

9.A.3.163

COs/POs/PSOs Mapping

CO's	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	-	2	2	-	-	-	-	-	-	2	3	2	2
2	3	3	-	2	-	-	-	-	-	-	-	2	2	3	2
3	3	3	3	2	2	-	-	-	-	-	-	2	3	3	2
4	3	2	2	3	3	2	-	-	-	-	-	2	3	3	2
5	2	3	3	2	2	2	2	-	-	-	-	3	3	3	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	5	5	5	5	5	75	100

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

2. A. 3. 164

Department	Computer Science and Engineering	Programme: **B.Tech.**						
Semester	V	Course Category: **PC**			End Semester Exam Type: **LE**			
Course Code	U23CSPC05	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ARTIFICIAL INTELLIGENCE LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**

(Common to CSE, IT and CCE)

Prerequisite	Basics of Algorithms and Probability	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Apply Search Algorithms to implement and compare heuristic-based search algorithms like Greedy Best First Search, A*, and AO* to solve pathfinding and graph-based problems.	K3
	CO2 Solve CSPs with Backtracking to model and solve complex Constraint Satisfaction Problems (CSPs) such as N-Queens or Sudoku using backtracking techniques.	K3
	CO3 Develop Inference Engines: Students will develop forward and backward chaining inference engines, leveraging First-Order Logic for AI decision-making tasks.	K3
	CO4 Examine Probabilistic Reasoning: to construct and use Bayesian Networks, Hidden Markov Models, and Kalman Filters for probabilistic reasoning and sequence prediction tasks.	K3
	CO5 Make use of AI in different applications.	K3

List of Exercises

1. Implement Greedy Best First Search and A* Search for pathfinding problems (e.g., solving a grid-based puzzle).
2. Model a classic Constraint Satisfaction Problem (e.g., N-Queens problem or Sudoku) and solve using backtracking.
3. Implement AO* search for a graph-based problem.
4. Develop an inference engine using forward chaining and backward chaining to deduce conclusions from a given set of facts and rules.
5. Implement basic inference techniques in First-Order Logic using forward and backward chaining for an AI-based decision-making task.
6. Construct a Bayesian Network for a real-world problem (e.g., medical diagnosis) and perform inference using conditional probabilities.
7. Implement a Hidden Markov Model for sequence prediction (e.g., weather prediction or speech recognition).
8. Simulate a Kalman Filter for a tracking or navigation problem (e.g., predicting object positions over time).
9. Implement basic belief functions and apply Dempster-Shafer theory for uncertainty modeling in a decision-making problem.
10. Develop a model to predict stock price movements using historical data.

Lecture Periods: 0	**Tutorial Periods: 0**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Cherry Bhargava," Artificial Intelligence Fundamentals and Applications", 1st Edition, CRC Press,2021.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson, 2020.
3. Elaine Rich, Kevin Knight and Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, McGraw Hill Educations, 2017.
4. Chris Thornton, Benedict Du Boulay," Artificial Intelligence through Search",4th Edition, Springer Netherlands,2012.
5. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms synthesis and applications",15th Edition, PHI Learning Private Limited,2011

Web References

1. https://www.tutorialspoint.com/artificial_intelligence/index.html
2. https://www.javatpoint.com/artificial-intelligence-ai
3. https://www.geeksforgeeks.org/artificial-intelligence/

COs/POs/PSOs Mapping

Co's	Program Outcomes (POs)												Program Outcomes		Specific (PSOs)
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	-	-	-	2	-	-	2	3	3	2
2	3	3	3	3	2	-	-	-	2	-	-	2	3	3	3
3	3	3	3	3	2	-	-	-	2	-	-	2	3	3	3
4	3	3	3	3	2	-	-	-	2	-	-	2	3	3	3
5	3	2	3	2	2	-	-	-	2	-	-	2	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
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2. A. 3. 166

