D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)

(Accredited with A^{++} Grade by NAAC & Accredited by NBA(B.Tech-CSE, ECE & EEE))

BALUSUMUDI, BHIMAVARAM, W.G.Dist., A.P., PIN-534 202

Ph*: 08816-221238, *Email: dnrcet@gmail.com*, *Website: https://dnrcet.org

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

THIRD BOARD OF STUDIES (BOS) MEETING
(Held on 20-01-2026)

Vision & Mission of the Institute

Vision of the Institution:

To evolve as a Quality Institution in Teaching, Innovative Research, Entrepreneurship and Consultation in Engineering & Technology, empower rural youth globally competent and self-disciplined technocrats.

Mission of the Institution:

IM_1: Inculcate technical knowledge, soft skills through student centric teaching & learning.

IM_2: Strengthen industry institute interaction, provide solutions to the ever-changing requirements.

IM_3: Implant entrepreneurial attitude and ethical values.

IM_4: Create work culture towards learning, Research & Development.

IM_5: Develop a unique practice that instills responsibility and accountability among the stakeholders

Vision & Mission of the Department

Vision of the Department:

To become an identified development center for high quality professionals in the area of Computer Sciehce and Engineering serving the societal needs.

Mission of the Department:

DM_1: Train the stakeholders in the area of Computer Science and Engineering.

DM_2: Organize innovative technical training and leadership activities to groom professionals.

DM_3: Provide quality resources towards research and development on Artificial Intelligence.

Program Educational Objectives (PEOs)

Graduates of the Program will be

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
PEO-1	Apply engineering knowledge in the chosen fields with ethics and professional values.
PEO-2	Continue to learn and solve real life problems inculcate with interdisciplinary teams.
PEO-3	Face the challenges in industry and purse higher studies.

Program Outcomes (POs)

After successful completion of the Program, the graduates will be able to

PROGRAM OUTCOMES (POS)		
1	**Engineering knowledge:**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis:**	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**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.
4	**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.
5	**Modern tool usage:**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6	**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.
7	**Environment sustainability:**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:**	Function effectively as an individual, and as a member or leader in diverse teams, and in

		multidisciplinary settings.
10	**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.
11	**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.
12	**Lifelong 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.

Program Specific Outcomes (PSOs)

After successful completion of the Program, the graduates will be able to

PROGRAM SPECIFIC OUTCOMES (PSOS)	
PSO-1	Develop Computer Applications by applying Artificial Intelligence
PSO-2	Demonstrate the skills in the field of Networks, Web – Design, Cloud Computing and Data Analytics.

Mission of the Department – PEOs mapping

PEO Statements	DM1	DM2	DM3
PEO1: Apply engineering knowledge in the chosen fields with ethics and professional values.	3	3	3
PEO2: Continue to learn and solve real life problems inculcate with interdisciplinary teams.	3	3	2
PEO3: Face the challenges in industry and pursue higher studies.	2	3	3

Note:

Blooms Taxonomy Knowledge Level	Knowledge Level Representation
6 : Create	L6
5 : Evaluate	L5
4: Analyze	L4
3: Apply	L3
2: Understand	L2
1: Remember	L1

Mapping or Correlation Levels	
1:	Slight (Low)
2:	Moderate (Medium)
3:	Substantial (High)

Consistency or Justification of Co-relation parameters of the above matrix

Mapping Justification			
PEOs	**Mission Element**	**Mapping Level**	**Justification**
PEO1 **(Core Skills)**	DM1 **(Engineering Knowledge)**	3	PEO1 has high correlation with DM 1 as the Mission1 focuses on the quality teaching learning processes to acquire engineering Professional skills.
PEO1 **(Core Skills)**	DM2 **(Technical Knowledge)**	3	PEO1 has high correlation with DM 2 as the Mission 2 focuses on leadership capabilities of the graduates through various activities.
PEO1 **(Core Skills)**	DM3 **(Professional Knowledge)**	3	PEO1 has high correlation with DM 3 as the Mission 3 focuses on innovative research follows development on AI.
PEO2 **(Ethical and Professional Skills)**	DM1 **(Engineering Knowledge)**	3	PEO2 has high correlation with DM 1 as the Mission1 focuses on the application development in computer science & engineering.
PEO2 **(Ethical and Professional Skills)**	DM2 **(Technical Knowledge)**	3	PEO2 has high correlation with DM 2 as the Mission 2 focuses on seminars and workshops on practices /duties conducted for the students to train them about their duties and responsibilities.
PEO2 **(Ethical and Professional Skills)**	DM3 **(Professional Knowledge)**	2	PEO2 has moderate correlation with DM 3 as the Mission 3 focuses on the student participation for consultancy activities and real time projects are encouraged.

PEO3 **(Problem Solving and Lifelong Learning)**	DM1 **(Engineering Knowledge)**	2	PEO3 has moderate correlation with DM 1 as the Mission1 focuses on the quality education imparted through academically proficient teachers trained in institutes of repute would prepare graduates to evolve into professionally ethically sound engineers to meet the current technical challenges.
PEO3 **(Problem Solving and Lifelong Learning)**	DM2 **(Technical Knowledge)**	3	PEO3 has high correlation with DM 2 as the Mission 2 focuses on the Organize of activities to nurture graduates into ethically strong and responsible engineers capable of addressing global challenges in the area of Computer Science & engineering.
PEO3 **(Problem Solving and Lifelong Learning)**	DM3 **(Professional Knowledge)**	3	PEO3 has high correlation with DM 3 as the Mission3 focuses on the knowledge, practical skills and research aptitude sharpen at the institution would enable the graduates to have an urge for the lifelong learning.

PEOs mapping with department mission statements and justification of mapping

PEOs	DM1	Justification
PEO1	3	PEO1 has high correlation with DM1 as the Mission1 focuses on the quality teaching learning processes to acquire engineering professional skills.
PEO2	3	PEO1 has high correlation with DM1as the Mission 1 focuses on leadership capabilities of the graduates through various activities.
PEO3	2	PEO1 has moderate correlation with DM1 as the Mission 1 focuses on innovative research follows development on AI.
PEOs	**DM2**	**Justification**
PEO1	3	PEO2 has moderate correlation with DM2 as the Mission2 focuses on the application development in Computer Science & Engineering.
PEO2	3	PEO2 has high correlation with DM2 as the Mission2 focuses on seminars and workshops on practices /duties conducted for the students to train them about their duties and responsibilities.
PEO3	2	PEO2 has moderate correlation with DM2 as the Mission2 focuses on the student participation for consultancy activities and real time projects are encouraged.
PEOs	**DM3**	**Justification**
PEO1	3	PEO3 has high correlation with DM3 as the Mission3 focuses on the quality education imparted through academically proficient teachers trained in institutes of repute would prepare graduates to evolve into professionally ethically sound engineers to meet the current technical challenges.
PEO2	3	PEO3 has moderate correlation with DM3 as the Mission3 focuses on the Organize of activities to nurture graduates into ethically strong and responsible engineers capable of addressing global challenges in the arena of Computer Science & Engineering.
PEO3	2	PEO3 has high correlation with DM3 as the Mission3 focuses on the knowledge, practical skills and research aptitude sharpen at the institution would enable the graduates to have an urge for the lifelong learning.

Graduate Accomplishments

Graduate Accomplishments:

GA1. Preparation – Employment/Higher studies
GA2. Core competence – Discipline knowledge
GA3. Core competence – 'T' shaped Engineer
GA4. Professionalism – 3 Ps – Professional value – knowledge – development
GA5. Lifelong learning - Environment

PEOs Mapping with Graduate Accomplishments:

	GA1	GA2	GA3	GA4	GA5
PEO1	3	3	2	3	3
PEO2	2	2	3	2	2
PEO3	3	3	2	2	3

Justification for Department PEOs with Graduate Accomplishments

Department PEOs	Graduate Accom-plishments	Mapping level	JUSTIFICATION
PEO1	GA1	3	Apply engineering knowledge for improving placements and Higher studies
PEO1	GA2	3	Apply engineering knowledge for improving placements and Higher studies
PEO1	GA3	2	Apply engineering knowledge for improving placements and Higher studies
PEO1	GA4	3	Apply engineering knowledge for improving placements and Higher studies
PEO1	GA5	3	Apply engineering knowledge for improving placements and Higher studies
PEO2	GA1	2	Continue to learn Core & interdisciplinary knowledge
PEO2	GA2	2	Continue to learn Core & interdisciplinary knowledge
PEO2	GA3	3	Continue to learn Core & interdisciplinary knowledge
PEO2	GA4	2	Continue to learn Core & interdisciplinary knowledge
PEO2	GA5	2	Continue to learn Core & interdisciplinary knowledge
PEO3	GA1	3	Improve the Professional values and Face the challenges in industry
PEO3	GA2	3	Improve the Professional values and Face the challenges in industry
PEO3	GA3	2	Improve the Professional values and Face the challenges in industry
PEO3	GA4	2	Improve the Professional values and Face the challenges in industry
PEO3	GA5	3	Improve the Professional values and Face the challenges in industry

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Mr. B NANDANA KUMAR.
M. Tech (CSE),(PhD),
HoD, CSE

BHIMAVARAM
W. G. DIST (AP)
PIN: 534202

CIRCULAR

Ref: *DNRCET/CSE/2026-27/BoS/C-3* **Date:** *09.01.2026*

It is to inform all BoS members of the CSE department to attend the BoS meeting to be conducted ***on 20th January, 2026*** at ***10:00 a.m.*** The following agenda is being discussed.

Agenda:

1. Welcome Speech by the Chairperson.
2. Introducing the members of the Board of Studies.
3. To discuss and finalize the proposed III B. Tech. I & II Semester Course structure and Syllabus of DR24 Regulations.
4. To discuss and finalize the proposed M. Tech. Course structure and Syllabus of DR25 Regulations.
5. To discuss and finalize Syllabus for M. Tech I Sem (PG) course of AI &ML for Mechanical Engineering in Department of Mechanical Engineering.
6. Ratification of Course Objectives and Course Outcomes for the proposed Curriculum.
7. Finalization of Model Question Papers and List of Paper Setters.
8. Any other item with the permission of the chair.

G. I V. S
Member Secretary

Nandan Kumar
Chairperson Board of Studies /
Head of the Department
Department of Computer Science & Engineering

Head of the Department
Department of Computer Science & Engineering
D.N.R. College of Engineering & Technology
BHIMAVARAM-534 202.

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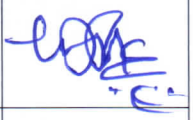
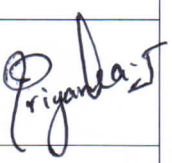
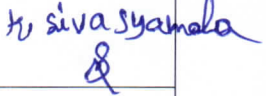
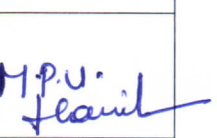
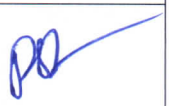
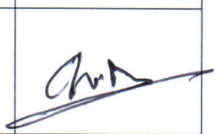
Mr. B Nandana Kumar
M. Tech (CSE), (PhD),
Assistant Professor & HoD, CSE

Department of Computer Science & Engineering
E-Mail: csehod@dnrcet.org
Mobile: +91-9550555254, Phone: 08816-221237

List of members of Board of Studies

S. No.	Category	Name	Position	Signature
1	Chairperson	Mr. B. Nandana Kumar	Assistant Professor & HoD Department of CSE DNRCET, Bhimavaram	
2	Expert Nominated by Vice-Chancellor	Dr. N. Ramakrishnaiah	Professor, CSE Department, UCEK, JNTUK Kakinada, Kakinada – 533003.	Attended ON-LINE
3	Subject Experts from outside Parent Universities	Dr. V. Chandrasekhar,	Professor & HoD, Department of CSE, S. R. K. R. Engineering College (A), BHIMAVARAM 534202.	Attended ON-LINE
4		Dr. P. Kiran Sree,	Professor & HoD, Department of CSE, Shri Vishnu Engineering College for Women (A), Bhimavaram, W.G. Dist., A.P.	Attended ON-LINE
5	Member (Industrial Expert)	Rajiv Chand Kakarla	CEO, Amaravathi Software Innovations, Rajahmundry, East Godavari District, A.P.,	Attended ON-LINE
6	Members Secretary	Mr. K. T. V. Subba Rao	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
	Faculty Members	Mrs.V Navya Devi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. N. Bharathi	Assistant Professor, Department of CSE,	

			DNRCET, Bhimavaram.	
		Mr. L. Dhanaratna Kishore	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. B. Supraja	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. G. V. Sriram	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. D Tejaswini	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. P. Lalitha Rajeswari	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. J. Priyanka	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Ms. K. Siva Syamala	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. M. V. S. K. Prabhavathi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. Ch. Venkat Reddy	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. M. P. V. Harika	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. K. R. S. Spandana	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. M. Bhargavi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. B. Suryanarayana Murthy	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. K. Rambabu	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	

		Mr. P. Sirish Kumar	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. B. Ravi Kiran	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. B. Prasanna Kumar	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. K. Radha Krishna	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. K. Tulasiram	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. K Chanti Babu	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. I. Ramadevi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Ms. D. Phani Sri Lakshmi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. T. Venkatesh	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. Ch. Somesh Kumar	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
8	Member (College Alumni)	K. S. Sai Kumar (219P1D5804)	Assistant Professor, Department of CE, VIT, Bhimavaram.	

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Department of Computer Science & Engineering

Date: 9.01.2026

To
Dr. N. Ramakrishnaiah,
Professor,
CSE Department,
UCEK, JNTUK Kakinada,
Kakinada – 533003.

Sub: DNR College of Engineering & Technology – Department of Computer Science & Engineering – Board of Studies Meeting – Reg.

We take the privilege in inviting you for the Board of Studies Meeting of Department of Computer Science & Engineering, DNR College of Engineering & Technology as an Expert Nominated by Vice-Chancellor, JNTUK, Kakinada. It is proposed to discuss and finalize the course structure and syllabi for the 3rd year of DR24 B. Tech (CSE) course curriculum and the DR25 M. Tech (CSE) course curriculum.

In this regard, you are requested to attend the meeting scheduled to be held on **20.01.2026** at **10.00 AM** in online mode.

Kindly accept our invitation and make it convenient to attend the Board of Studies meeting.

Thanking You Sir

Yours Sincerely,

Nandankumar

Chairperson Board of Studies /
Head of the Department

Head of the Department
Department of Computer Science & Engineering
D.N.R. College of Engineering & Technology
BHIMAVARAM-534 202.

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Department of Computer Science & Engineering

Date: 9.01.2026

To

Dr. V. Chandrasekhar,
Professor & Dean,
Department of Computer Science & Engineering,
S. R. K. R. Engineering College (A),
BHIMAVARAM 534202.

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of Computer Science & Engineering – Board of Studies Meeting – Reg.

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Department of Computer Science & Engineering

Date: 09.01.2026

To
Dr. P. Kiran Sree,
Professor & HoD,
Department of Computer Science & Engineering,
Shri Vishnu Engineering College for Women (A),
Bhimavaram, W.G. Dist., A.P.

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of Computer Science & Engineering – Board of Studies Meeting – Reg.

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Head of the Department

Head of the Department
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Department of Computer Science & Engineering

Date: 09.01.2026

To

Rajiv Chand Kakarla
CEO, Amaravathi Software Innovations
Rajahmundry,
East Godavari District, A.P.,

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of Computer Science & Engineering – Board of Studies Meeting – Reg.

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Nandan Kumar

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Head of the Department

Head of the Department
Department of Computer Science & Engineering
D.N.R. College of Engineering & Technology
BHIMAVARAM-534 202.

hodcse dnrcet <hodcse@dnrcet.org>

BoS meeting regarding

1 message

hodcse dnrcet <hodcse@dnrcet.org> Tue, Jan 19, 2026 at 9:55 AM
To: nrkrishna27@gmail.com

Respected sir, we are from Dept. of CSE,DNRCET(9P) conducting 3rd BoS Meeting on behalf of this we are inviting to BoS meeting at 10.0AM on 20-1-2026

DNR CET1 is inviting you to a scheduled Zoom meeting.

Topic: 3rd Board of Studies(BoS) Meeting-CSE DEPT, DNRCET
Time: Jan 20, 2026 10:00 AM India
Join Zoom Meeting
https://us05web.zoom.us/j/88487589518?pwd=DaFnxzXtq2y5YXUMgvb8Tc7VlwA3ew.1

Meeting ID: 884 8758 9518
Passcode: 12345

Join instructions
https://us05web.zoom.us/meetings/88487589518/invitations?signature=pH75yhBvEAwmplTZd7VBXwFzAG37o5RYq-jJKrVLzDA

hodcse dnrcet <hodcse@dnrcet.org>

BoS meeting regarding

1 message

hodcse dnrcet <hodcse@dnrcet.org> Tue, Jan 20, 2026 at 8:48 AM
To: hodcse@svecw.edu.in

Respected sir, we are from Dept. of CSE,DNRCET(9P) conducting 3rd BoS Meeting on behalf of this we are inviting to BoS meeting at 10.0AM on 20-1-2026

DNR CET1 is inviting you to a scheduled Zoom meeting.

Topic: 3rd Board of Studies(BoS) Meeting-CSE DEPT, DNRCET
Time: Jan 20, 2026 10:00 AM India
Join Zoom Meeting
https://us05web.zoom.us/j/88487589518?pwd=DaFnxzXtq2y5YXUMgvb8Tc7VIwA3ew.1

Meeting ID: 884 8758 9518
Passcode: 12345

Join instructions
https://us05web.zoom.us/meetings/88487589518/invitations?signature=pH75yhBvEAwmpITZd7VBXwFzAG37o5RYq-jJKrVLzDA

hodcse dnrcet <hodcse@dnrcet.org>

BoS meeting regarding

1 message

hodcse dnrcet <hodcse@dnrcet.org> Tue, Jan 20, 2026 at 8:50 AM
To: dr.vcs@srkrec.ac.in

Respected sir, we are from Dept. of CSE,DNRCET(9P) conducting 3rd BoS Meeting on behalf of this we are inviting to BoS meeting at 10.0AM on 20-1-2026

DNR CET1 is inviting you to a scheduled Zoom meeting.