Department	**Computer Science and Engineering**	Programme: **B. Tech**						
Semester	**V**	Course Category: **PC**			End Semester Exam Type: **TE**			
Course Code	**U23CSTC07**	Periods/Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CAM**	**ESE**	**TM**
Course Name	**WEB DESIGNING**	3	0	0	3	25	75	100

(Common to CSE and AI&DS)

Prerequisite	Basic knowledge in Programming and Database		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Interpret the concepts of HTML and CSS in creating and designing web page	**K2**
	CO2	Apply client-side programming using JavaScript	**K3**
	CO3	Interpret the concepts of PHP to include forms and process the form data in web pages	**K2**
	CO4	Apply PHP scripts to handle and manipulate databases	**K3**
	CO5	Apply the web hosting procedures to host a web application in Internet	**K3**

UNIT - I	**Web Basics, Html and CSS**	**Periods:09**	
Web Basics: The Internet – World wide web – DNS – URI and URL – HTTP – web client and web server. Introduction to HTML: HTML Syntax – Structure of HTML Documents – HTML Elements: Headings – Links – Images – Lists – Tables – Forms. Introduction to CSS: CSS Syntax – Location of Styles – Selectors – Box Model – Text Styling – CSS Layout: Positioning Elements – Floating Elements.			**CO1**
UNIT - II	**Javascript**	**Periods:09**	
JavaScript Introduction: Syntax – Variables – Operators – Data Types – Functions – Objects – String Methods – Number Methods – Arrays – Array Methods – Conditions – Loops – Popup Alert – Events – Event Listener. JavaScript Objects: Object Definitions – Object Properties –Object Methods– Object Display.			**CO2**
UNIT - III	**Introduction to PHP and Forms**	**Periods:09**	
Introduction to PHP: Variables – Data Types – Constants – Echo / Print. Operators: Arithmetic – Comparison – Logical – String – If...Else...Elseif – Switch – Loops – Arrays – Functions – Super globals – RegEx. PHP Form: Form Handling – GET/POST – Using Bootstarp – Form Validation – Form Required – Form Submission. Data: Date and Time – File Upload – Cookies – Sessions – Include – Exceptions.			**CO3**
UNIT - IV	**PHP with Database Connectivity**	**Periods:09**	
Introduction to Database: Essential SQL – Creating a MySQL Database – Creating a New Table – Putting Data into the New Database – Accessing the Database in PHP – Updating Databases – Inserting New Data Items into a Database – Deleting Records – Sorting the Data.			**CO4**
UNIT - V	**Web Hosting**	**Periods:09**	
Introduction to Web Hosting: Creating the website – Working on the site – Sending email and access other websites – Registering domains – Themes Publishing web sites – Maintaining a website.			**CO5**

Lecture Periods:45	**Tutorial Periods: 0**	**Practical Periods: 0**	**Total Periods:45**

Text Books

1. Randy Connolly and Ricardo Hoar, "Fundamentals of Web Development", Pearson Education Inc, 3rd Edition, 2022.
2. Steven Holzner, "PHP: The Complete Reference", McGraw Hill Education, 3rd Edition, 2020.
3. Jon Dukett, "JavaScript and JQuery: Interactive Front–End Web Development", Paperback, 2018.

Reference Books

1. Lyza Danger Gardner, "Java Script on Things: Hacking Hardware for Web Developers", Dream tech Press,1st Edition, 2018.
2. Nixon Robin, "Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5", O'Reilly Media, 5th Edition, 2018.
3. Laura Lemay, Rafe Colburn, "Mastering HTML, CSS & Javascript Web", BPB Publications, 1st Edition, 2016.
4. Alex Libby, Gaurav Gupta, Asoj Talesra, "Responsive Web Design with HTML5 and CSS3 Essentials", Packt Publishing, 2nd Edition, 2016.
5. Bassett, Lindsay, "Introduction to JavaScript object notation: a to-the-point guide to JSON", O'Reilly Media, 2015.

Web References

1. https://developer.mozilla.org/en-US/docs/Learn
2. https://www.w3schools.com/sql/default.asp
3. https://www.smashingmagazine.com/2021/03/complete-guide-accessible-front-end-components/
4. https://alistapart.com/article/mobile-first-css-is-it-time-for-a-rethink/
5. https://css-tricks.com/tag/view-transitions/
6. https://www.tutorialspoint.com/php/php_introduction.html

* TE – Theory Exam, LE – Lab Exam

2.A.3.167

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

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

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

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

2-A-3: 168

Department	**Computer Science and Engineering**	Programme: **B.Tech.**					
Semester	**V**	Course Category: **PC**			End Semester Exam Type: **LE**		
Course Code	**U23CSPC06**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**WEB DESIGNING LABORATORY**	0	0	2	1	50	50	100

(CSE and AI&DS)

Prerequisite	Basic knowledge in Programming and Database	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
CO1	Construct and display webpage with HTML and CSS elements	**K3**
CO2	Develop JavaScript programming for website creation	**K3**
CO3	Build PHP Forms	**K3**
CO4	Develop Database Connectivity using PHP	**K3**
CO5	Utilize PHP applications for Web hosting	**K3**

List of Exercises

1. (a) Design a home page which displays information about your college department using headings, HTML entities and paragraphs.
   (b) Create a webpage for any clinic using marquee and HTML formatting tags.
2. Design a timetable and display it in tabular format.
3. Design an admission form for any course in your college with text, password fields, drop-down list, check-boxes, radio buttons, submit and reset button etc.
4. Design a web page of your home town with an attractive background color, text color, an image, font face by using Inline CSS formatting.
5. (a) Design a web page by using different CSS border styles.
   (b) Demonstrate the use of CSS Box Model.
6. Write a JavaScript program to remove a character at the specified position of a given string and return the new string.
7. Develop and demonstrate a HTML file that includes JavaScript script for taking a number n as input using prompt and display first n Fibonacci numbers in a paragraph.
8. Design HTML form for keeping student record, apply JavaScript validation in it for restriction of mandatory fields, numeric field, email-address field, specific value in a field etc.
9. Write a program in PHP for processing a simple form (use controls like checkbox, radio buttons and options).
10. Write a program in PHP for a simple POST and GET functions
11. Design a login form using cookies, bootstrap, PHP, Database.
12. Design a student form with add, update, delete, display all and search option using student database.

Lecture Periods: 0	**Tutorial Periods:0**	**Practical Periods:30**	**Total Periods:30**

Reference Books

1. Lyza Danger Gardner, "Java Script on Things: Hacking Hardware for Web Developers", Dreamtech Press, 1st Edition, 2018.
2. Laura Lemay, Rafe Colburn, "Mastering HTML, CSS and Javascript Web", BPB Publications, 1st edition, 2016.
3. Keith Wald, Jason Lengstorf, "Pro PHP and jQuery", Paperback, 2016.
4. Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript & HTML5 All-in-One", John Wiley and Sons Inc, 2013.
5. Leon Atkinson," Core PHP Programming: Using PHP to Build Dynamic Web Sites", Paperback, 2000.

Web References

1. https://www.w3schools.com/php/DEFAULT.asp
2. https://www.tutorialspoint.com/php/index.html
3. https://www.phptpoint.com/php-tutorial/
4. https://www.javatpoint.com/php-tutorial
5. https://www.w3schools.com/html/default.asp

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

2.A.3.170

Department	Computer Science and Engineering	Programme: B.Tech						
Semester	VI	Course Category: PE			End Semester Exam Type: TE			
Course Code	U23CSE614	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	SERVER-SIDE SCRIPTING LANGUAGES	3	0	0	3	25	75	100
	CSE							
Prerequisite	A basic understanding of Client-Server Architecture & what a web server is.							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand the basics of scripting languages.	K2
	CO2 Experiment about scripting with respective to reactive web Pages	K3
	CO3 Develop the basic functionality using Pearl scripting.	K3
	CO4 Rephrase the basic functionality using Ruby scripting.	K2
	CO5 Inference the in-depth knowledge of programming features of Angular JS	K4