Topic: 3rd Board of Studies(BoS) Meeting-CSE DEPT, DNRCET
Time: Jan 20, 2026 10:00 AM India
Join Zoom Meeting
https://us05web.zoom.us/j/88487589518?pwd=DaFnxzXtq2y5YXUMgvb8Tc7VIwA3ew.1

Meeting ID: 884 8758 9518
Passcode: 12345

Join instructions
https://us05web.zoom.us/meetings/88487589518/invitations?signature=pH75yhBvEAwmplTZd7VBXwFzAG37o5RYq-jJKrVLzDA

D. N. R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)

BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

Ph: 08816-221238, Email: dnrcet@gmail.com , ***Website:*** https://dnrcet.org

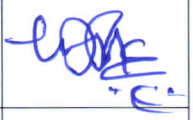
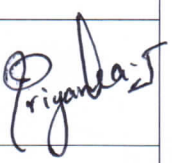
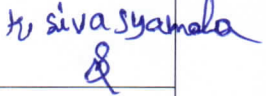
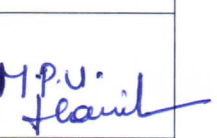
Accredited with A^{++} Grade with 3.73/4 CGPA by NAAC and Accredited by NBA (B. Tech- CSE, ECE & EEE)

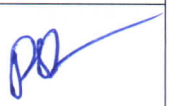
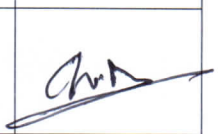
Mr. B Nandana Kumar
M. Tech (CSE), (PhD),
Assistant Professor & HoD, CSE

Department of Computer Science & Engineering
E-Mail: csehod@dnrcet.org
Mobile: +91-9550555254, Phone: 08816-221237

List of members of Board of Studies

S. No.	Category	Name	Position	Signature
1	Chairperson	Mr. B. Nandana Kumar	Assistant Professor & HoD Department of CSE DNRCET, Bhimavaram	
2	Expert Nominated by Vice-Chancellor	Dr. N. Ramakrishnaiah	Professor, CSE Department, UCEK, JNTUK Kakinada, Kakinada – 533003.	Attended ON-LINE
3	Subject Experts from outside Parent Universities	Dr. V. Chandrasekhar,	Professor & HoD, Department of CSE, S. R. K. R. Engineering College (A), BHIMAVARAM 534202.	Attended ON-LINE
4		Dr. P. Kiran Sree,	Professor & HoD, Department of CSE, Shri Vishnu Engineering College for Women (A), Bhimavaram, W.G. Dist., A.P.	Attended ON-LINE
5	Member (Industrial Expert)	Rajiv Chand Kakarla	CEO, Amaravathi Software Innovations, Rajahmundry, East Godavari District, A.P.,	Attended ON-LINE
6	Members Secretary	Mr. K. T. V. Subba Rao	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
	Faculty Members	Mrs.V Navya Devi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. N. Bharathi	Assistant Professor, Department of CSE,	

			DNRCET, Bhimavaram.	
		Mr. L. Dhanaratna Kishore	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. B. Supraja	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. G. V. Sriram	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. D Tejaswini	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. P. Lalitha Rajeswari	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. J. Priyanka	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Ms. K. Siva Syamala	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. M. V. S. K. Prabhavathi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. Ch. Venkat Reddy	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. M. P. V. Harika	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. K. R. S. Spandana	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. M. Bhargavi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. B. Suryanarayana Murthy	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. K. Rambabu	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	

		Mr. P. Sirish Kumar	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. B. Ravi Kiran	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. B. Prasanna Kumar	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. K. Radha Krishna	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. K. Tulasiram	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. K Chanti Babu	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mrs. I. Ramadevi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Ms. D. Phani Sri Lakshmi	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. T. Venkatesh	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
		Mr. Ch. Somesh Kumar	Assistant Professor, Department of CSE, DNRCET, Bhimavaram.	
8	Member (College Alumni)	K. S. Sai Kumar (219P1D5804)	Assistant Professor, Department of CE, VIT, Bhimavaram.	

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Ref: *DNRCET/CSE/2025-26/BoS/MoM-3* **Date:** *20.01.2026*

Board of Studies (BoS) Minutes of Meeting

20th JANUARY, 2026 at 10:00 a.m.

Agenda:

1. Introducing the members of Board of Studies.
2. Discussion on III-year Semester I & II course structure for B. Tech (Computer Science & Engineering) Program for the academic year 2026-27.
3. Discussion on I Year Semester I & II for M. Tech (Computer Science & Engineering) Program for the academic year 2025-26.
4. Discussion on preparation of course syllabus in accordance to JNTUK course structure and syllabus.
5. To discuss and finalize Syllabus for M. Tech I Sem (PG) course of AI &ML for Mechanical Engineering in Department of Mechanical Engineering.
6. Discussion on Academic Regulations of PG Program.
7. Discussion and finalizing the model papers of both UG and PG.
8. Any other agenda with the permission of the chair.

The Board of Studies meeting held on 20th JANUARY, 2026 at 10:00 am through online & offline mode with the welcome speech by Mr. B NANDANA KUMAR, Assistant Professor & Head of department / Chairperson of BoS.

The points mentioned in the agenda were discussed, and the details are listed below:

Agenda No. 1: The Board of Studies (BoS) for Computer Science and Engineering department is constituted by the chairperson as per the guidelines of Academic Council. The Chairperson introduced all nominated Board of Studies members of department of Computer Science & Engineering to each other.

Agenda No. 2, 3, 4, 5, 6: The BoS members discussed on the agenda 2, 3, 4, 5 and made the following resolutions.

Resolution on Agenda 2, 3, 4, 5, 6 :

1. The members of the Board of Studies (BoS) and the chairperson made the decision to there are no changes in the B. Tech (DR24) III-year detailed syllabus, and it has been followed as prescribed by JNTUK, Kakinada, without any modifications and R-25 regulations for M. Tech Program for the academic year 2025-26 that were put into place for first year students. Syllabus for M. Tech I Sem (PG) course of AI & ML for Mechanical Engineering in Department of Mechanical Engineering. This included adhering the

DR 25 REGULATIONS

M. Tech

CURRICULUM

(Applicable for batches admitted from 2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

AUTONOMOUS

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Accredited with A^{++} Grade by NAAC & Accredited by NBA (B. TECH – CSE, ECE & EEE)

ACADEMIC REGULATIONS - DR25 FOR M. Tech (REGULAR) DEGREE COURSE

Applicable for the students admitted to M. Tech (Regular) Course from the Academic Year 2025-26 and onwards. The M. Tech Degree of Jawaharlal Nehru Technological University Kakinada shall be conferred on candidates who are admitted to the program and who fulfil all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

Admissions shall be made on the basis of merit/rank obtained by the candidates (i) in national level qualifying Entrance Test (GATE), (ii) AP PGECET conducted by State Government and (iii) Few Sponsored seats notified by university on the basis of any order of merit as approved by the State Government /University, subject to reservations as laid down by the Government from time to time.

2.0 AWARD OF M. Tech DEGREE

2.1 A student shall be declared eligible for the award of the M. Tech Degree, if he pursues a course of study in not less than two and not more than four academic years. Under any circumstances, permission shall not be given to complete the course work beyond four years.

2.2 **The student shall register for all 80 credits and secure all the 80 credits.**

2.3 The minimum instruction period in each semester is 16 weeks.

3.0 PROGRAMME OF STUDY

The following specializations are offered at present for the M. Tech Programme of study.

M.Tech in

1. Computer Science & Engineering
2. Digital Electronics and Communication Systems
3. Structural Engineering
4. Machine Design

and any other course as approved by AICTE/ University from time to time.

4.0 ATTENDANCE

4.1 Attendance is calculated separately for each course. Attendance in all classes (Lectures/Laboratories) is compulsory. The minimum required attendance in each course is 75%. A student shall not be permitted to appear for the Semester End Examinations (SEE), if his/her attendance is less than 75%.

4.2 Condoning of shortage of attendance (between 65% and 75%) up to a maximum of 10% (*considering the days of attendance in sports, games, NSS activities and medical exigencies*) in each course (Theory/Lab/Seminar) is condoned on production of valid Certificates/documents in the stipulated time mentioned here with:

4.2.1 Students who are admitted as in patients for treatment are only eligible to claim condonation of attendance. Such students under medical exigencies need to Produce (a) Doctor Medical Prescription, (ii) Medical bills duly signed by Doctor/Hospital authorities, (c) Diagnosis reports, if any, (d) Discharge summary issued at the time of discharge and any other supporting documents within two week(s) from the date of discharge to the respective institution.

Note: University at any point of time can inform the institution(s) to submit such list/proofs. *Hence, respective institution shall verify and accord condonation privilege scrupulously*.

4.2.2 Students' participation in Sports/Games and NSS activities shall also be permitted for condonation of attendance. In such cases, they need to produce (a) invitation letter from the organizing institute/agency, (ii) participation certificate and any supporting documents within two week(s) from the date of participation to the respective institution

4.3 A prescribed fee per course shall be payable for condoning shortage of attendance after getting the approval of College Academic Committee for the same. The College Academic Committee shall maintain all the relevant documents along with the request from the students, whose attendance is condoned.

4.4 Shortage of Attendance below 65% in any course shall in no case be condoned.

4.5 A Student, whose shortage of attendance is not condoned in any course(s) (Theory/Lab/Seminar) in any Semester, is considered as '**Detained in that course(s)**, and is not eligible to write Semester End Examination(s) of such Course(s), (in case of Seminar, his/her Seminar Report or Presentation are not eligible for evaluation) in that Semester; and he/she has to seek re-registration for those course(s) in subsequent Semesters, and attend the same as and when offered.

4.6 A student shall put in a minimum required attendance in at least FOUR courses in I semester for promotion to II Semester; and at least FOUR courses in II semester for promotion to III Semester.

Re-admission / re-registration

4.7 A student shall not be permitted to appear for the Semester End Examinations (SEE) in a course unless they meet the prescribed attendance requirements for that course. Such students may take readmission for the course in the subsequent semester when it is offered by paying the prescribed fee, *at least 30 days before the commencement of classwork*. The college must obtain permission from the University by submitting the list of students eligible/applied for readmission before the commencement of classwork

4.8 Students who fail due to **less internal marks (less than 50%)** may register for the course within the maximum permissible duration of the Program.

4.9 In such a case, the candidate must re-register for the course(s) and secure the required minimum attendance. The candidate's attendance in the re-registered course(s) shall be calculated separately to decide upon eligibility for writing the end examination in those course(s).

4.10 In a semester, students are permitted to re-register maximum of THREE courses.

4.11 Upon re-registration, the student's previous performance in the respective course(s) will be nullified. Re-registration must be completed by paying the prescribed fee at least 30 days prior to the commencement of classwork. The college is required to obtain approval from the University by submitting a list of eligible and interested students before the start of commencement of classwork.

5.0 EVALUATION

The performance of the candidate in each semester shall be evaluated course-wise, with a maximum of 100 marks for theory and 100 marks for practical, on the basis of Internal Evaluation and End Semester Examination.

5.1 For the theory courses 60 marks shall be awarded based on the performance in the End Semester Examination and 40 marks shall be awarded based on the Internal Evaluation. The continuous / internal evaluation shall be made based on the **average** of the marks secured in the two CIE/Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each CIE/midterm examination shall be conducted for a total duration of 120 minutes with 4 questions (without choice) each question for 10 marks. End semester examination is conducted for 60 marks for all FIVE (5) questions (one question from one unit) to be answered (either or).

5.2 For practical courses, 60 marks shall be awarded based on the performance in the End Semester Examinations and 40 marks shall be awarded based on the day-to-day performance as Internal Marks. The internal evaluation based on the day-to-day work-10 marks, record- 10 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with breakup marks of Procedure-**15,** Experimentation- **25,** Results-10, Viva-voce-10.

5.3 For Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Seminar, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

5.4 A candidate shall be deemed to have secured the minimum academic requirement in a course if he secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

5.5 Laboratory examination for M. Tech. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher or teacher of the respective college and the second examiner shall be appointed by the University from the panel of examiners submitted by the respective college.

5.6 Students shall undergo mandatory summer internship / industrial training (3 credits) for a minimum of **eight weeks duration** at the end of second semester of the Programme /Summer Break. A student will be required to submit a summer internship/industrial training report to the concerned department and appear for an oral presentation before the committee. The Committee comprises of a HoD / Professor of the department and two faculty. The report and the oral presentation shall carry 40% and 60% weightages respectively. For summer internship / industrial training, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

5.7 The objective of comprehensive viva-voce is to assess the overall knowledge of the student in the relevant field of Engineering/Specialization in the PG program. Viva will be conducted in 3rd semester. The examination committee will be constituted by the HoD and Professor of the department and two faculty. For comprehensive viva-voce, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

6.0 EVALUATION OF SEMINAR/INTERNSHIP/DISSERTATION WORK

All the students admitted under these regulations have to mandatorily comply the requirements of (i) Seminar-I, (ii) Seminar-II, (iii) Comprehensive Viva, (iv) Dissertation Part-A and (v) Dissertation Part-B. Out of these, (i) to (iv) are evaluated by internally by Project Review Committee (PRC) and (v) External Evaluation.

6.1 A Project Review Committee (PRC) shall be constituted with Head of the Department and Two other senior faculty members in the department.

6.2 Students are required to appear for Seminar-I and Seminar-II in First and Second semester respectively. They shall present before PRC on the topic of their choice/interest preferably on the courses listed in respective semesters. PRC shall advise the students in advance to select topics which strengthen their Dissertation Part-A and Dissertation Part-B.

6.3 Students shall undergo mandatory summer internship / industrial training (*2 credits*) for a minimum of eight weeks duration at the end of second semester of the Programme/Summer Break. A student will be required to submit a summer internship/industrial training report to the concerned department and appear for an oral presentation before PRC. The report and the oral presentation shall carry 40% and 60% weightages respectively. For summer internship / industrial training, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

6.4 The objective of comprehensive viva-voce is to assess the overall knowledge of the student in the relevant field of Engineering/Specialization in the PG program. Viva will be conducted in 3rd semester. For comprehensive viva-voce, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

6.5 Registration of Dissertation/Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses, both theory and practical and duly approved by PRC.

6.6 After satisfying 6.5, student has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval

6.7 If a candidate wishes to change his/her supervisor or topic of the project, he/she can do so with the approval of PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

6.8 Continuous assessment of Dissertation-Part A and Dissertation-Part B during the Semester(s) will be monitored by PRC. *Dissertation-Part A* will be only internal evaluation by PRC for 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

6.9 The candidate shall submit a status report to the PRC in two stages, each accompanied by an oral presentation, with a minimum interval of three months between the two.

6.10 The work on the project shall be initiated at the beginning of the III Sem and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis *(Dissertation – Part A & Part B)* only with the approval of PRC not earlier than 40 weeks from the date of registration of the project work.

6.11 Three copies of the project thesis, printed on both sides of the page and certified by the supervisor, shall be submitted to the College/Institute along with the plagiarism report.

6.10 The thesis shall be adjudicated by one examiner selected by the University. For this, the Principal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.

6.11 If the report of the examiner is *not favourable*, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is *not favourable* again, the thesis shall be summarily rejected. The

candidate has to reregister for the project and complete the project within the stipulated time after taking the approval from the University.

6.12 If the report of the examiner is favourable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination. The Board shall jointly report the candidate's work for a maximum of 100 marks. Corresponding grade will be awarded by the University.

6.13 If the report of the Viva-Voce is unsatisfactory (i.e., < 50 marks), the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the University.

7.0 Cumulative Grade Point Average (CGPA)

Marks Range (Max – 100)	Letter Grade	Level	Grade Point
≥ 90	S	Outstanding	10
≥80 to <90	A	Excellent	9
≥70 to <80	B	Very Good	8
≥60 to <70	C	Good	7
≥50 to <60	D	Fair	6
<50	F	Fail	3
		Absent	0

Computation of SGPA

- The following procedure is to be adopted to compute the Semester Grade Point Average(SGPA) and Cumulative Grade Point Average (CGPA):
- The **SGPA** is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e
  SGPA (Si) = ∑ (Ci X Gi) / ∑ Ci
- Where Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th} course.

Computation of CGPA

- The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a Programme, i.e.
  CGPA = ∑ (Ci X Si) / ∑ Ci
- Where Si is the SGPA of the i^{th} semester and Ci is the total number of credits in that semester.
- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- Equivalent Percentage = (CGPA- 0.5) x 10

8.0 AWARD OF DEGREE AND CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	
First Division with Distinction	≥ 7.5 (without supplementary History)	From the CGPA secured from 80 credits
First Class	≥ 6.5	
Second Class	≥ 6.0 to < 6.5	

The secured grade, grade points, status and credits obtained will be shown separately in the memorandum of marks. If a student wants to leave the program / exit after successful completion of first two semesters, he/she will be awarded Post Graduate Diploma in the specialization concerned.

9.0 WITHHOLDING OF RESULTS

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

10.0 GENERAL

10.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

10.2 The academic regulation should be read as a whole for the purpose of any interpretation.

10.3 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

10.4 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**Punishment**
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	Both the candidates involved in the malpractice will forefeit their seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.

12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators:

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
   (i) A show cause notice shall be issued to the college.
   (ii) Impose a suitable fine on the college.
   (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

Programme Structure

R25 M.Tech Course Structure

M.Tech (XXXX) I – Semester

S. No.	Course Code	Course Title	L	T	P	C
1		Program Core – 1	3	1	0	4
2		Program Core – 2	3	1	0	4
3		Program Core – 3	3	1	0	4
4		Program Elective – I	3	0	0	3
5		Program Elective – II	3	0	0	3
6		Laboratory – 1	0	1	2	2
7		Laboratory – 2	0	1	2	2
8		Seminar-I	0	0	2	1
		TOTAL	**15**	**5**	**6**	**23**

List of Professional Elective Courses in I Semester (Electives – I & II)

S.No.	Course Code	Course Title
1		
2		
3		
4		
5		
6		
7		
8		

@ Minimum 2/3 themes per elective

M.Tech (XXXX) II – Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1		Program Core – 4	3	1	0	4
2		Program Core – 5	3	1	0	4
3		Program Core – 6	3	1	0	4
4		Program Elective – III	3	0	0	3
5		Program Elective - IV	3	0	0	3
6		Laboratory – 3	0	1	2	2
7		Laboratory – 4	0	1	2	2
8		Seminar – II	0	0	2	1
		TOTAL	**15**	**5**	**6**	**23**

List of Professional Elective Courses in II Semester (Electives III & IV)

S.No.	Course Code	Course Title
1		
2		
3		
4		
5		
6		
7		
8		

@ Minimum 2/3 themes per elective

M.Tech (XXXX) - III Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1		Research Methodology and IPR / *Swayam 12 week MOOC course – RM&IPR*	3	0	0	3
2		Summer Internship/ Industrial Training (8-10 weeks)*	-	-	-	3
3		Comprehensive Viva#	-	-	-	2
4		Dissertation Part – A$	-	-	20	10
		TOTAL	**3**	**-**	**20**	**18**

* Student attended during summer / year break and assessment will be done in 3rd Sem.
# Comprehensive viva can be conducted courses completed upto second sem.
$ Dissertation – Part A, internal assessment

M.Tech (XXXX) – IV Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1		Dissertation Part – B%	-	-	32	16
		TOTAL	**-**	**-**	**32**	**16**

% External Assessment

Revised Bloom's Taxonomy Action Verbs

Definitions	I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V. Evaluating	VI. Creating
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Verbs	• Choose • Define • Find • How • Label • List • Match • Name • Omit • Recall • Relate • Select • Show • Spell • Tell • What • When • Where • Which • Who • Why	• Classify • Compare • Contrast • Demonstrate • Explain • Extend • Illustrate • Infer • Interpret • Outline • Relate • Rephrase • Show • Summarize • Translate	• Apply • Build • Choose • Construct • Develop • Experiment with • Identify • Interview • Make use of • Model • Organize • Plan • Select • Solve • Utilize	• Analyze • Assume • Categorize • Classify • Compare • Conclusion • Contrast • Discover • Dissect • Distinguish • Divide • Examine • Function • Inference • Inspect • List • Motive • Relationships • Simplify • Survey • Take part in • Test for • Theme	• Agree • Appraise • Assess • Award • Choose • Compare • Conclude • Criteria • Criticize • Decide • Deduct • Defend • Determine • Disprove • Estimate • Evaluate • Explain • Importance • Influence • Interpret • Judge • Justify • Mark • Measure • Opinion • Perceive • Prioritize • Prove • Rate • Recommend • Rule on • Select • Support • Value	• Adapt • Build • Change • Choose • Combine • Compile • Compose • Construct • Create • Delete • Design • Develop • Discuss • Elaborate • Estimate • Formulate • Happen • Imagine • Improve • Invent • Make up • Maximize • Minimize • Modify • Original • Originate • Plan • Predict • Propose • Solution • Solve • Suppose • Test • Theory

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE & SYLLABUS M. Tech CSE for COMPUTER SCIENCE & ENGINEERING PROGRAMME

(Applicable for batches admitted from 2025-2026)

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

I-SEMESTER

S. No	Course Code	Course Title	Teaching Scheme			C
			L	T	P	
1	D2515800	**ProgramCore-1 :** Data Structures and Algorithm Analysis	3	1	0	4
2	D2515801	**ProgramCore-2 :** Advanced Data warehousing and Data Mining	3	1	0	4
3	D2515802	**ProgramCore-3 :** Mathematical foundations of computer science	3	1	0	4
4	**Program Elective-I**		3	0	0	3
		1. Image Processing				
		2. Soft computing				
		3. Advanced Computer Networks				
		4. Advanced Software Engineering				
5	**Program Elective-II**		3	0	0	3
		1. Time Series Analysis				
		2. High Performance Computing				
		3. Agile Methodologies				
		4. Advanced Compiler Design				
		5. Any minimum12 weeks MOOCS/NPTEL courses suggested by BOS				
6	D2515803	**Laboratory-1:** Data Structures and Algorithm Analysis lab	0	1	2	2
7	D2515804	**Laboartory-2:** Advanced Data warehousing and Data Mining lab	0	1	2	2
8	D2515805	Seminar-I	0	0	2	1
Total Credits			15	5	6	23

List of Professional Elective Courses in I Semester (Electives – I & II)

S. No	Course Title	Course Code
1	Image Processing	D25158A0
2	Soft computing	D25158A1
3	Advanced Computer Networks	D25158A2
4	Advanced Software Engineering	D25158A3
5	Time Series Analysis	D25158B0
6	High Performance Computing	D25158B1
7	Agile Methodologies	D25158B2
8	Advanced Compiler Design	D25158B3
9	Any minimum12 weeks MOOCS/NPTEL courses suggested by BOS	D25158B4

II-SEMESTER

S. No	Course Code	Course Title	Teaching Scheme			C
			L	T	P	
1	D2525800	**ProgramCore-4 :** Machine Learning	3	1	0	4
2	D2525801	**ProgramCore-5 :** Natural Language Processing	3	1	0	4
3	D2525802	**ProgramCore-6 :** Introduction to Quantum computing	3	1	0	4
4	**Program Elective-III**		3	0	0	3
		1. Feature Engineering				
		2. Generative AI				
		3. Adhoc Sensor Networks				
		4. Principles of Network Security				
5	**Program Elective-IV**		3	0	0	3
		1. Block Chain Technologies				
		2. DevOps				
		3. Secure Coding				
		4. Design Patterns				
		5. Any minimum12 weeks MOOCS/NPTEL courses suggested by BOS				
6	D2525803	**Laboratory-3:** Machine Learning Lab	0	1	2	2
7	D2525804	**Laboartory-4:** Natural Language Processing Lab	0	1	2	2
8	D2525805	Seminar-II	0	0	2	1
Total Credits			15	5	6	23

List of Professional Elective Courses in II Semester (Electives – III & IV)

S. No	Course Title	Course Code
1	Feature Engineering	D25258A0
2	Generative AI	D25258A1
3	Adhoc Sensor Networks	D25258A2
4	Principles of Network Security	D25258A3
5	Block Chain Technologies	D25258B0
6	DevOps	D25258B1
7	Secure Coding	D25258B2
8	Design Patterns	D25258B3
9	Any minimum12 weeks MOOCS/NPTEL courses suggested by BOS	D25258B4

III-SEMESTER

S. No	Course Code	Course Title	Teaching Scheme			C
			L	T	P	
1	D2535800	Research Methodology and IPR / Swayam 12 week MOOC course – RM&IPR	3	0	0	3
2	D2535801	Summer Internship/ Industrial Training (8-10 weeks)*	-	-	-	3
3	D2535802	Comprehensive Viva#	-	-	-	2
4	D2535803	Dissertation Part – A$	-	-	20	10
Total Credits			3	-	20	18

* Student attended during summer / year break and assessment will be done in 3rd Sem.
# Comprehensive viva can be conducted courses completed upto second sem.
$ Dissertation – Part A, internal assessment

IVSEMESTER

S. No	Course Code	Course Title	Teaching Scheme			C
			L	T	P	
1	D2545800	Dissertation Part – B%	--	--	32	16
Total Credits					32	16

% External Assessment

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

M. Tech Programme

CSE COURSE STRUCTURE & SYLLABUS

(Common to M. Tech Computer Science & Engineering)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D2515800	L	T	P	C
		3	1	0	4

DATA STRUCTURES & ALGORITHMS ANALYSIS

		Knowledge Level (K)#
CO1	Ability to write and analyze algorithms for algorithm correctness and efficiency	K2
CO2	Master a variety of advanced abstract data type (ADT) and data structures and their Implementation.	K4
CO3	Demonstrate various searching, sorting and hash techniques and be able to apply and solve problems of real life	K4
CO4	Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees	K3
CO5	Ability to compare various search trees and find solutions for IT related problems	K6

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		2	3		
CO2			3	3		
CO3			3	3		2
CO4			3	3		3
CO5			3	3	2	2

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Introduction to Data Structures-** Singly Linked Lists, Doubly Linked Lists, Circular Lists-Algorithms, Stacks and Queues- Algorithm Implementation using Linked Lists.	10Hrs
UNIT – 2	**Searching-** Linear and Binary, Search Methods, Sorting- Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Trees- Binary trees, Operations- Insertion, Deletion, Properties, Representation and Traversals (DFT, BFT), Expression Trees (Infix, prefix, postfix), Graphs- Basic Concepts, Storage structures and Traversals	12Hrs
UNIT – 3	Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, Open Addressing- Linear Probing, Double Hashing	12Hrs
UNIT – 4	**Priority queues**- Definition, ADT, Realising a Priority Queue Using Heaps, Definition, Insertion, Deletion, Search Trees- Binary Search Trees, Definition, ADT, Implementation, Operations- Searching, Insertion, Deletion	12Hrs
UNIT – 5	**Search Trees**- AVL Trees, Definition, Height of AVL Tree, Operations- Insertion, Deletion and Searching. Introduction to Red-Black and Splay Trees, B-Trees, Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, Richard F.Gilberg, Behrouz A. Forouzon, Cengage Learning, 2004
2. Data Structures, Algorithms and Applications in java, 2 nd Edition, Sartaj Sahni, University Press/Orient BlackSwan, 2005

Reference Books:

1. Data Structures And Algorithm Analysis, 2 nd Edition, Mark Allen Weiss, Pearson, 2002
2. Data Structures And Algorithms in C++, 3 rd Edition, Adam Drozdek, Cengage Learning, 2005
3. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, 1 st Edition, N.B.Venkateswarulu, E.V. Prasad, S Chand & Co, 2009
4. Classic Data Structures, 2 nd Edition, Debasis Samantha, PHI Learning, 2009

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D2515801	L	T	P	C
		3	1	0	4

ADVANCED DATA WAREHOUSING AND DATA MINING

***Pre-requisites*:** Data Structures, Algorithms, Probability & Statistics, Data Base Management Systems

***Course Objectives*:** The main objective of the course is to

- Understand Data Warehousing and OLA
- Master Data Preprocessing and Statistical Techniques
- Apply Classification Techniques and Model Evaluation
- Perform Association and Sequential Pattern Mining
- Explore Clustering and Advanced Data Mining

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**Describe** the architecture, modeling techniques, and implementation strategies of data warehouses and OLAP systems, including modern cloud-based approaches (K2).	K2
CO2	**Apply** statistical and visualization techniques to describe datasets and perform data preprocessing tasks such as cleaning, integration, reduction, and transformation. (K3)	K3
CO3	**Develop** and evaluate classification models using decision trees, Bayesian classifiers, and rule-based methods for solving predictive analytics problems.(K4)	K4
CO4	**Discover** meaningful associations and sequential patterns in data using algorithms like Apriori, FP-Growth, and sequential pattern mining techniques. (K3)	K3
CO5	**Implement** clustering techniques such as K-means, hierarchical clustering, and DBSCAN, and analyze advanced data mining for text, spatial, and graph data.(K4)	K4

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1			3	2	3	
CO2			3	3	2	
CO3	2		3	3	2	
CO4	2		3	3	2	
CO5	2		3	3	3	

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	Data Warehousing and Online Analytical Processing: Basic concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Cloud Data Warehouse; Data Mining Methodologies: CRISP-DM and SEMMA, Comparison of Data Mining Methodologies. Statistical Limits on Data Mining, Introduction to Predictive Analytics, Technologies, Applications, Major issues (Text Book- 1)	10Hrs
UNIT – 2	Data Objects & Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization. (Text Book- 1)	10Hrs
UNIT – 3	**Classification:** Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction, Bayesian Classification Methods: Bayes Theorem, Naïve Bayes Classification, Rule-Based Classification, Model Evaluation and Selection. (Text Book- 2)	12Hrs
UNIT – 4	**Association Analysis:** Problem Definition, Frequent Itemset Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation of frequent item sets, FP-Growth Algorithm, *Sequential Patterns*: Preliminaries, Sequential Pattern Discovery (Text Book- 2)	12Hrs
UNIT – 5	**Cluster Analysis:** Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means, *Agglomerative Hierarchical Clustering*: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. *Mining rich data types*: Mining text data, Spatial-temporal data, Graph and networks. (Text Book- 2)	12Hrs
	Total	56Hrs

*Note:

Text Books:

1. Data Mining concepts and Techniques, 3rd edition, Jiawei Han, Michel Kamber, Elsevier, 2011.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar,

Reference Books:

3. Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
4. Data Mining Techniques, Arun K Pujari, 3rd edition, Universities

Online Resources: (NPTEL course by Prof.PabitraMitra)

1. http://onlinecourses.nptel.ac.in/noc17_mg24/preview

2. http://www.saedsayad.com/data_mining_map.htm

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D2515803	L	T	P	C
		3	1	0	4
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE					

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution	K3
CO2	Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters	K5
CO3	To learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests	K2

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		2	3		2
CO2	2		2	3		2
CO3	3	2	3	3		2

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Basic Probability and Random Variables:** Random Experiments, Sample Spaces Events, the Concept of Probability the Axioms of Probability, Some Important Theorems on Probability Assignment of Probabilities, Conditional Probability Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables	10Hrs
UNIT – 2	**Sampling and Estimation Theory:** Population and Sample, Statistical Inference Sampling With and Without Replacement Random Samples, Random Numbers Population Parameters Sample Statistics Sampling Distributions, Frequency Distributions, Relative Frequency Distributions, Computation of Mean, Variance, and Moments for Grouped Data. Unbiased Estimates and Efficient Estimates Point Estimates and Interval Estimates. Reliability Confidence Interval Estimates of Population Parameters, Maximum Likelihood Estimates	10Hrs

UNIT – 3	**Tests of Hypothesis and Significance:** Statistical Decisions Statistical Hypotheses. Null Hypotheses Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests Involving the Normal Distribution One-Tailed and Two- Tailed Tests P Value Special Tests of Significance for Large Samples Special Tests of Significance for Small Samples Relationship between Estimation Theory and Hypothesis Testing Operating Characteristic Curves. Power of a Test Quality Control Charts Fitting Theoretical Distributions to Sample Frequency Distributions, The Chi-Square Test for Goodness of Fit Contingency Tables Yates' Correction for Continuity Coefficient of Contingency.)	12Hrs
UNIT – 4	**Algebraic Structures and Number Theory**: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic,Modular Arithmetic (Fermat's Theorem and Euler's Theorem)	12Hrs
UNIT – 5	**Graph Theory:** Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).	12Hrs
	Total	56Hrs

*Note:

Text Books:

1.Foundation Mathematics for Computer Science,1st edition, John Vince, Springer,2015

2.Probability & Statistics, 3rd Edition, Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers, 2018

3.Probability and Statistics with Reliability,2nd edition, K. Trivedi, Wiley, 2011

4.Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, H. Rosen, Tata McGraw Hill, 2003

Reference Books:

1.Probability and Computing: Randomized Algorithms and Probabilistic Analysis,1 st edition, M. Mitzenmacher and E. Upfal,2005

2.Applied Combinatorics,6th edition, Alan Tucker, Wiley,2012

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D25158A0	L	T	P	C
		3	0	0	3
IMAGE PROCESSING (PROGRAM ELECTIVE-I)					

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**CO1** Describe and explain basic principles of digital image processing.	K3
CO2	Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).	K3
CO3	Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).	K4
CO4	**CO4** Assess the performance of image processing algorithms and systems	K6

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		3	3		
CO2	3		3	3	2	2
CO3	3		3	3	2	3
CO4	2	2	3	2		3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Introduction:** Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. Image Enhancement Techniques: Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image subtraction, image averaging	10Hrs

UNIT – 2	**Spatial filtering:** Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters, Homomorphism is filtering. Image Restoration & Reconstruction: Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering,Minimum mean square Error filtering, constrained least square filtering, Geometric mean filter, Image reconstruction from projections. Color Fundamentals, Color Models, Color Transformations.	10Hrs
UNIT – 3	**Image Compression:** Redundancies- Coding, Interpixel, Psycho visual; Fidelity, Source and Channel Encoding, Elements of Information Theory; Loss Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization, Entropy coding, LZW coding; Image Compression Standards-JPEG, JPEG 2000, MPEG; Video compression.	12Hrs
UNIT – 4	**Wavelet Based Image Compression:** Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding	12Hrs
UNIT – 5	**Image Segmentation:** Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds; Introduction to morphological operations; binary morphology- erosion, dilation, opening and closing operations, applications; basic gray-scale morphology operations; Feature extraction; Classification; Object recognition. Digital Image Watermarking: Introduction, need of Digital Image Watermarking, applications of watermarking in copyright protection and Image quality analysis.	12Hrs
	Total	56Hrs

*Note:

Text Books:

1.Digital Image Processing. 2nd ed. Gonzalez, R.C. and Woods, R.E. India: Person Education,2009

Reference Books:

1. Digital Image Processing. John Wiley, Pratt, W. K, Fourth Edition-2001

2. Digital Image Processing, Jayaraman, S., Veerakumar, T. and Esakkiranjan, S.,Tata McGraw-Hill,Edition

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D25158A1	L	T	P	C
		3	0	0	3
SOFT COMPUTING **(Program Elective-I)**					

Course Objectives:

1. To introduce the concepts in Soft Computing such as Artificial Neural Networks, Fuzzy logic-based systems, genetic algorithm-based systems and their hybrids.

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**CO1** Learn soft computing techniques and their applications.	K2
CO2	**CO2** Analyze various neural network architectures.	K3
CO3	**CO3** Define the fuzzy systems	K2
CO4	**CO4**Understand the genetic algorithm concepts and their applications.	K2
CO5	**CO5** Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution	K4

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2	3	2	
CO2	2		3	3		
CO3	1		2	2		
CO4	2		3	3	2	
CO5	3	2	3	3	3	3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	Introduction to Soft Computing, Artificial neural networks, biological neurons, Basic models of artificial neural networks, Connections, Learning, Activation Functions, McCulloch and Pitts Neuron, Hebb network.	10Hrs
UNIT – 2	Perceptron networks, Learning rule, Training and testing algorithm, Adaptive Linear Neuron, Back propagation Network, Architecture, Training algorithm	10Hrs
UNIT – 3	Fuzzy logic, fuzzy sets, properties, operations on fuzzy sets, fuzzy relations, operations on fuzzy relations, Fuzzy membership functions, fuzzification, Methods of membership, value assignments, intuition, inference, rank ordering, Lambda –Cuts for fuzzy sets , Defuzzification methods	12Hrs
UNIT – 4	Truth values and Tables in Fuzzy Logic, Fuzzy propositions, Formation of fuzzy rules, Decomposition of rules, Aggregation of rules, Fuzzy Inference Systems, Mamdani and Sugeno types, Neuro-fuzzy hybrid systems, characteristics, classification	12Hrs
UNIT – 5	Introduction to genetic algorithm, operators in genetic algorithm, coding, selection, crossover, mutation, stopping condition for genetic algorithm flow, Genetic-neuro hybrid systems, Genetic Fuzzy rule based system	12Hrs
	Total	56Hrs

Text Books:

1. S. N. Sivanandam and S. N. Deepa, Principles of soft computing–John Wiley & Sons,2007.
2. Timothy J. Ross, Fuzzy Logic with engineering applications, John Wiley & Sons, 2016.

Reference Books:

1. N.K. Sinhaand M.M. Gupta,Soft Computing & Intelligent Systems:Theory & Applications-Academic Press /Elsevier. 2009.
2. Simon Haykin, Neural Network-A Comprehensive Foundation-Prentice Hall International, Inc.1998
3. R. Eberhart and Y. Shi, Computational Intelligence: Concepts to Implementation, Morgan Kaufman/Elsevier, 2007.
4. Driankov D., Hellendoorn H.and Reinfrank M.,An Introduction to Fuzzy Control Narosa Pub., 2001.