UNIT - I	Introduction to scripts and scripting languages	Periods:09
Introduction to Scripts and Scripting Languages – Scripts and Programs, Uses for Scripting Languages, Web Scripting. JavaScript: Variables, Data Types, Operators, Conditional statements, Loops, Arrays, Functions, Objects- Predefined objects, Accessing objects, Object Methods.		CO1

UNIT - II	JavaScript for reactive web pages elements	Periods:09
JavaScript programming of reactive web pages elements: JavaScript Events- Mouse events, Keyboard events, Form events, window events, Event handlers, Frames, Form object, JavaScript Form Validation		CO2

UNIT - III	PEARL	Periods:09
Data Types, Variables, Scalars, Operators, Conditional statements, Loops, Arrays, Strings, Hashes, Lists, Built-in Functions, Pattern matching and regular expression operators.		CO3

UNIT - IV	RUBY	Periods:09
Data types, Variables, Operators, Conditional statements, Loops, Methods, Blocks, Modules, Arrays, Strings, Hashes, File I/O, Ruby Form handling.		CO4

UNIT - V	AngularJS	Periods:09
AngularJS Development Environment, Expressions in AngularJS, AngularJS Directives, Data Binding, AngularJS Model Modes, One Way Binding, Two Way Binding, AngularJS Controller, AngularJS Scope, AngularJS Filters, AngularJS Forms.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. David Flanagan, "JavaScript: The Definitive Guide: Master the World's Most-Used Programming Language", 7th Edition, O'Reilly Publications, 2020.
2. O'Reilly, "Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites", 3rd Edition, O'Reilly Publications, 2014.
3. Tom Christiansen, Brian D Foy, Larry Wall, Jon Orwant," Programming Perl", 4th Edition, O'Reilly Media,2012.
4. David Barron, "The World of Scripting Languages", 1st Edition, Wiley Publications, 2009.

Reference Books

1. Russ Ferguson, Christian Heilmann, "Beginning JavaScript with Dom scripting and AJAX", 2nd Edition, Apress,2013.
2. David Flanagan and Yukihiro Matsumoto, "The Ruby Programming Language", 1st Edition, O'Reilly Publications,2008.
3. J. Lee, B. Ware, "OpenSource Web Development with LAMP using Linux Apache, MySQL, Perl and PHP", 1st Edition, Pearson Education, 2003.

Web References

1. https://www.ruby-lang.org/en/
2. https://www.geeksforgeeks.org/ruby-programming-language/
3. https://www.javatpoint.com/perl-tutorial
4. https://www.tutorialspoint.com/perl/index.htm
5. https://www.perl.org/learn.html
6. https://www.w3schools.com/angular/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

2.A.3.131

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	-	-
2	2	2	3	-	-	-	-	-	-	-	-	-	2	-	-
3	2	2	3	2	-	-	-	-	-	-	-	-	2	-	-
4	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
5	2	3	3	-	-	-	-	-	-	-	-	-	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	5	5	5	5	5	75	100

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

2-A.3.172

Department	Computer Science and Engineering	Programme: B.Tech						
Semester	V/VIII	Course Category: PE				End Semester Exam Type: TE		
Course Code	U23CSEC02	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Introduction to Industry 4.0	3	0	0	3	25	75	100

(Common to CSE and Mechatronics)

Prerequisite	NIL	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand key Industry 4.0 Concepts and Technologies.	K1
	CO2 Explore advanced technologies like AI, Big Data and Robotics.	K2
	CO3 Comprehend the working of Cloud Computing Technologies	K3
	CO4 Learn how AR/VR improves Industrial Automation and Safety.	K2
	CO5 Apply design thinking and explore IIoT Use Cases and Cybersecurity.	K3