5. BartKosko, Neural Network and Fuzzy Systems-Prentice Hall,Inc.,Englewood Cliffs, 1992
6. Goldberg D.E, Genetic Algorithms in Search , Optimization , and Machine Learning Addison Wesley, 1989

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D25158A2	L	T	P	C
		3	0	0	3

ADVANCED COMPUTER NETWORKS
(Program Elective-I)

Course Objectives: This course is aimed at enabling the students to

1. The course is aimed at providing basic understanding of Computer networks starting with OSI Reference Model, Protocols at different layers with special emphasis on IP, TCP & UDP and Routing algorithms.
2. Some of the major topics which are included in this course are CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routing and Addressing.
3. Provide the mathematical background of routing protocols.
4. Aim of this course is to develop some familiarity with current research problems and research methods in advance computer networks

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**CO1** Illustrate reference models with layers, protocols, and interfaces.	K4
CO2	Describe routing algorithms, subnetting, and addressing in IPv4 and IPv6.	K3
CO3	**CO3** Analyze basic network protocols and their use in network design and implementation.	K3
CO4	Describe concepts related to wireless networks such as WLANs, WiMAX, IEEE 802.11, cellular and satellite systems.	K4
CO5	Describe emerging network trends such as MANETs and Wireless Sensor Networks (WSNs).	K2

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1			3	3		
CO2			3	3		
CO3	2		3	3		2
CO4			2	2		
CO5			2	2	2	2

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Network layer:** Network Layer design issues: store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual – circuit and datagram subnets, Routing Algorithms-shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, congestion control algorithms : Approaches to congestion control, Traffic aware routing, Admission control, Traffic throttling, choke Packets, Load shedding, Random early detection, Quality of Service, Application requirements, Traffic shaping, Leaky and Token buckets.	12Hrs
UNIT – 2	**Internetworking and IP protocols:** How networks differ, How networks can be connected, internetworking, tunneling, The network layer in the internet, IPV4 Protocol, IP addresses, Subnets, CIDR, classful and Special addressing, network address translation (NAT),IPV6 Address structure address space, IPV6 Advantages, packet format, extension Headers, Transition from IPV4 to IPV6 , Internet Control Protocols-IMCP, ARP, DHCP.	12Hrs
UNIT – 3	**Transport Layer Protocols**: Introduction, Services, Port numbers, User Datagram Protocol: User datagram, UDP services, UDP Applications, Transmission control Protocol: TCP services, TCP features, Segment, A TCP connection, State transition diagram, Windows in TCP, Flow control and error control, TCP Congestion control, TCP Timers, SCTP: SCTP services SCTP features, packet format, An SCTP association, flow control, error control	12Hrs
UNIT – 4	**Wireless LANS:** Introduction, Architectural comparison, Access control, The IEEE 802.11 Project: Architecture, MAC sub layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Bluetooth Layers Other Wireless Networks: WIMAX: Services, IEEE project 802.16, Layers in project 802.16, Cellular Telephony: Operations, First Generation (1G), Second Generation (2G), Third Generation (3G), Fourth Generation (4G), Satellite Networks: Operation, GEO Satellites, MEO satellites, LEO satellites	12Hrs
UNIT – 5	**Emerging trends in Computer networks:Mobile computing:** Motivation for mobile computing, Protocol stack issues in mobile computing environment, mobility issues in mobile computing, security issues in mobile networks, MOBILE Ad Hoc Networks: Applications of Ad Hoc Networks, Challenges and Issues in MANETS, MAC Layer Issues Routing Protocols in MANET, Transport Layer Issues, Ad hoc Network Security **Wireless Sensor Networks:** WSN functioning, Operating system support in sensor devices, WSN characteristics, sensor network operation, Sensor Architecture: Cluster management, Wireless Mesh Networks: WMN design, Issues in WMNs, Computational Grids, Grid Features, Issues in Grid construction design, Grid design features,P2P Networks:	12Hrs
	Total	60Hrs

Text Books:

1. Data communications and networking 4th edition Behrouz A Fourzan,TMH-2007

2. Computer networks 4th edition Andrew S Tanenbaum, Pearson,2012

3. Computer networks, Mayank Dave,CENGAGE, First edition.2012

Reference Books:

1. Computer networks, A system Approach, 5thed, Larry L Peterson and Bruce S Davie, Elsevier-2012.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D25158A3	L	T	P	C
		3	0	0	3

ADVANCED SOFTWARE ENGINEERING
(PROGRAM ELECTIVE-I)

Course Objectives: This course is aimed at enabling the students to

1. This course is designed to provide an in depth understanding of phases of Software Development, common process models including Waterfall, the Unified Process, hands-on experience with elements of the agile process, a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, and Software Design techniques.

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	Demonstrate software process, various models and Agile methodologies	K4
CO2	Analyze and Specify software requirements through a SRS documents	K5
CO3	Design and Plan software solutions to problems	K3
CO4	Analyze the importance of Quality assurance and design, implement, and execute test cases at the Unit level.	K5
CO5	Design, implement, and execute test cases at Integration level and analyze the role of various metrics	K3

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		3	3		2
CO2	2		3	3		2
CO3	3	2	3	3		3
CO4	2		3	3		3
CO5	2		3	3		3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Software and Software Engineering:** Nature of software, Software Process, Software Engineering Practice. Process Models: Generic process model, defining a framework activity, identifying task set, process assessment and improvement, perspective process models Aglity and process: Agility, Agile process, Scrum, other Agile frameworks, recommended process model	10Hrs
UNIT – 2	**Human aspects of Software Engineering:** characteristics and psychology of Software Engineer, software team, team structure. **Principles that guide practice:** core principles, principles that guide each framework activity. **Understanding Requirements:** Requirements engineering, establishing groundwork, requirements gathering, developing use cases, building analysis model, negotiating requirements, requirements monitoring, validating Requirements **Requirements modeling:** requirements analysis, class-based modeling, functional modeling, behavioral modeling.	12Hrs
UNIT – 3	**Design: Design process, design concepts, design model Architectural design:** software architecture, architectural styles, architectural design, assessing alternative architectural designs. **User experience design:** elements, golden rules, User interface analysis and design, user experience analysis, user interface design, design evaluation, usability and accessibility **Design for mobility:** mobile development life cycle, mobile architecture, web design pyramid, , mobility and design quality, best practices.	12Hrs
UNIT – 4	**Quality: software quality, quality dilemma, achieving software quality Reviews:** review metrics, Informal reviews, Formal technical reviews. **Software Quality Assurance:** elements, SQA process, Product characteristics, SQA tasks, goals and metrics, statistical software quality assurance, software reliability, ISO 9000 quality standards, SQA plan**. Software testing:** strategic approach to software testing, planning and recordkeeping, test case design, white box testing, black box testing, object oriented testing.	12Hrs
UNIT – 5	**Software testing- integration level:** Software testing fundamentals, integration testing, regression testing, integration testing in OO context, validation testing. **Software testing- testing for mobility:** mobile testing guidelines, testing strategies, User experience testing issues, web application testing, Web testing strategies, security testing, performance testing. **Software metrics and analytics:** software measurement, software analytics, product metrics, metrics for testing, metrics for maintenance, process and project metrics, software measurement, metrics for software quality	12Hrs
	Total	58Hrs

Text Books:

1. "Software Engineering, A practitioner's Approach", Roger S. Pressman, Bruce R. Maxim, 9th Edition, Tata McGraw-Hill.
2. "Software Engineering", Ian Sommerville, 9th edition, Pearson education

Reference Books:

1. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D25158B0	L	T	P	C
		3	0	0	3

TIME SERIES ANALYSIS
(PROGRAM ELECTIVE-II)

Course Objectives: This course is aimed at enabling the students to

1. The main objective of the course is to introduce a variety of statistical models for time series and cover the main methods for analyzing these models

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**CO1** formulate real life problems using time series models	K1
CO2	Describe the statistical software to estimate the models from real data, and draw conclusions and develop solutions from the	K3
CO3	Explain the visual and numerical diagnostics to assess the soundness of their models	K2
CO4	Develop to communicate the statistical analyses of substantial data sets through explanatory text, tables and graphs	K5
CO5	combine and adapt different statistical models to analyse larger and more complex data	K2

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		3	3		3
CO2	2		3	3	2	3
CO3	3	2	3	3		2
CO4	2		2	2		2
CO5	2		3	3	2	3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**INTRODUCTION OF TIMESERIES ANALYSIS:** Introduction to Time Series and Forecasting, Different types of data, Internal structures of time series. Models for time series analysis, Autocorrelation and Partial autocorrelation. Examples of Time series Nature and uses of forecasting, Forecasting Process, Data for forecasting, Resources for forecasting	10Hrs

UNIT – 2	**STATISTICS BACKGROUND FOR FORECASTING:** Graphical Displays, Time Series Plots, Plotting Smoothed Data, Numerical Description of Time Series Data, Use of Data Transformations and Adjustments, General Approach to Time Series Modeling and Forecasting, Evaluating and Monitoring Forecasting Model Performance	12Hrs
UNIT – 3	**TIME SERIES REGRESSION MODEL:** Introduction Least Squares Estimation in Linear Regression Models, Statistical Inference in Linear Regression, Prediction of New Observations, Model Adequacy Checking, Variable Selection Methods in Regression, Generalized and Weighted Least Squares, Regression Models for General Time Series Data, Exponential Smoothing, First order and Second order	12Hrs
UNIT – 4	**AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA)MODELS:** Autoregressive Moving Average (ARMA) Models, Stationarity and Invertibility of ARMA Models, Checking for Stationarity using Variogram, Detecting Nonstationarity, Autoregressive Integrated Moving Average (ARIMA) Models, Forecasting using ARIMA, Seasonal Data, Seasonal ARIMA Models Forecasting using Seasonal ARIMA Models Introduction, Finding the "BEST" Model. **Example:** Internet Users Data Model Selection Criteria, Impulse Response Function to Study the Differences in Models Comparing Impulse Response Functions for Competing Models.	12Hrs
UNIT – 5	**MULTIVARIATE TIME SERIES MODELS AND FORECASTING:** Multivariate Time Series Models and Forecasting, Multivariate Stationary Process, Vector ARIMA Models, Vector AR (VAR) Models, Neural Networks and Forecasting Spectral Analysis, Bayesian Methods in Forecasting.	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Introduction To Time Series Analysis And Forecasting, 2nd Edition, Wiley Series In Probability And Statistics, By Douglas C. Montgomery, Cheryl L. Jen(2015)
2. Master Time Series Data Processing, Visualization, And Modeling Using Python Dr. Avishek PalDr. PksPrakash (2017)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D25158B1	L	T	P	C
		3	0	0	3

HIGH PERFORMANCE COMPUTING
(PROGRAM ELECTIVE-II)

Course Objectives: This course is aimed at enabling the students to

1. The main objective of the course is to introduce a variety of statistical models for time series and cover the main methods for analyzing these models

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	Describe different parallel architectures, inter-connect networks programming models	K3
CO2	**CO2** Develop an efficient parallel algorithm to solve given problem	K4
CO3	Analyze and measure performance of modern parallel computing systems	K5
CO4	**CO4**Build the logic to parallelize the programming task	K2

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		3	3		
CO2	3		3	3	2	3
CO3	3		3	3	2	3
CO4	3		3	3	2	3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Introduction:** Motivating Parallelism, Scope of Parallel Computing, Parallel Programming Platforms: Implicit Parallelism, Trends in Microprocessor and Architectures, Limitations of Memory, System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Scalable design principles, Architectures: N-wide superscalar architectures, Multi-core architecture.	10Hrs
UNIT – 2	**Parallel Programming:** Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing,	12Hrs

	Containing Interaction Overheads, Parallel Algorithm Models, The Age of Parallel Processing, the Rise of GPU Computing, A Brief History of GPUs, Early GPU.	
UNIT – 3	**Basic Communication:** Operations- One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations. Programming shared address space platforms: threads- basics, synchronization, OpenMP programming	12Hrs
UNIT – 4	**Analytical Models:** Sources of overhead in Parallel Programs, Performance Metrics for Parallel Systems, and The effect of Granularity on Performance, Scalability of Parallel Systems, Minimum execution time and minimum cost, optimal execution time. **Dense Matrix Algorithms:** Matrix Vector Multiplication, Matrix-Matrix	12Hrs
UNIT – 5	**Parallel Algorithms- Sorting and Graph :** Issues in Sorting on Parallel Computers, Bubble Sort and its Variants, Parallelizing Quick sort, All-Pairs Shortest Paths, Algorithm for sparse graph, Parallel Depth-First Search, Parallel Best First Search. **CUDA Architecture:** CUDA Architecture, Using the CUDA Architecture, Applications of CUDA Introduction to CUDA C-Write and launch CUDA C kernels, Manage GPU memory, Manage communication and synchronization, Parallel programming in CUDA- C.	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Wesley, 2003, ISBN: 0-201-64865-2
2. Jason sanders, Edward Kandrot, "CUDA by Example", Addison-Wesley, ISBN-13: 978-0-13-138768-3

Reference Books

1. Kai Hwang, "Scalable Parallel Computing", McGraw Hill 1998, ISBN:0070317984
2. Shane Cook, "CUDA Programming: A Developer's Guide to Parallel Computing with GPUs", Morgan Kaufmann Publishers Inc. San Francisco, CA, USA 2013 ISBN: 780124159884
3. David Culler Jaswinder Pal Singh, "Parallel Computer Architecture: A Hardware/ Software Approach", Morgan Kaufmann,1999, ISBN 978-1-55860-343-1
4. Rod Stephens, "Essential Algorithms", Wiley, ISBN: ISBN: 978-1-118-61210-1

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D25158B2	L	T	P	C
		3	0	0	3

AGILE METHODOLOGIES
(PROGRAM ELECTIVE-II)

Course Objectives: This course is aimed at enabling the students to

1. The main objectives of this course are to introduce the important concepts of Agile software development Process, emphasize the role of stand-up meetings in software collaboration, impart the knowledge on values and principles in understanding agility

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	Understand the core values and mindset of Agile Methodology for effective project development	K1
CO2	Explain Agile Principles and apply them in Agile Project management practices	K3
CO3	**CO3** Describe Key concepts of XP, Simplicity, and Incremental Design	K2
CO4	Apply Lean Principles to identify and Eliminating Waste in software processes	K4

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2	3	2	2
CO2	2	2	3	3	2	3
CO3	2		3	3		2
CO4	3		3	3	2	3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Learning Agile**: Getting Agile into your brain, Understanding Agile values, No Silver Bullet, Agile to the Rescue, adding Agile makes a difference. A fractured perspective, How a fractured perspective causes project problems. The Agile Manifesto, Purpose behind Each Practice. Individuals and Interactions Over Processes and Tools, Working Software over Comprehensive Documentation, Customer Collaboration over Contract Negotiation, Responding to Change over Following a Plan,	10Hrs

	Methodologies Help You Get It All in Place at Once, Where to Start with a New Methodology	
UNIT – 2	**The Agile Principles:** The 12 Principles of Agile Software, The Customer Is Always Right, "Do As I Say, Not As I Said". Delivering the Project, Better Project Delivery for the Ebook Reader Project. Communicating and Working Together, Better Communication for the Ebook Reader Project. Project Execution—Moving the Project Along, A Better Working Environment for the Ebook Reader Project Team. Constantly Improving the Project and the Team. The Agile Project: Bringing All the Principles Together	12Hrs
UNIT – 3	**SCRUM and Self-Organizing Teams:** The Rules of Scrum, Act I: I Can Haz Scrum?, Everyone on a Scrum Team owns the Project, The Scrum Master Guides the Team's Decisions, The Product Owner Helps the Team Understand the Value of the Software, Everyone Owns the Project, Scrum Has Its Own Set of Values ,Status Updates Are for Social Networks!, The Whole Team Uses the Daily Scrum, Feedback and the Visibility-Inspection- Adaptation Cycle, The Last Responsible Moment, How to Hold an Effective Daily Scrum. Sprinting into a Wall, Sprints, Planning, and Retrospectives, Iterative or Incremental?, The Product Owner Makes or Breaks the Sprint, Visibility and Value, How to Plan and Run an Effective Scrum Sprint **Scrum Planning And Collective Commitment:** Not Quite Expecting the Unexpected, User Stories, Velocity, and Generally Accepted Scrum Practices, Make Your Software Useful, User Stories Help Build Features Your Users Will Use, Conditions of Satisfaction, Story Points and Velocity, Burndown Charts, Planning and Running a Sprint Using Stories, Points, Tasks, and a Task Board. Victory Lap, Scrum Values Revisited, Practices Do Work Without the Values (Just Don't Call It Scrum), Is Your Company's Culture Compatible with Scrum Values.	12Hrs
UNIT – 4	**XP And Embracing Change:** Going into Overtime, The Primary Practices of XP, Programming Practices, Integration Practices, Planning Practices, Team Practices, Why Teams Resist Changes, and How the Practices Help. The Game Plan Changed, but We're Still Losing, The XP Values Help the Team Change Their Mindset, XP Helps Developers Learn to Work with Users, Practices Only "Stick" When the Team Truly Believes in Them, An Effective Mindset Starts with the XP Values, The XP Values, Paved with Good Intentions. The Momentum Shifts, Understanding the XP Principles Helps You Embrace Change, The Principles of XP, XP Principles Help You Understand Planning, XP Principles Help You Understand Practices—and Vice Versa, Feedback Loops. **XP, Simplicity, and Incremental Design:** Code and Design, Code Smells and Antipatterns (or, How to Tell If You're Being Too Clever), XP Teams Look for Code Smells and Fix Them, Hooks, Edge Cases, and Code That Does Too Much. Make Code and Design Decisions at the Last Responsible Moment, Fix Technical Debt by Refactoring Mercilessly, Use Continuous Integration to Find Design Problems, Avoid Monolithic Design, Incremental Design and the Holistic XP Practices. Teams Work Best When They Feel Like They Have Time to	12Hrs

	Planning, Team, and Holistic Practices Form an Ecosystem Incremental Design Versus Designing for Reuse, When Units Interact in a Simple Way, the System Can Grow Incrementally, Great Design Emerges from Simple Interactions, Final Score.	
UNIT – 5	**Lean, Eliminating Waste, and Seeing the whole:** Lean Thinking, Commitment, Options Thinking, and Set-Based Development, Creating Heroes and Magical Thinking. Eliminate Waste, Use a Value Stream Map to Help See Waste Clearly, Gain a Deeper Understanding of the Product, See the Whole, Find the Root Cause of Problems That You Discover. Deliver As Fast As Possible, Use an Area Chart to Visualize Work in Progress, Control Bottlenecks by Limiting Work in Progress. **Kanban, Flow, and Constantly Improving:** The Principles of Kanban, Find a Starting Point and Evolve Experimentally from There. Stories Go into the System; Code Comes Out, Improving Your Process with Kanban, Visualize the Workflow, Limit Work in Progress. Measure and Manage Flow, Managing Flow with WIP Limits Naturally Creates Slack. Make Process Policies Explicit So Everyone Is on the Same Page. Emergent Behavior with Kanban. **The Agile Coach:** Coaches Understand Why People Don't Always Want to	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Andrew Stellman, Jill Alison Hart, Learning Agile, O'Reilly, 2015.

Reference Books:

1. Andrew stellman, Jennifer Green, Head first Agile, O'Reilly, 2017.
2. Rubin K , Essential Scrum : A practical guide to the most popular Agile process, Addison- Wesley, 2013

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D25158B3	L	T	P	C
		3	0	0	3

ADVANCED COMPILER DESIGN
(PROGRAM ELECTIVE-II)

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**CO1** Demonstrate various phases involved in the design of compiler	K4
CO2	Organize and apply Syntax Analysis Techniques such as Top Down Parsing and LL(1) grammars	K3
CO3	**CO3** Design Bottom Up Parsing and Construct LR parsers	K4
CO4	Analyse synthesized, inherited attributes and syntax directed translation schemes	K5
CO5	**CO5** Determine appropriate algorithms for a target code generation	K6

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		3	3		2
CO2			3	3		
CO3	2		3	3		2
CO4	3		3	3		2
CO5	3		3	3	2	3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Lexical Analysis:** Language Processors, Structure of a Compiler, Lexical Analysis, The Role of the Lexical Analyzer, Bootstrapping, Input Buffering, Specification of Tokens, Recognition of Tokens, Lexical Analyzer Generator-LEX, Finite Automata, Regular Expressions and Finite Automata, Design of a Lexical Analyzer Generator.	10Hrs
UNIT – 2	**Syntax Analysis:** The Role of the Parser, Context-Free Grammars, Derivations, Parse Trees, Ambiguity, Left Recursion, Left Factoring, Top Down Parsing: Pre Processing Steps of Top Down Parsing, Backtracking, Recursive Descent Parsing, LL (1) Grammars, Non-recursive Predictive Parsing, Error Recovery in Predictive Parsing	12Hrs
UNIT – 3	**Bottom Up Parsing:** Introduction, Difference between LR and LL Parsers, Types of LR Parsers, Shift Reduce Parsing, SLR Parsers,	12Hrs

	Construction of SLR Parsing Tables, More Powerful LR Parses, Construction of CLR (1) and LALR Parsing Tables, Dangling Else Ambiguity, Error Recovery in LR Parsing, Handling Ambiguity Grammar with LR Parsers	
UNIT – 4	**Syntax Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's. Intermediate Code Generation: Variants of Syntax Trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Intermediate Code for Procedures.	12Hrs
UNIT – 5	**Run Time Environments:** Storage Organization, Run Time Storage Allocation, Activation Records, Procedure Calls, Displays, Code Optimization: The Principle Sources of Optimization, Basic Blocks, Optimization of Basic Blocks, Structure Preserving Transformations, Flow Graphs, Loop Optimization, Data-Flow Analysis, Peephole Optimization, Code Generation: Issues in the Design of a Code Generator, Object Code Forms, Code Generation Algorithm, Register Allocation and Assignment.	12Hrs
	Total	58Hrs

*Note:

Text Books:

1.Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S.
Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers,2007

Reference Books:

1. Compiler Construction, Principles and Practice, Kenneth C Louden,Cengage Learning, 2006
2. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3. Optimizing Compilers for Modern Architectures, Randy Allen, Ken Kennedy, Morgan Kauffmann, 2001.
4. Levine, J.R., T. Mason and D. Brown, Lex and Yacc, edition, O'Reilly & Associates, 1990

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D25158B4	L	T	P	C
		3	0	0	3
Any minimum 12 weeks MOOCS/NPTEL courses suggested by BOS (PROGRAM ELECTIVE-II)					

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D2515803	L	T	P	C
		0	1	2	2

DATA STRUCTURES ALGORITHM & ANALYSIS LAB
(Laboratory-1)

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	Ability to write and analyze algorithms for algorithm correctness and efficiency	K2
CO2	Master a variety of advanced abstract data type (ADT) and data structures and their Implementation.	K4
CO3	Demonstrate various searching, sorting and hash techniques and be able to apply and solve problems of real life	K4
CO4	Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees	K3
CO5	Ability to compare various search trees and find solutions for IT related problems	K6

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		2	3		
CO2			3	3		
CO3			3	3		2
CO4			3	3		3
CO5			3	3	2	2

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
Experiment– 1	Write a java program to perform various operations on single linked list	10Hrs
Experiment– 2	Write a java program for the following a) Reverse a linked list b) Sort the data in a linked list c) Remove duplicates d) Merge two linked lists	12Hrs
Experiment– 3	Write a java program to perform various operations on doubly linked list	12Hrs
Experiment– 4	Write a java program to perform various operations on circular linked list	

Experiment– 5	Write a java program for performing various operations on stack using linked list	12Hrs
Experiment– 6	Write a java program for performing various operations on queue using linked list	12Hrs
Experiment– 7	**Experiment– 7** Write a java program for the following using stack a) Infix to postfix conversion. b) Expression evaluation.	
Experiment– 8	Write a java program to implement various operations on Binary Search Tree Using Recursive and Non-Recursive methods.	
Experiment– 9	Write a java program to implement the following for a graph. a) BFS b) DFS	
Experiment– 10	Write a java program to implement Merge & Heap Sort of given elements	
Experiment– 11	Write a java program to implement Quick Sort of given elements	
Experiment– 12	Write a java program to implement various operations on AVL trees	
Experiment– 13	Write a java program to perform the following operations: a) Insertion into a B-tree b) Searching in a B-tree	
Experiment– 14	Write a java program to implementation of recursive and non-recursive functions to Binary tree Traversals	
Experiment– 15	Write a java program to implement all the functions of Dictionary (ADT) using Hashing	
	Total	58Hrs

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D2515804	L	T	P	C
		0	1	2	2

ADVANCED DATA WAREHOUSING AND DATA MINING LAB
(Laboratory-2)

Pre-requisites: Data Base Management Systems, Python Programming
COURSE OBJECTIVES: The main objective of the course is to

- Inculcate Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
- Design a data warehouse or data mart to present information needed by management in a form that is usable
- Emphasize hands-on experience working with all real data sets.
- Test real data sets using popular data mining tools such as WEKA, Python Libraries
- Develop ability to design various algorithms based on data mining tools

Software Requirements: WEKA Tool/Python/R-Tool/Rapid Tool/Oracle Data mining

UNIT	CONTENTS	Contact Hours
Experiment– 1	Creation of a Data Warehouse. 1. Build Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration Tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects,etc.,) 2. Design multi-dimensional data models namely Star, Snowflake and Fact Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc). 3. Write ETL scripts and implement using data warehouse tools. ▪Perform Various OLAP operations such slice, dice, roll up, drill up and pivot	10Hrs

Experiment– 2	➢ Explore machine learning tool "WEKA" ➢ Explore WEKA Data Mining/Machine Learning Toolkit. ➢ Downloading and/or installation of WEKA data mining toolkit. ➢ Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface. ➢ Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel) ➢ Study the arff file format Explore the available data sets in WEKA. Load a data set (ex. Weather dataset, Iris dataset, etc.) ➢ Load each dataset and observe the following: 1. List the attribute names and they types 2. Number of records in each dataset 3. Identify the class attribute (if any) 4. Plot Histogram 5. Determine the number of records for each class. 6. Visualize the data in various dimensions	12Hrs

Experiment– 3	Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets 1.Explore various options available in Weka for preprocessing data and apply Unsupervised filters like Discretization, Resample filter, etc. on each dataset 2 Load weather. nominal, Iris, Glass datasets into Weka and run Apriori Algorithm with different support and confidence values. 3.Study the rules generated. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated. 4. Derive interesting insights and observe the effect of discretization in the rule generation process.	12Hrs
Experiment– 4	Demonstrate performing classification on data sets Weka/R 1.Load each dataset and run 1d3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic. 2.Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix. 3. Load each dataset into Weka/R and perform Naïve-bayes classification and k-Nearest Neighbour classificati Interpret the results obtained. 4. Plot RoC Curves 5. Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.	
Experiment– 5	Demonstrate performing clustering of data sets 1.Load each dataset into Weka/R and run simple k-means clustering algorithm with different values of k (number of desired clusters). 2. Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights. 3. Explore other clustering techniques available in Weka/R. Explore visualization features of Weka/R to visualize the clusters. Derive interesting insights and explain	12Hrs

Experiment– 6	Demonstrate knowledge flow application on data sets into Weka/R 1.Develop a knowledge flow layout for finding strong association rules by using Apriori, FP Growth algorithms 2.Set up the knowledge flow to load an ARFF (batch mode) and perform a cross validation using J48 algorithm Demonstrate plotting multiple ROC curves in the same plot window by using j48 and Random forest tree	12Hrs
Experiment– 7	Demonstrate ZeroR technique on Iris dataset (by using necessary preprocessing technique(s)) and share your observations	
Experiment– 8	Write a java program to prepare a simulated data set with unique instances	
Experiment– 9	Write a Python program to generate frequent item sets / association rules using Apriori algorithm	
Experiment– 10	Write a program to calculate chi-square value using Python/R. Report your observation.	
Experiment– 11	Implement a Java/R program to perform Apriori algorithm	
Experiment– 12	Write a R program to cluster your choice of data using simple k-means algorithm using JDK	
Experiment– 13	Write a program of cluster analysis using simple k-means algorithm Python/R programming language	
Experiment– 14	Write a program to compute/display dissimilarity matrix (for your own dataset containing at least four instances with two attributes) using Python	
Experiment– 15	Visualize the datasets using matplotlib in python/R.(Histogram, Box plot, Bar chart, Pie chart etc.,)	
	Total	58Hrs

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester	Course Code: D2515805	L	T	P	C
		0	0	2	1
Seminar-1					

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D2525800	L	T	P	C
		3	1	0	4

MACHINE LEARNING

Course Objectives: The objectives of the course are to

1. Define machine learning and its different types (supervised and unsupervised) and understand their applications.
2. Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN).
3. Implement unsupervised learning techniques, such as K-means clustering.

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**CO1** Enumerate the Fundamentals of Machine Learning	K2
CO2	**CO2** Build Nearest Neighbour based models	K2
CO3	**CO3** Apply Models based on decision trees and Bayes rule	K4
CO4	**CO4**Choose appropriate clustering technique	K2

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		3	3		
CO2	2		3	3	2	2
CO3	2		3	3	2	2
CO4	3		3	3	2	3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Introduction to Machine Learning:** Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets	10Hrs

UNIT – 2	**Nearest Neighbor-Based Models:** Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression	12Hrs
UNIT – 3	**Models Based on Decision Trees**: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression **The Bayes Classifier:** Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)	12Hrs
UNIT – 4	**: Linear Discriminants for Machine Learning**: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptron's (MLPs), Backpropagation for Training an MLP	12Hrs
UNIT – 5	**Clustering** : Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. "Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

Reference Books:

1. Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017
2. "Machine Learning in Action",Peter Harrington, DreamTech
3. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D2525801	L	T	P	C
		3	1	0	4

NATURAL LANGUAGE PROCESSING

Course Objectives: This course introduces the fundamental concepts and techniques of natural language processing (NLP).

- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**CO1** Demonstrate a given text with basic Language features	K5
CO2	**CO2** Design an innovative application using NLP components	K3
CO3	Explain a rule based system to tackle morphology/syntax of a language	K3
CO4	**CO4**Design a tag set to be used for statistical processing for real-time applications	K3
C05	compare and contrast the use of different statistical approaches for different types of NLP applications	K5

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2	3		
CO2	3	2	3	3	3	3
CO3	2		3	3		
CO4	2		3	3	2	
CO5	2	2	3	3	3	2

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**INTRODUCTION:** Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology,	10Hrs

	rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance	
UNIT – 2	**WORD LEVEL ANALYSIS:** Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models	12Hrs
UNIT – 3	**SYNTACTIC ANALYSIS**: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures	12Hrs
UNIT – 4	**SEMANTICS AND PRAGMATICS:** Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.	12Hrs
UNIT – 5	**DISCOURSE ANALYSIS AND LEXICAL RESOURCES:** Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2nd Edition, Daniel Jurafsky, James H. Martin - Pearson Publication,2014.
2. Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward Loper, OReilly Media,2009.

Reference Books:

1. Language Processing with Java and Ling Pipe Cookbook, 1st Edition, Breck Baldwin, Atlantic Publisher, 2015.
2. Natural Language Processing with Java, 2nd Edition, Richard M Reese, OReilly Media,2015.
3. Handbook of Natural Language Processing, Second, Nitin Indurkhya and Fred J. Damerau, Chapman and Hall/CRC Press, 2010.Edition Natural Language Processing and Information Retrieval, 3rd Edition, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press,2008.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year – II Semester	Course Code: D2525802	L	T	P	C
		3	1	0	4
	INTRODUCTION TO QUANTUM COMPUTING				

Course Objectives: The main objectives of the course are to

1. Introduce fundamental concepts of quantum mechanics and its mathematical formalism. ▪Explore quantum computing and communication principles and technologies.
2. Understand the physical implementation and limitations of quantum systems.
3. Enable students to relate quantum theory to practical applications in computing, cryptography, and sensing.
4. Familiarize students with the emerging trends in quantum technologies

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	Describe the Historical development of quantum theory and its relevance to modern computing	K2
CO2	**CO2** Define Qubits and Compare the Classical vs. quantum information	K4
CO3	**CO3** Explain the Classical computing review and limitations	K3
CO4	Demonstrate the principles and techniques of Quantum error correction	K4
C05	Discuss the working, applications and potential of Quantum sensors in real-world scenarios	K3

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2			
CO2	2		3	3		
CO3	2		3	2		
CO4	3		3	3	2	1
CO5	2		2	2	3	2

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**History of Quantum Computing:** Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations	10Hrs
UNIT – 2	**Background Mathematics**: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. **Background Physics:** Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)	12Hrs
UNIT – 3	**Qubit:** Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.	12Hrs
UNIT – 4	**Quantum Algorithms:** Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm	12Hrs
UNIT – 5	**Noise and error correction:** Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation	12Hrs
	Total	58Hrs

*Note:

Text Books:

1.Nielsen M. A., Quantum Computation and Quantum Information, Cambridge

Reference Books:

1.Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci

2.Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I: Basic Concepts, Vol II

3.Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D25258A0	L	T	P	C
		3	0	0	3

FEATURE ENGINEERING
(PROGRAM ELECTIVE-III)

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	Describe the Basic concepts of Data, Tasks, Models, Features and Model building	K2
CO2	Explain the concept of coverting Text into Flat Vectors using Bag- of-Words, and Bag-of-n-Grams	K3
CO3	**CO3** Demonstrate techniques for Dimensionality Reduction	K4
CO4	**CO4**Discuss non linear Featurization	K4
C05	Explain the concept of Item-Based Collaborative Filtering	K3

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		3	2		
CO2	2		3	3		
CO3	3		3	3	2	
CO4	3		3	3	2	1
CO5	2		2	3	3	1

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**The Machine Learning Pipeline:** Data, Tasks, Models, Features, Model Evaluation Fancy Tricks with Simple Numbers: Scalars, Vectors, and Spaces, Dealing with Counts, Binarization, Quantization or Binning, Log Transformation, Log Transform in Action, Power Transforms: Generalization of the Log Transform, Feature Scaling or Normalization, Min-Max Scaling, Standardization (Variance Scaling), ℓ2 Normalization, Interaction Features, Feature Selection	10Hrs
UNIT – 2	**Text Data: Flattening, Filtering, and Chunking: Bag-of-X:** Turning Natural Text into Flat Vectors, Bag- of-Words, Bag-of-n-Grams, Filtering for Cleaner Features: Stopwords, Frequency-Based Filtering, Stemming; Atoms of Meaning: From Words to n-Grams to Phrases: Parsing and Tokenization, Collocation Extraction for Phrase Detection The Effects of Feature Scaling: From Bag-of-Words to Tf-Idf :Tf-Idf : A Simple Twist on Bag-of- Words, Putting It to the Test : Creating a Classification Dataset,	12Hrs

	Scaling Bag-of-Words with Tf-Idf Transformation, Classification with Logistic Regression, Tuning Logistic Regression with Regularization	
UNIT – 3	**Categorical Variables:** Counting Eggs in the Age of Robotic Chickens: Encoding Categorical Variables: One-Hot Encoding, Dummy Coding, Effect Coding, Pros and Cons of Categorical Variable Encodings; Dealing with Large Categorical Variables: Feature Hashing, Bin Counting. **Dimensionality Reduction:** Squashing the Data Pancake with PCA: Intuition, Derivation: Linear Projection, Variance and Empirical Variance, Principal Components: First Formulation, Principal Components: Matrix-Vector Formulation, General Solution of the Principal Components; Transforming Features, Implementing PCA: PCA in Action, Whitening and ZCA, Considerations and Limitations of PCA	12Hrs
UNIT – 4	**Nonlinear Featurization via K-Means Model Stacking:** k-Means Clustering, Clustering as Surface Tiling, k-Means Featurization for Classification: Alternative Dense Featurization, Pros, Cons, and Gotchas	12Hrs
UNIT – 5	**Item-Based Collaborative Filtering, First Pass:** Data Import, Cleaning, and Feature Parsing, Academic Paper Recommender: Naive Approach, Second Pass: More Engineering and a Smarter Model, Academic Paper Recommender: Take 2, Third Pass: More Features is More Information, Academic Paper Recommender: Take 3	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. "Feature Engineering for Machine Learning Principles and Techniques for Data Scientists", Alice Zheng& Amanda Casari, O'REILLY, 2018
2. "Feature Engineering and Selection: A Practical Approach for Predictive Models", Max Kuhn, Kjell Johnson, CRC Press, 2019

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D25258A1	L	T	P	C
		3	0	0	3
GENERATIVE AI (PROGRAM ELECTIVE-III)					

Course Objectives:

1. To learn Python and TensorFlow skills for Generative AI.
2. To study techniques for cleaning and preparing data for Generative AI tasks.
3. To implement generative AI models
4. To develop innovative applications using generative AI tools and techniques.