UNIT - I	Foundations Of Industry 4.0 and Smart Systems	Periods:09
Introduction to Industry 4.0 - The Fourth Industrial Revolution - Globalization and Emerging Issues Lean Production Systems - Smart and Connected Business Perspectives - Cyber-Physical Systems (CPS) - Introduction to Sensing and Actuation - Introduction to IIoT (Industrial Internet of Things) - FDM Machine and 3D Printing Demonstration - Case Studies in Industry 4.0.		CO1

UNIT - II	Key Technologies and Advanced Analysis In Industry 4.0	Periods:09
Next-Generation Sensors - Collaborative Platforms and Product Lifecycle Management (PLM) - Artificial Intelligence (AI) in Industry 4.0 - Big Data and Advanced Analytics - Introduction to Robotics - Introduction to UAVs (Drones) - Energy-Efficient Technologies - Collaborative Robots (Cobots) - Artificial Intelligence and Data Analytics for Predictive Maintenance.		CO2

UNIT - III	Cloud Computing Technologies and Industrial Applications	Periods:09
Introduction to Cloud Technologies - Top Cloud Service Providers - Cloud Computing in Industry 4.0 -Azure IoT Hub and Cloud Services - Edge and Fog Computing - Hybrid Cloud Solutions - Cloud-Based Big Data Platforms - Cloud Security - Cloud Solutions for Smart Cities.		CO3

UNIT - IV	Augmented Reality (AR), Virtual Reality (VR), and Industrial Automation	Periods:09
Introduction to AR and VR in Industry 4.0 - Industrial Use Cases of AR and VR - AR/VR in Maintenance and Inspection - Mixed Reality (MR) and Digital Twins - Automation Tools and Techniques -VR for Industrial Safety and Training - Challenges in AR/VR Adoption.		CO4

UNIT - V	Design Thinking, IIOT, and Case Studies	Periods:09
Introduction to Design Thinking - Design Thinking Process - Human-Centered Design for Industrial Applications - Basics of Industrial IoT (IIoT) - Industrial Processes and Automation - Cybersecurity in Industry 4.0 - Real-time Use Cases - Drones and UAVs in Industry - UAV Regulations and Safety Standards - Future of Industry 4.0.		CO5

Lecture Periods:45	Tutorial Periods: 0	Practical Periods: 0	Total Periods:45

Text Books

1. Ravi Kant, Hema Gurung, "Industry 4.0: Concepts, Processes and Systems", CRC Press,2023.
2. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress,2016.
3. Emre Cevikcan, Alp Ustundag, "Industry 4.0: Managing The Digital Transformation", Sprniger,2017.

Reference Books

1. Soumya Das, "Industry 4.0 with SAP", Rheinwerk,2024.
2. Abhinav Sharma, Arpit Jain, Paawan Sharma, Mohendra Roy, "Recent Trends and Best Practices in Industry 4.0", River Publishers,2023.
3. Anand Nayyar, Mohd Naved, Rudra Rameshwar, New Horizons for Industry 4.0 in Modern Business, Springer,2023.
4. Dominik T. Matt, Vladimír Modrák, Helmut Zsifkovits, Industry 4.0 for SMEs: Challenges, Opportunities and Requirements, Palgrave Macmilla,2020.
5. Bruno S. Sergi, Elena G. Popkova, Aleksei V. Bogoviz, Tatiana N. Litvinova, "Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work", Emerald Publishing Limited,2019.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_cs69/preview
2. https://www.oracle.com/in/industrial-manufacturing/industry-4-components/
3. https://aws.amazon.com/blogs/iot/tag/industry-4-0/

* TE – Theory Exam, LE – Lab Exam

2.A.3.173

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	3	3	2	2	2	-	-	2	-	-	2	2	2	2
2	2	3	3	3	2	3	-	-	2	-	-	2	2	2	2
3	3	3	2	3	2	3	-	-	2	-	-	2	3	2	3
4	2	2	2	3	2	3	-	-	2	2	-	2	2	2	2
5	2	2	3	3	2	2	-	-	2	2	-	2	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

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