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	Implement Python and TensorFlow basics, including data handling and preprocessing techniques	K5
CO2	Implement Generative AI models such as GANs, VAEs, LSTM networks, and Transformer models for image text, and music	K4
CO3	Evaluate model performance and experiment with hyper parameters and optimization techniques to enhance Generative AI outcomes.	K6
CO4	Develop innovative applications in image, text, and music generation, showcasing practical skills	K5

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2	3	2	
CO2	3		3	3	3	1
CO3	3		3	3	3	2
CO4	3	2	3	3	3	3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Introduction To Gen Ai:** Historical Overview of Generative modelling, Difference between Gen AI and Discriminative Modeling, Importance of generative models in AI and Machine Learning, Types of Generative models, GANs, VAEs, autoregressive models and Vector quantized Diffusion models, Understanding if probabilistic modeling and generative process, Challenges of Generative Modeling, Future of Gen AI, Ethical Aspects of AI, Responsible AI, Use Cases	10Hrs

UNIT – 2	**Generative Models For Text:** Language Models Basics, Building blocks of Language models, Transformer Architecture, Encoder and Decoder, Attention mechanisms, Generation of Text, Models like BERT and GPT models, Generation of Text, Autoencoding, Regression Models, Exploring ChatGPT, Prompt Engineering: Designing Prompts, Revising Prompts using Reinforcement Learning from Human Feedback (RLHF), Retrieval Augmented Generation, Multimodal LLM, Issues of LLM like hallucination	12Hrs
UNIT – 3	**Generation of Images:** Introduction to Generative Adversarial Networks, Adversarial Training Process, Nash Equilibrium, Variational Autoencoders, Encoder-Decoder Architectures, Stable Diffusion Models, Introduction to Transformer-based Image Generation, CLIP, Visual Transformers ViT- Dall-E2 and Dall-E3, GPT-4V, Issues of Image Generation models like Mode Collapse and Stability.	12Hrs
UNIT – 4	Generation of Painting, Music, and Play: Variants of GAN, Types of GAN, Cyclic GAN, Using Cyclic GAN to Generate Paintings, Neural Style Transfer, Style Transfer, Music Generating RNN, MuseGAN, Autonomous agents, Deep Q Algorithm, Actor-critic Network.	12Hrs
UNIT – 5	**Open Source Models And Programming Frameworks:** Training and Fine tuning of Generative models, GPT 4 All, Transfer learning and Pretrained models, Training vision models, Google Copilot, Programming LLM, LangChain, Open Source Models, Llama, Programming for TimeSformer, Deployment, Hugging Face.	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Denis Rothman, "Transformers for Natural Language Processing and Computer Vision", Third Edition , Packt Books, 2024

Reference Books:

1. David Foster, "Generative Deep Learning", O'Reily Books, 2024.
2. Altaf Rehmani, "Generative AI for Everyone", BlueRose One, 2024.

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY(Autonomous)
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D25258A2	L	T	P	C
		3	0	0	3

ADHOC SENSOR NETWORKS
(PROGRAM ELECTIVE-III)

Course Objectives:

1. Architect sensor networks for various application setups.
2. Devise appropriate data dissemination protocols and model links cost.
3. Understandings of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.
4. Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	Describe fundamentals of wireless communication, wireless propagation, and challenges in adhoc and sensor networks	K2
CO2	Analyze MAC layer issues and protocols in adhoc networks including IEEE 802.11	K4
CO3	Evaluate routing and transport layer protocols in adhoc wireless networks and explain their security considerations	K5
CO4	Explain WSN architecture ,sensor node components and MAC protocols including IEEE 802.15.4	K3

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2	3		1
CO2	2		2	3	2	
CO3	3	2	3	3	2	2
CO4	2		3	3	2	2

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Introduction:** Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio propagation Mechanisms, Characteristics of the Wireless channel mobile ad hoc networks (MANETs), Wireless Sensor Networks (WSNs): concepts and architectures, Applications of Ad Hoc and Sensor Networks, Design Challenges in Ad hoc and Sensor Networks	10Hrs

UNIT – 2	**MAC Protocols for Ad Hoc Wireless Networks:** Issues in designing a MAC Protocol, Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention based protocols with Scheduling Mechanisms, Multi-channel MAC – IEEE 802.11.	12Hrs
UNIT – 3	**Routing Protocols and Transport Layer In Ad Hoc Wireless Networks:** Routing Protocol: Issues in designing a routing protocol for Ad hoc networks, Classification, proactive routing, reactive routing (on-demand), hybrid routing, Transport Layer protocol for Ad hoc networks, Design Goals of a Transport Layer Protocol for AdHoc Wireless Networks, Classification of Transport Layer solutions-TCP over Ad hoc wireless, Network Security, Security in Ad Hoc Wireless Networks, Network Security Requirements.	12Hrs
UNIT – 4	**Wireless Sensor Networks (WSNS) And Mac Protocols:** Single node architecture - hardware and software components of a sensor node, WSN Network architecture: typical network architectures, data relaying and aggregation strategies, MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC -IEEE 802.15.4.	12Hrs
UNIT – 5	**: WSN Routing, Localization & Qos:** Issues in WSN routing, OLSR, Localization, Indoor and Sensor Network Localization, absolute and relative localization, triangulation, QOS in WSN, Energy Efficient Design, Synchronization.	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Ad Hoc Wireless Networks: Architectures and Protocols ", C. Siva Ram Murthy, and B. S. Manoj, Pearson Education, 2008
2. "Wireless Adhoc and Sensor Networks", Labiod. H, Wiley, 1 st edition-2008
3. "Wireless ad -hoc and sensor Networks: theory and applications", Li, X, Cambridge University Press, fifth edition-2008.

Reference Books:

1. "Ad Hoc & Sensor Networks: Theory and Applications", 2nd edition, Carlos De MoraisCordeiro, Dharma Prakash Agrawal ,World Scientific Publishing Company, 2011
2. Wireless Sensor Networks Feng Zhao and LeonidesGuibas,Elsevier Publication 2nd edition-2004 3. "Protocols and Architectures for Wireless Sensor Networks", Holger Karl and Andreas Willig,Wiley, 2005 (soft copy available)
4. "Wireless Sensor Networks Technology, Protocols, and Applications", KazemSohraby, Daniel Minoli, &TaiebZnati, John Wiley, 2007. (soft copy available)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D25258A3	L	T	P	C
		3	0	0	3

PRINCIPLES OF NETWORK SECURITY
(PROGRAM ELECTIVE-III)

COURSE OBJECTIVES:

1. Explain the objectives of information security
2. Explain the importance and application of each of confidentiality, integrity, authentication and availability
3. Understand the basic categories of threats to computers and networks
4. Discusses the Mathematics of Cryptography
5. Discuss the fundamental ideas of Symmetric and Asymmetric Cryptographic Algorithms
6. Discusses the Network layer, Transport Layer and Application Layer Protocols Enhanced security mechanisms

Course Outcomes: At the end of the course, student will be able to

CO	Course Outcomes	Knowledge Level (K)#
CO1	Understand security issues related to computer networks and learn different symmetric key techniques	**K2**
CO2	Apply mathematic of cryptography for symmetric and Asymmetric algorithms and apply this knowledge to understand the Cryptographic algorithms	**K3**
CO3	**CO3** Understand and Compare different types of symmetric and	**K2**
CO4	Explain Hash functions, message authentication and digital signature and their importance to the security	**K2**
CO5	**CO5** Analyze enhanced security protocols at various network layer,	**K4**

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**2**		**2**	**3**		**2**
CO2	**2**		**3**	**3**	**2**	**1**
CO3	**1**		**2**	**3**		**2**
CO4	**2**	**2**	**3**	**3**		**3**
CO5	**3**	**2**	**3**	**3**	**2**	**3**

(Please fill the above with Levels of Correlation, viz., L-1, M-2, H-3)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography.Classical Encryption Techniques-symmetric cipher model, Substitution techniques, Transposition techniques, Rotor Machines,	10Hrs
UNIT – 2	**Introduction to Symmetric Cryptography: Algebraic Structures**-Groups, Rings, Fields, GF(2) fields, Polynomials.**Mathematics of Asymmetric cryptography:** Primes, Checking For Primness, Eulers phi-functions, Fermat's Little Theorem, Euler's Theorem, Generating Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence Exponentiation And Logarithm.	12Hrs
UNIT – 3	**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, IDEA, Block cipher operation, Stream ciphers: RC4, RC5 **Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Elgamal Cryptographic system, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.	12Hrs
UNIT – 4	**Cryptographic Hash Functions:** Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithms (SHA) **Message Authentication Codes:** Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MAC'S,MAC'S Based On Hash Functions: HMAC, MAC'S Based On Block Ciphers: DAA And CMAC **Digital Signatures:** Digital Signatures, Elgamal Digital Signature Scheme, Elliptic Curve Digital Signature Algorithm, RSA-PSS Digital Signature Algorithm.	12Hrs
UNIT – 5	**Network and Internet Security: Transport-Level Security:** Web Security Considerations, Transport Level Security, HTTPS, SSH. **IP Security:** IP Security Overview, IP Security Policy, Encapsulating Security Payload, Authentication Header Protocol. **Electronic-Mail Security:** Internet-mail Security, Email Format, Email Threats and Comprehensive Email Security, S/MIME, PGP.	12Hrs
	Total	58Hrs

*Note:

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 7th Edition, 2017
2. Cryptography and Network Security: Behrouz A. Forouzan Debdeep, Mc Graw Hill, 3rd Edition, 2015

REFERENCE BOOKS:

1. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition
2. Introduction to Cryptography with Coding Theory: Wade Trappe, Lawrence C. Washington, Pearson.
3. Modern Cryptography: Theory and Practice By Wenbo Mao. Pearson

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D25258B0	L	T	P	C
		3	0	0	3
BLOCK CHAIN TECHNOLOGIES (PROGRAM ELECTIVE-IV)					

Course Objectives:

1. Architect sensor networks for various application setups.
2. Devise appropriate data dissemination protocols and model links cost.
3. Understandings of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.
4. Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**CO1** Discuss the Cryptographic primitives used in Blockchain (K2)	K2
CO2	**CO2** Discuss about various technologies borrowed in blockchain (K2)	K2
CO3	**CO3** Illustrate various models for blockchain (K2)	K2
CO4	**CO4**Discuss about Ethereum (K2)	K2
CO5	**CO5** Discuss about Hyperledger Fabric (K2)	K2

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1		2	3	2	2
CO2	1		2	2	3	2
CO3			2	2	2	
CO4			2	2	3	2
CO5			2	2	3	2

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**INTRODUCTION TO BLOCKCHAIN:** Introduction, history of Bitcoin and origins of Blockchain, Fundamentals of Blockchain and key components **(Chapter 1-book1),** Permission and Permission-less platforms**(Chapter 1-book2),** Introduction to Cryptography, SHA256 and ECDSA, Hashing and Encryption, Symmetric/ Asymmetric keys, Private and Public Keys(**Chapter 3-book2)**.	10Hrs

UNIT – 2	**TECHNOLOGIES BORROWED IN BLOCKCHAIN:** Technologies Borrowed in Blockchain –hash pointers- - Digital cash etc.- Bitcoin blockchain - Wallet – Blocks Merkley Tree - hardness of mining - Transaction verifiability - Anonymity - forks - Double spending - Mathematical analysis of properties of Bitcoin - Bitcoin- the challenges and solutions. (**Chapter 3-book2)**.	12Hrs
UNIT – 3	**CONSENSUS MECHANISMS :Consensus Algorithms:** Proof of Work (PoW) as random oracle - Formal treatment of consistency- Liveness and Fairness - Proof of Stake (PoS) based Chains -Hybrid models (PoW + PoS), Byzantine Models of fault	12Hrs
UNIT – 4	**ETHEREUM:** Ethereum -Ethereum Virtual Machine (EVM) -Wallets for Ethereum -Solidity - Smart Contracts **(Chapter 5-book1),** - The Turing Completeness of Smart Contract Languages and verification challenges- Using smart contracts to enforce legal contracts- Comparing Bitcoin scripting vs. Ethereum Smart Contracts-Some attacks on smart contracts (**Chapter 6 and**	12Hrs
UNIT – 5	**HYPERLEDGER FABRIC:** Hyperledger fabric- the plug and play platform and mechanisms in permissioned blockchain - Beyond Cryptocurrency – applications of blockchain in cyber security- integrity of information- E-Governance and other contract enforcement mechanisms - Limitations of blockchain as a technology and myths vs reality of blockchain technology **(Chapter 16-book1),** (**Chapter 9 -book2)**	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Blockchain Technology Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, University Press, 2020.
2. Mastering Blockchain - Distributed ledger technology, decentralization, and smart contracts explained, Imran Bashir,2nd ed. Edition,2018, pakct publication

Reference Books:

1. .Shukla, M.Dhawan, S.Sharma,S. Venkatesan "Blockchain Technology: Cryptocurrency and Applications" ,Oxford University Press 2019 .
2. Cryptography and network security principles and practice, William Stallings, Pearson, 8th edition,

WEB REFERENCES:

1. https://drive.google.com/file/d/1PtYaDmWYaqPVGjKDnMYGWO5eoI5wMPtJ/view
2. https://archive.nptel.ac.in/courses/106/104/106104220/
3. https://www.tutorialspoint.com/blockchain/index.htm

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D25258B1	L	T	P	C
		3	0	0	3
DEVOPS (PROGRAM ELECTIVE-IV)					

Course Objectives: The main objectives of this course are to:

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. Implement automated system update and DevOps lifecycle.

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	**CO1** Explain DevOps Life cycle process	K2
CO2	**CO2** Demonstrate the concept of Code coverage	K3
CO3	Explain Jenkins , jenkins workflow, jenkins master slave architecture, Jenkins Pipelines	K2
CO4	**CO4**Discuss the concept of Dockers Command and running containers	K2

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1		2	2	3	
CO2			2	3	3	
CO3			2	3	3	
CO4			2	2	3	

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Intı oduction to De Ops:** Introduction t SDLC, Agile Model. Intr oduction to Dev ps. DevOps Features , DevOps Architecture, Dev ps Lifecycle, Understanding Worl flow an l principles, Intr oduction to DevOps tools, Build Automation, Delivery Automation Unc rstanding Code Quality, Automation o f CI/ CD. R lease	10Hrs

UNIT – 2	**Source Code Management (GIT**): The need for source code control, The history of source code management, Roles and code, source code management system and migrations. What is Version Control and GIT, GIT Installation, GIT features, GIT workflow, working with remote repository, GIT commands, GIT branching, GIT staging and collaboration. UNIT TESTING-CODECOVERAGE: Junit ,nUnit & Code Coverage with Sonar Qube, SonarQube - Code Quality Analysis.	12Hrs
UNIT – 3	**Build Automation - Continuous Integration (CI):** Build Automation, What isCI Why CI is Required, CI tools, Introduction to Jenkins (With Architecture), jenkins workflow, jenkins master slave architecture, Jenkins Pipelines, PIPELINE BASICS - Jenkins Master, Node, Agent, and Executor Freestyle Projects& Pipelines, Jenkins for Continuous Integration, Create and Manage Builds, User Management in Jenkins Schedule Builds, Launch Builds on Slave Nodes.	12Hrs
UNIT – 4	**Continuous Delivery:** Importance of Continuous Delivery, CONTINUOUS DEPLOYMENT CD Flow, Containerization with Docker: Introduction to Docker, Docker installation, Docker commands, Images & Containers, Docker File, running containers, working with containers and publish to Docker Hub. Testing Tools: Introduction to Selenium and its features, Java Script testing	12Hrs
UNIT – 5	**Configuration Management - ANSIBLE**: Introduction to Ansible, Ansible tasks Roles, Jinja2 templating, Vaults, Deployments using Ansible. CONTAINERIZATION USING UBERNETES(OPENSHIFT): Introduction to Kubernetes Namespace & Resources, CI/CD - On OCP, BC, DC& Config Maps, Deploying Apps on Open shift Container Pods. Introduction to Puppet master and Chef	12Hrs
	Total	58Hrs

*Note:

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins. 6.Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.

8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in Java Script and perform testing using Selenium.
12. Develop test cases for the above containerized application sing selenium.

Text Books

1. Joyner, Joseph., DevOps for Beginners: DevOps Software Development Method Guide for Software Developers and It Professionals, 1st Edition Mihails Konoplows, 2015.
2. Alisson Machado de Menezes., Hands-on DevOps with Linux,1st Edition, BPB Publications, India, 2021.

Reference Books

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10
2. Gene Kim Je Humble, Patrick Debois, John Willis. The DevOps Handbook, 1st Edition, IT Revolution Press, 2016.
3. Verona ,Joakim Practical DevOps,1stEdition,Packt Publishing,2016.
4. Joakim Verona. Practical Devops, Second Edition.In gram short title; 2nd edition (2018). ISBN10: 1788392574
5. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's View point. Wiley publications.ISBN:9788126579952

Web Resources:

4. https://archive.nptel.ac.in/courses/106/104/106104220/
5. https://www.tutorialspoint.com/blockchain/index.htm

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D25258B2	L	T	P	C
		3	0	0	3
SECURE CODING (PROGRAM ELECTIVE-IV)					

Course Objectives:

1. Understanding of the various security attacks and knowledge to recognize and remove common coding errors that lead to vulnerabilities.
2. Knowledge of outline of the techniques for developing a secure application.
3. Recognize opportunities to apply secure coding principles

Course Outcomes: At the end of the course, student will be able to (Four to Six)

		Knowledge Level (K)#
CO1	Demonstrate the development of process of software leads to secure coding practices	K3
CO2	**CO2** Apply Secure programs and various risk in the software's	K3
CO3	**CO3** Classify various errors that lead to vulnerabilities	K4
CO4	**CO4**Design Real time software and vulnerabilities	K6

#Based on suggested Revised BTL

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		3	3	2	2
CO2	2		3	3	3	3
CO3			2	3	2	3
CO4	3	2	3	3	3	3

(Please fill the above with Levels of Correlation, viz., L, M, H)

UNIT	CONTENTS	Contact Hours
UNIT – 1	**Introduction-** Need for secure systems, Proactive security development process, Security principles to live by and threat modelling.	10Hrs
UNIT – 2	**Secure Coding in C-** Character strings- String manipulation errors, String Vulnerabilities and exploits Mitigation strategies for strings, Pointers, Mitigation strategies in pointer based vulnerabilities Buffer Overflow based vulnerabilities	12Hrs
UNIT – 3	**Secure Coding in C++ and Java-** Dynamic memory management, Common errors in dynamic memory management, Memory managers, Double –free vulnerabilities, Integer security, Mitigation strategies	12Hrs

UNIT – 4	**Database and Web Specific Input Issues**- Quoting the Input, Use of stored procedures, Building SQL statements securely, XSS related attacks and remedies	12Hrs
UNIT – 5	**Software Security Engineering-** Requirements engineering for secure software: Misuse and abuse cases, SQUARE process model Software security practices and knowledge for architecture and design	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Writing Secure Code, 2 nd Edition, Michael Howard, David LeBlanc, Microsoft Press, 2003

Reference Books:

2. Secure Coding in C and C++, Robert C. Seacord, 2 nd edition, Pearson Education, 2013
3. Software Security Engineering: A guide for Project Managers, 1 st ed, Julia H. Allen, Sean J.Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Addison-Wesley Professional,2008

UNIT	CONTENTS	Contact Hours
UNIT – 1	What is a Design Pattern, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalogue of Design Patterns, Organizing The Cato log, How Design Patterns solve Design Problems, How to Select a Design pattern, How to Use a Design Pattern.	10Hrs
UNIT – 2	**A Case Study**: Designing a Document Editor, Design Problems , Document Structure, Formatting , Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary, Creational Patterns, Abstract Factory, Builder , Factory Method, Prototype, Singleton, Discussion of Creational Patterns.	12Hrs
UNIT – 3	Structural Pattern Part-I, Adapter, Bridge, Composite. Structural Pattern Part-II, Decorator, Facade, Flyweight, Proxy.	12Hrs
UNIT – 4	Behavioral Patterns Part: I, Chain of Responsibility, Command, Interpreter, Iterator. Behavioral Patterns Part: II, Mediator, Memento, Observer, Discussion of Behavioral Patterns.	12Hrs
UNIT – 5	**Behavioral Patterns Part:** III, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community, An Invitation, A Parting Thought.	12Hrs
	Total	58Hrs

*Note:

Text Books:

1. Design Patterns By Erich Gamma, Pearson Education

Reference Books:

1. Patterns in JAVA Vol-I (or) Vol-II By Mark Grand, Wiley Dream Tech.
2. Java Enterprise Design Patterns Vol-III By Mark Grand Wiley Dream Tech

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D25258B3	L	T	P	C
		3	0	0	3
Any minimum 12 weeks MOOCS/NPTEL courses suggested by BOS (PROGRAM ELECTIVE-IV)					

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D2525803	L	T	P	C
		0	1	2	2

MACHINE LEARNING LAB
(Laboratory-3)

Pre-requisites: Data Base Management Systems, Python Programming

COURSE OBJECTIVES: The main objective of the course is to

1. To learn about computing central tendency measures and Data pre-processing techniques ▪To learn about classification and regression algorithms
2. To apply different clustering algorithms for a problem.

Software's Required: Python/R/Weka

UNIT	CONTENTS	Contact Hours
Experiment– 1	Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.	10Hrs
Experiment– 2	Apply the following Pre-processing techniques for a given dataset. a. Attribute selection b. Handling Missing Values c. Discretization d. Elimination of	12Hrs
Experiment– 3	Apply KNN algorithm for classification and regression	12Hrs
Experiment– 4	Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results	
Experiment– 5	Demonstrate decision tree algorithm for a regression problem	12Hrs
Experiment– 6	Apply Random Forest algorithm for classification and regression	12Hrs
Experiment– 7	**Experiment– 7** Demonstrate Naïve Bayes Classification algorithm	
Experiment– 8	**Experiment– 8** Apply Support Vector algorithm for classification	
Experiment– 9	Demonstrate simple linear regression algorithm for a regression problem	
Experiment– 10	Apply Logistic regression algorithm for a classification problem	
Experiment– 11	Demonstrate Multi-layer Perceptron algorithm for a classification problem	
Experiment– 12	Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of	

	the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.	
Experiment – 13	Demonstrate the use of Fuzzy C-Means Clustering	
Experiment – 14	Demonstrate the use of Expectation Maximization based clustering algorithm	
	Total	58Hrs

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D2525804	L	T	P	C
		0	1	2	2

NATURAL LANGUAGE PROCESSING LAB
(Laboratory-4)

Pre-requisites: Data Base Management Systems, Python Programming

COURSE OUTCOMES: On completion of this course, the student will be able to

1. Design Neural networks to solve real world problems
2. Build RNN, CNN models for classification
3. Choose appropriate pre-trained model to solve real time problem ·Apply different NLP techniques using NLTK package.
4. Design solutions to real-world problems using NLP

Software Packages Required:

- Keras
- Tensorflow
- PyTorch
- NLTK

UNIT	CONTENTS	Contact Hours
Experiment– 1	Implement Multilayer Perceptron algorithm for MNIST Handwritten Digit Classification.	10Hrs
Experiment– 2	**Experiment– 2** Design Neural Network for following problems i). Movie reviews classification (Binary Classification) using IMDB dataset. ii). News Wires classification (Multiclass Classification) using Reuters dataset.	12Hrs
Experiment– 3	Implement a Recurrent Neural Network(RNN) and LSTM for IMDB movie review classification problem	12Hrs
Experiment– 4	Build a Convolution Neural Network for simple image (dogs and Cats) Classification	
Experiment– 5	Use a Pre-trained Convolution Neural Network LeNet, AlexNet for image classification	12Hrs
Experiment– 6	Implement One Hot Encoding and Word Embeddings on any real world dataset	12Hrs
Experiment– 7	Create Sample list at least 10 words POS tagging and find the POS for any given word	
Experiment– 8	Write a Python program to	

	i). Perform Morphological Analysis using NLTK library ii)Generate n-grams using NLTK N-Grams library iii). Implement N-Grams Smoothing	
Experiment– 9	Write a program to implement Named Entity Recognition(NER)for any corpus	
Experiment– 10	Using NLTK package to convert audio file to text and text file to audio files	
Experiment– 11	Write a program to perform Auto-Correction of spellings for any text	
Experiment– 12	Implement twitter sentiment analysis using NLP.	
	Total	58Hrs

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester	Course Code: D2525805	L	T	P	C
		0	0	2	1
Seminar-II					

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Date:20-01-2026

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					Course Code: D25158A3
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		ADVANCED SOFTWARE ENGINEERING			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Explain the **nature of software** and **software engineering practice**.	**1**	**2**	**6**
	ii).	Explain the **generic process model** and describe **framework activities**.	**1**	**3**	**6**
		OR			
1.B	**i).**	Discuss **process assessment and process improvement** in software engineering.	**1**	**3**	**6**
	ii).	Explain **agility and agile process**.Discuss **Scrum and other agile frameworks**.	**1**	**4**	**6**
		UNIT-2			
2.A	**i).**	Explain the **characteristics and psychology of a software engineer**.Describe **software team structures**.	**2**	**2**	**6**
	ii).	Discuss the **core principles that guide software engineering practice**.	**2**	**3**	**6**
		OR			
2.B	**i).**	Explain the **requirements engineering process** including:requirements gathering, use cases, and analysis modeling.	**2**	**4**	**6**
	ii).	Describe **requirements modeling techniques**:class-based, functional, and behavioral modeling.	**2**	**3**	**6**
		UNIT-3			
3.A	**i).**	Explain the **design process, design concepts, and design model**.	**3**	**2**	**6**
	ii).	Discuss **software architecture** and explain different **architectural styles**.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain **user interface design principles** and **golden rules of UI design**.	**3**	**3**	**6**
	ii).	Explain **design for mobility**:mobile architecture, mobile development life cycle, and best practices.	**3**	**4**	**6**
		UNIT-4			
4.A	**i).**	Explain **software quality** and discuss the **quality dilemma**.	**4**	**2**	**6**
	ii).	Explain **formal and informal reviews** and their importance.	**4**	**3**	**6**
		OR			

4.B	**i).**	Describe **Software Quality Assurance (SQA)** process, goals, and metrics.	**4**	**4**	**6**
	ii).	Explain **white box testing and black box testing** techniques.	**4**	**3**	**6**
		UNIT-5			
5.A	**i).**	Explain **integration testing and regression testing**.	**5**	**2**	**6**
	ii).	Discuss **validation testing** and **object-oriented integration testing**.	**5**	**3**	**6**
		OR			
5.B	**i).**	Explain **mobile application testing guidelines** and testing strategies.	**5**	**4**	**6**
	ii).	Explain **software metrics and analytics**.Discuss **product, process, and project metrics**.	**5**	**4**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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					Course Code: D25258A2
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		ADHOC SENSOR NETWORKS			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Explain the **fundamentals of wireless communication technology** and the **electromagnetic spectrum**.	**1**	**2**	**6**
	ii).	Describe **radio propagation mechanisms** and explain the **characteristics of the wireless channel**.	**1**	**3**	**6**
		OR			
1.B	**i).**	Explain **Mobile Ad Hoc Networks (MANETs)** and **Wireless Sensor Networks (WSNs)** with their architectures.	**1**	**3**	**6**
	ii).	Discuss the **design challenges** and **applications of Ad Hoc and Sensor Networks**.	**1**	**4**	**6**
		UNIT-2			
2.A	**i).**	Explain the **issues and design goals** of a MAC protocol for Ad Hoc Wireless Networks.	**2**	**2**	**6**
	ii).	Classify **MAC protocols** for Ad Hoc networks and explain **contention-based protocols**.	**2**	**3**	**6**
		OR			
2.B	**i).**	Explain **contention-based MAC protocols with reservation and scheduling mechanisms**.	**2**	**3**	**6**
	ii).	Describe **multi-channel MAC protocols** and explain **IEEE 802.11 MAC** in Ad Hoc mode.	**2**	**3**	**6**
		UNIT-3			
3.A	**i).**	Explain the **issues in designing routing protocols** for Ad Hoc Wireless Networks.	**3**	**3**	**6**
	ii).	Classify **routing protocols** and explain **proactive, reactive, and hybrid routing** approaches.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain the **design goals and classification of transport layer protocols** for Ad Hoc networks.	**3**	**3**	**6**
	ii).	Discuss **network security in Ad Hoc Wireless Networks** and explain **security requirements**.	**3**	**3**	**6**
		UNIT-4			
4.A	**i).**	Explain the **single sensor node architecture**, including **hardware and software components**.	**4**	**2**	**6**
	ii).	Describe **WSN network architectures** and **data relaying and aggregation**	**4**	**4**	**6**

		strategies.			
		OR			
4.B	**i).**	Explain **self-organizing MAC protocols** for Wireless Sensor Networks.	**4**	**3**	**6**
	ii).	Explain **Hybrid TDMA/FDMA and CSMA based MAC protocols** with reference to **IEEE 802.15.4**	**4**	**4**	**6**
		UNIT-5			
5.A	**i).**	Discuss the **issues in WSN routing** and explain **OLSR protocol**.	**5**	**2**	**6**
	ii).	Explain **localization techniques** in WSNs:**absolute, relative, indoor, and sensor network localization**.	**5**	**3**	**6**
		OR			
5.B	**i).**	Explain **triangulation techniques** used for node localization.	**5**	**4**	**6**
	ii).	Discuss **QoS in WSNs**, **energy-efficient design**, and **synchronization** issues.	**5**	**5**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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				Course Code: D25258B0	
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		BLOCK CHAIN TECHNOLOGIES			
		For Computer Science & Engineering			
Time: 3 Hrs.				**Max. Marks: 60 M**	
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
				5 x 12 = 60 Marks	
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Explain the **history of Bitcoin** and the **origins of Blockchain technology**.	**1**	**2**	**6**
	ii).	Explain the **fundamentals of Blockchain** and describe its **key components**.	**1**	**3**	**6**
		OR			
1.B	**i).**	Differentiate between **permissioned and permission-less blockchain platforms** with examples.	**1**	**3**	**6**
	ii).	Explain **cryptographic concepts in blockchain**: SHA-256, ECDSA, hashing vs encryption, symmetric and asymmetric keys.	**1**	**4**	**6**
		UNIT-2			
2.A	**i).**	Explain the **Bitcoin blockchain architecture** including blocks, wallets, and Merkle trees.	**2**	**2**	**6**
	ii).	Explain **hash pointers** and discuss the **hardness of mining** in Bitcoin.	**2**	**3**	**6**
		OR			
2.B	**i).**	Explain **double spending problem** and how Bitcoin ensures **transaction verifiability and anonymity**.	**2**	**4**	**6**
	ii).	Discuss the **challenges of Bitcoin** and evaluate the **solutions proposed**.	**2**	**5**	**6**
		UNIT-3			
3.A	**i).**	Explain **Proof of Work (PoW)** as a random oracle and discuss its working.	**3**	**3**	**6**
	ii).	Explain **consistency, liveness, and fairness** properties in consensus algorithms.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain **Proof of Stake (PoS)** based blockchains and **hybrid PoW + PoS models**.	**3**	**3**	**6**
	ii).	Discuss **Byzantine fault models** and evaluate their impact on blockchain consensus.	**3**	**5**	**6**
		UNIT-4			
4.A	**i).**	Explain **Ethereum architecture** and the role of the **Ethereum Virtual Machine (EVM)**.	**4**	**2**	**6**
	ii).	Explain **Solidity language** and the concept of **smart contracts** with examples.	**4**	**4**	**6**
		OR			

4.B	**i).**	Discuss the **Turing completeness of smart contract languages** and associated **verification challenges**.	**4**	**4**	**6**
	ii).	Compare **Bitcoin scripting** and **Ethereum smart contracts**.Discuss common **attacks on smart contracts**.	**4**	**5**	**6**
		UNIT-5			
5.A	**i).**	Explain **Hyperledger Fabric architecture** and its **plug-and-play mechanisms** in permissioned blockchains.	**5**	**2**	**6**
	ii).	Explain **blockchain applications beyond cryptocurrency**, focusing on **cyber security and e-governance**.	**5**	**3**	**6**
		OR			
5.B	**i).**	Discuss how blockchain ensures **integrity of information** and **contract enforcement mechanisms**.	**5**	**4**	**6**
	ii).	Explain the **limitations of blockchain technology** and critically analyze **myths vs reality of blockchain**.	**5**	**3**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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		Course Code: D25258B1			
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		DEVOPS			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Explain **DevOps** and describe the **DevOps life cycle**.How does DevOps improve software delivery?	**1**	**2**	**6**
	ii).	Explain the **DevOps workflow** and its integration with **SDLC and Agile model**.	**1**	**3**	**6**
		OR			
1.B	**i).**	Explain **CI/CD automation** and its role in **build quality and release automation**.	**1**	**3**	**6**
	ii).	Discuss **DevOps principles and architecture**. Analyze how automation improves collaboration between development and operations.	**1**	**4**	**6**
		UNIT-2			
2.A	**i).**	Explain the **need for source code management** and the **history of version control systems**.	**2**	**2**	**6**
	ii).	Explain **Git architecture, features, and workflow**. Describe working with **remote repositories**.	**2**	**3**	**6**
		OR			
2.B	**i).**	Explain **Git commands, branching, staging, and collaboration** in detail.	**2**	**3**	**6**
	ii).	Explain **unit testing and code coverage** using **JUnit / NUnit**.	**2**	**3**	**6**
		UNIT-3			
3.A	**i).**	Explain **build automation** and the need for **Continuous Integration (CI)**.	**3**	**3**	**6**
	ii).	Explain **Jenkins architecture** and **Jenkins workflow**.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain **Jenkins master–slave architecture** and **pipeline basics**(Master, Node, Agent, Executor).	**3**	**3**	**6**
	ii).	Explain how to **create, schedule, and manage builds in Jenkins**, including user management and slave nodes.	**3**	**3**	**6**
		UNIT-4			
4.A	**i).**	Explain the **importance of Continuous Delivery and Continuous Deployment**.	**4**	**2**	**6**
	ii).	Explain **containerization using Docker** and analyze its advantages.	**4**	**4**	**6**

		OR			
4.B	**i).**	Explain **Docker architecture**, images, containers, Dockerfile, and Docker Hub.	**4**	**3**	**6**
	ii).	Explain **testing tools** – Selenium and JavaScript testing. Analyze their role in DevOps pipelines.	**4**	**4**	**6**
		UNIT-5			
5.A	**i).**	Explain **Ansible architecture**, tasks, roles, and Jinja2 templating.	**5**	**2**	**6**
	ii).	Explain **deployments using Ansible**, including **Vaults**.	**5**	**3**	**6**
		OR			
5.B	**i).**	Explain **Kubernetes (OpenShift) architecture** – namespaces, pods, services, config maps, and CI/CD on OCP.	**5**	**4**	**6**
	ii).	Compare **Ansible, Puppet, and Chef**.Evaluate their role in configuration management.	**5**	**5**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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					Course Code: D25258B3
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		DESIGN PATTERNS			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	What is a **Design Pattern**?Explain **Design Patterns in Smalltalk MVC**.	**1**	**2**	**6**
	ii).	Explain how **Design Patterns solve design problems**.Describe the **catalogue of design patterns** and its organization.	**1**	**3**	**6**
		OR			
1.B	**i).**	Explain **how to select a design pattern** for a given problem.	**1**	**3**	**6**
	ii).	Explain **how to use a design pattern**.Analyze the benefits and consequences of applying design patterns.	**1**	**4**	**6**
		UNIT-2			
2.A	**i).**	Explain the **Document Editor case study** and discuss its **design problems**.	**2**	**2**	**6**
	ii).	Explain how the Document Editor supports **document structure and formatting**.	**2**	**3**	**6**
		OR			
2.B	**i).**	Explain **Creational Design Patterns**.Discuss **Abstract Factory and Builder** patterns with examples.	**2**	**3**	**6**
	ii).	Explain **Factory Method, Prototype, and Singleton** patterns.Compare and discuss creational patterns.	**2**	**4**	**6**
		UNIT-3			
3.A	**i).**	Explain **Adapter and Bridge patterns** with UML diagrams.	**3**	**3**	**6**
	ii).	Explain **Composite pattern** and analyze its applicability.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain **Decorator and Facade patterns** with examples.	**3**	**3**	**6**
	ii).	Explain **Flyweight and Proxy patterns**.Analyze their advantages and limitations.	**3**	**4**	**6**
		UNIT-4			
4.A	**i).**	Explain **Chain of Responsibility and Command patterns**.	**4**	**2**	**6**
	ii).	Explain **Interpreter and Iterator patterns** with use cases.	**4**	**4**	**6**
		OR			

4.B	**i).**	Explain **Mediator and Memento patterns** with examples.	**4**	**3**	**6**
	ii).	Explain **Observer pattern** and discuss behavioral pattern characteristics.	**4**	**4**	**6**
		UNIT-5			
5.A	**i).**	Explain **State and Strategy patterns** with examples.	**5**	**2**	**6**
	ii).	Explain **Template Method pattern** and its benefits.	**5**	**3**	**6**
		OR			
5.B	**i).**	Explain **Visitor pattern** and analyze its applicability.	**5**	**4**	**6**
	ii).	Discuss **what to expect from design patterns**, their history, and the **pattern community**.	**5**	**5**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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		Course Code: D2515800			
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		DATA STRUCTURES AND ALGORITHM ANALYSIS			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	What is a Singly Linked List? Explain its structure and main operations with algorithms	**1**	**2**	**6**
	ii).	Explain Doubly Linked List with a diagram and write insertion & deletion algorithms.	**1**	**3**	**6**
		OR			
1.B	**i).**	Explain Circular Linked List types and their working with key algorithms.	**1**	**2**	**6**
	ii).	Describe Stack and Queue implementation using Linked Lists with push, pop, enqueue & dequeue algorithms.	**1**	**3**	**6**
		UNIT-2			
2.A	**i).**	Explain Linear Search and Binary Search with examples and analyze their time complexities.	**2**	**4**	**6**
	ii).	Explain Bubble, Selection, and Insertion Sort algorithms with a comparison.	**2**	**4**	**6**
		OR			
2.B	**i).**	Define Binary Tree. Explain its properties and representations.	**2**	**2**	**6**
	ii).	Describe Expression Trees with Infix/Prefix/Postfix.	**2**	**3**	**6**
		UNIT-3			
3.A	**i).**	Define ADT. Explain List ADT, Stack ADT, and Queue ADT operations.	**3**	**2**	**6**
	ii).	Explain Hash Table representation with examples and describe common hash functions.	**3**	**2**	**6**
		OR			
3.B	**i).**	Explain Separate Chaining and Open Addressing collision resolution techniques.	**3**	**3**	**6**
	ii).	Explain clustering in Linear Probing and analyze how Double Hashing reduces it.	**3**	**4**	**6**
		UNIT-4			
4.A	**i).**	Define Priority Queue ADT. Compare array, linked list, and heap implementations	**4**	**4**	**6**
	ii).	Explain Heap (Min/Max) and write insertion & deletion algorithms with	**4**	**3**	**6**

		examples			
		OR			
4.B	**i).**	Define Binary Search Tree (BST). Explain its properties and representation.	**4**	**2**	**6**
	ii).	Explain BST searching, insertion & deletion algorithms with best & worst case complexity analysis.	**4**	**4**	**6**
		UNIT-5			
5.A	**i).**	Define AVL Tree. Explain balance factor and height calculation.	**5**	**2**	**6**
	ii).	Explain AVL rotations (LL, RR, LR, RL) with diagrams and algorithms.	**5**	**3**	**6**
		OR			
5.B	**i).**	Define B-Tree. Explain height, insertion & deletion operations.	**5**	**2**	**6**
	ii).	Compare BST, AVL, Red-Black, Splay, and B-Tree based on balancing, efficiency and applications.	**5**	**4**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

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		Course Code: D25258A0			
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		FEATURE ENGINEERING			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Explain the **Machine Learning Pipeline**.Discuss the role of **data, tasks, models, features, and model evaluation**.	**1**	**2**	**6**
	ii).	Explain **feature transformation techniques** such as binarization, quantization (binning), and log transformation with examples.	**1**	**3**	**6**
		OR			
1.B	**i).**	Explain **feature scaling and normalization techniques**:Min–Max scaling, standardization, and ℓ2 normalization.	**1**	**3**	**6**
	ii).	Discuss **interaction features and feature selection techniques**.Analyze their impact on model performance.	**1**	**4**	**6**
		UNIT-2			
2.A	**i).**	Explain **Bag-of-Words and Bag-of-n-Grams** models for text representation.	**2**	**2**	**6**
	ii).	Explain **text preprocessing techniques**: stopword removal, frequency-based filtering, and stemming.	**2**	**3**	**6**
		OR			
2.B	**i).**	Explain **Tf–Idf transformation** and analyze how it improves over Bag-of-Words.	**2**	**4**	**6**
	ii).	Describe **text classification using Logistic Regression**.Explain the role of **regularization in tuning Logistic Regression**.	**2**	**4**	**6**
		UNIT-3			
3.A	**i).**	Explain **categorical variable encoding techniques**: One-Hot Encoding, Dummy Coding, and Effect Coding.	**3**	**2**	**6**
	ii).	Discuss **feature hashing and bin counting** for large categorical variables.	**3**	**3**	**6**
		OR			
3.B	**i).**	Explain **Principal Component Analysis (PCA)** with intuition and variance maximization.	**3**	**4**	**6**
	ii).	Discuss **PCA implementation, whitening, and ZCA**.Evaluate the **limitations and considerations of PCA**.	**3**	**5**	**6**
		UNIT-4			
4.A	**i).**	Explain **k-Means clustering** and the concept of **clustering as surface tiling**.	**4**	**2**	**6**
	ii).	Explain **k-Means based featurization** for classification tasks.	**4**	**4**	**6**

		OR			
4.B	**i).**	Discuss **model stacking using k-Means** as a nonlinear featurization technique.	**4**	**3**	**6**
	ii).	Analyze the **pros, cons, and practical challenges (gotchas)** of k-Means featurization.	**4**	**4**	**6**
		UNIT-5			
5.A	**i).**	Explain **item-based collaborative filtering** and its working principle.	**5**	**2**	**6**
	ii).	Describe the **naive academic paper recommender system** including data cleaning and feature parsing.	**5**	**3**	**6**
		OR			
5.B	**i).**	Explain the **second pass recommender system** with improved engineering and smarter modeling.	**5**	**4**	**6**
	ii).	Discuss the **third pass recommender system**.Evaluate how adding more features improves recommendation quality.	**5**	**5**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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		Course Code: D25258A1			
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		GENERATIVE AI			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Explain the **historical overview of generative modeling**.Differentiate between **Generative AI and Discriminative modeling**.	**1**	**2**	**6**
	ii).	Explain the **importance of generative models** in AI and Machine Learning. Discuss different **types of generative models**.	**1**	**3**	**6**
		OR			
1.B	**i).**	Explain **GANs, VAEs, autoregressive models, and diffusion models**.Analyze their working principles.	**1**	**4**	**6**
	ii).	Discuss the **challenges and future of Generative AI**.Explain **ethical aspects, responsible AI, and real-world use cases**.	**1**	**5**	**6**
		UNIT-2			
2.A	**i).**	Explain the **basics of language models** and the **building blocks of LLMs**.	**2**	**2**	**6**
	ii).	Describe the **Transformer architecture** with **encoder, decoder, and attention mechanism**.	**2**	**3**	**6**
		OR			
2.B	**i).**	Explain **text generation using BERT and GPT models**.Discuss **autoencoding and regression-based models**.	**2**	**4**	**6**
	ii).	Explain **Prompt Engineering, RLHF, and Retrieval Augmented Generation (RAG)**.	**2**	**3**	**6**
		UNIT-3			
3.A	**i).**	Explain **Generative Adversarial Networks (GANs)** and the **adversarial training process**.	**3**	**3**	**6**
	ii).	Explain **Variational Autoencoders (VAEs)** and **encoder–decoder architectures**.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain **Stable Diffusion models** and **Transformer-based image generation** techniques.	**3**	**3**	**6**
	ii).	Discuss **CLIP, ViT, DALL-E2, DALL-E3, and GPT-4V**.	**3**	**3**	**6**
		UNIT-4			
4.A	**i).**	Explain **variants and types of GANs**, including **Cyclic GAN**.	**4**	**2**	**6**
	ii).	Explain **neural style transfer** and the use of **Cyclic GAN for painting generation**.	**4**	**4**	**6**

		OR			
4.B	**i).**	Explain **music generation using RNNs and MuseGAN**.	**4**	**3**	**6**
	ii).	Explain **autonomous agents**, **Deep Q-Learning**, and **Actor–Critic networks**. Evaluate their role in game-playing AI.	**4**	**4**	**6**
		UNIT-5			
5.A	**i).**	Explain **training and fine-tuning of generative models**.Discuss **transfer learning and pretrained models**.	**5**	**2**	**6**
	ii).	Explain **open-source models** such as **GPT4All, LLaMA**, and **Programming LLMs**.	**5**	**3**	**6**
		OR			
5.B	**i).**	Explain **LangChain**, **Hugging Face ecosystem**, and **training vision models** like **TimeSformer**.	**5**	**4**	**6**
	ii).	Discuss **deployment of generative models**.Evaluate tools like **Google Copilot** and challenges in real-world deployment.	**5**	**5**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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					Course Code: D25158B1
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		HIGH PERFORMANCE COMPUTING			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	What is motivating parallelism? Explain the scope of parallel computing	**1**	**2**	**6**
	ii).	What is implicit parallelism? Explain its role in parallel programming platforms.	**1**	**3**	**6**
		OR			
1.B	**i).**	Analyze the trends in microprocessor architectures and explain how memory limitations affect system performance.	**1**	**4**	**6**
	ii).	Compare and contrast N-wide superscalar architectures and multi-core architectures.	**1**	**4**	**6**
		UNIT-2			
2.A	**i).**	Explain the principles of parallel algorithm design with emphasis on decomposition techniques.	**2**	**3**	**6**
	ii).	Describe the characteristics of tasks and interactions in parallel algorithms.	**2**	**2**	**6**
		OR			
2.B	**i).**	Explain mapping techniques for load balancing and analyze methods to contain interaction overheads.	**2**	**4**	**6**
	ii).	Explain the rise of GPU computing and discuss the features of early GPU architectures.	**2**	**3**	**6**
		UNIT-3			
3.A	**i).**	Explain one-to-all broadcast and all-to-one reduction operations in parallel systems.	**3**	**2**	**6**
	ii).	Explain scatter and gather communication operations.	**3**	**3**	**6**
		OR			
3.B	**i).**	Explain all-reduce and prefix-sum operations used in parallel computing.	**3**	**3**	**6**
	ii).	Explain thread basics, synchronization mechanisms, and OpenMP programming in shared address space platforms.	**3**	**3**	**6**
		UNIT-4			
4.A	**i).**	Explain the sources of overhead in parallel programs.	**4**	**2**	**6**
	ii).	Explain the performance metrics used for evaluating parallel systems.	**4**	**2**	**6**
		OR			

4.B	**i).**	Analyze the effect of granularity on performance and discuss the scalability of parallel systems.	**4**	**4**	**6**
	ii).	Explain parallel algorithms for matrix-vector multiplication and matrix-matrix multiplication.	**4**	**3**	**6**
		UNIT-5			
5.A	**i).**	Explain the issues involved in sorting on parallel computers and describe parallel bubble sort.	**5**	**2**	**6**
	ii).	Explain parallel depth-first search and parallel best-first search algorithms.	**5**	**3**	**6**
		OR			
5.B	**i).**	Analyze the parallelization of quick sort algorithm.	**5**	**4**	**6**
	ii).	Explain CUDA architecture and discuss kernel launch, GPU memory management, and synchronization in CUDA C.	**5**	**4**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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					Course Code: D25158A0
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		IMAGE PROCESSING			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Explain the components of an Image Processing System with a neat diagram.	**1**	**2**	**6**
	ii).	Describe the image sensing and acquisition process. What are the factors affecting image quality at acquisition stage?	**1**	**3**	**6**
		OR			
1.B	**i).**	Differentiate between image sampling and quantization. Explain uniform and non-uniform quantization.	**1**	**4**	**6**
	ii).	Explain histogram equalization with an example. What are its advantages and limitations?	**1**	**3**	**6**
		UNIT-2			
2.A	**i).**	Explain spatial filtering. Compare smoothing and sharpening filters with examples.	**2**	**2**	**6**
	ii).	Derive the Laplacian filter mask. Explain its role in image sharpening.	**2**	**4**	**6**
		OR			
2.B	**i).**	Explain homomorphic filtering. How does it improve image illumination?	**2**	**3**	**6**
	ii).	Explain noise models in image restoration. Compare arithmetic mean and geometric mean filters.	**2**	**5**	**6**
		UNIT-3			
3.A	**i).**	Explain image compression redundancies (Coding, Interpixel, Psychovisual).	**3**	**2**	**6**
	ii).	Explain Discrete Cosine Transform (DCT) and its role in JPEG compression.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain LZW coding with an example. Why is it preferred in lossless compression?	**3**	**3**	**6**
	ii).	Compare JPEG, JPEG-2000 and MPEG standards. Include applications and limitations.	**3**	**5**	**6**
		UNIT-4			
4.A	**i).**	Explain multiresolution analysis (MRA) in wavelet compression.	**4**	**2**	**6**

	ii).	Differentiate between Continuous and Discrete Wavelet Transform.	**4**	**3**	**6**
		OR			
4.B	**i).**	Explain 2-D DWT and Fast Wavelet Transform algorithm.	**4**	**4**	**6**
	ii).	Explain the JPEG-2000 encoding steps using wavelets.	**4**	**5**	**6**
		UNIT-5			
5.A	**i).**	Explain thresholding based segmentation. Compare global and adaptive thresholding.	**5**	**2**	**6**
	ii).	Explain morphological operations (Erosion, Dilation, Opening, Closing) with examples	**5**	**3**	**6**
		OR			
5.B	**i).**	Explain watershed segmentation. What are its limitations and improvements?	**5**	**4**	**6**
	ii).	Explain Digital Image Watermarking. Discuss its need and applications in copyright protection.	**5**	**2**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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					Course Code: D2525802
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		INTRODUCTION TO QUANTUM COMPUTING			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Explain the importance of Mathematics, Physics, and Biology in the development of Quantum Computing.	**1**	**2**	**6**
	ii).	Introduce Quantum Computing and compare it with Classical Computing.	**1**	**2**	**6**
		OR			
1.B	**i).**	Differentiate between Bits and Qubits.	**1**	**3**	**6**
	ii).	Analyze the differences between Classical logical operations and Quantum logical operations.	**1**	**4**	**6**
		UNIT-2			
2.A	**i).**	Explain the basics of Linear Algebra and their role in Quantum Computing.	**2**	**2**	**6**
	ii).	Define Hilbert Space and explain probabilities and measurements in Quantum Mechanics.	**2**	**3**	**6**
		OR			
2.B	**i).**	Explain the principles of Superposition and Entanglement in Quantum Physics.	**2**	**3**	**6**
	ii).	Analyze the Central Dogma of Molecular Biology with reference to Genomics and Proteomics.	**2**	**4**	**6**
		UNIT-3			
3.A	**i).**	Explain the physical implementations of a Qubit.	**3**	**3**	**6**
	ii).	Describe a Qubit as a quantum unit of information.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain the representation of a Qubit using the Bloch Sphere.	**3**	**3**	**6**
	ii).	Define Bell States and explain their significance in Quantum Computing.	**3**	**3**	**6**
		UNIT-4			
4.A	**i).**	Explain how classical computation can be performed on quantum computers.	**4**	**2**	**6**
	ii).	Explain the relationship between quantum and classical complexity classes.	**4**	**4**	**6**
		OR			

4.B	**i).**	Explain the working of Deutsch's or Deutsch–Jozsa Algorithm.	**4**	**3**	**6**
	ii).	Analyze either Shor's factorization algorithm or Grover's search algorithm.	**4**	**4**	**6**
		UNIT-5			
5.A	**i).**	Explain the concept of noise in quantum systems and graph states and codes.	**5**	**2**	**6**
	ii).	Explain the need for Quantum Error Correction.	**5**	**3**	**6**
		OR			
5.B	**i).**	Explain the concept of fault-tolerant quantum computation.	**5**	**4**	**6**
	ii).	Compare classical and quantum information theory and explain quantum teleportation.	**5**	**5**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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		Course Code: D2515802			
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Define random experiment, sample space, and events. Explain the axioms of probability with suitable examples.	**1**	**2**	**6**
	ii).	A box contains 5 red and 7 blue balls. Two balls are drawn at random without replacement. Find the probability that both balls are of the same colour.	**1**	**3**	**6**
		OR			
1.B	**i).**	A card is drawn at random from a standard deck. Find the probability that the card drawn is (i) a king or (ii) a red card given that it is a face card.	**1**	**3**	**6**
	ii).	A discrete random variable X has the probability distribution X: 0 1 2 3 P(X): 0.1 0.2 0.4 0.3 Find the mean and variance of X.	**1**	**4**	**6**
		UNIT-2			
2.A	**i).**	Distinguish between population and sample. Explain sampling with and without replacement.	**2**	**2**	**6**
	ii).	Explain sampling distributions and frequency distributions.	**2**	**3**	**6**
		OR			
2.B	**i).**	From a population with mean 100 and variance 25, a sample of size 36 is drawn. Find the mean and variance of the sampling distribution of the sample mean.	**2**	**3**	**6**
	ii).	Explain point estimation and interval estimation. Describe confidence interval estimation for population mean.	**2**	**3**	**6**
		UNIT-3			
3.A	**i).**	A sample of size 100 has a mean of 54 and a standard deviation of 8. Test whether the population mean is 52 at 5% level of significance.	**3**	**3**	**6**
	ii).	Explain the Chi-square test for goodness of fit. Apply it to test whether the given data follows a specified distribution.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain Type-I and Type-II errors and P-value in hypothesis testing.	**3**	**3**	**6**
	ii).	Define statistical hypothesis. Explain null hypothesis, alternative hypothesis, and level of significance.	**3**	**3**	**6**
		UNIT-4			

4.A	**i).**	Define algebraic systems. Explain semigroups and monoids with examples.	**4**	**2**	**6**
	ii).	Define group and subgroup. State the properties of an abelian group.	**4**	**4**	**6**
		OR			
4.B	**i).**	Test whether 561 is a prime number using Fermat's theorem.	**4**	**4**	**6**
	ii).	Using Euler's theorem, find the value of $7^{100} \bmod 40$.	**4**	**4**	**6**
		UNIT-5			
5.A	**i).**	Define graph, subgraph, and isomorphic graphs. Explain adjacency matrix and incidence matrix representations.	**5**	**2**	**6**
	ii).	Define Eulerian graph and Hamiltonian graph. State the necessary conditions for their existence.	**5**	**3**	**6**
		OR			
5.B	**i).**	Determine whether the given graph is Eulerian or Hamiltonian. Justify your answer.	**5**	**4**	**6**
	ii).	Find the spanning tree of a given graph using an appropriate algorithm.	**5**	**5**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 12 marks

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					Course Code: D25258A3
		DNR COLLEGE OF ENGINEERING & TECHNOLOGY(A)			**DR25**
		I M. Tech. I Semester MODEL QUESTION PAPER			
		PRINCIPLES OF NETWORK SECURITY			
		For Computer Science & Engineering			
Time: 3 Hrs.					**Max. Marks: 60 M**
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					5 x 12 = 60 Marks
		UNIT-1	**CO**	**KL**	**M**
1.A	**i).**	Explain the need for security and the basic principles of security in computer networks.	**1**	**2**	**6**
	ii).	Explain the types of security attacks and the security services provided to counter them.	**1**	**2**	**6**
		OR			
1.B	**i).**	Explain the security mechanisms and the network security model with reference to cryptography.	**1**	**3**	**6**
	ii).	Explain classical encryption techniques including substitution, transposition, and rotor machines.	**1**	**3**	**6**
		UNIT-2			
2.A	**i).**	Explain the algebraic structures used in cryptography such as groups, rings, fields, and GF(2).	**2**	**2**	**6**
	ii).	Explain primes, Euler's phi function, and Fermat's Little Theorem with their significance in cryptography.	**2**	**3**	**6**
		OR			
2.B	**i).**	Explain methods for generating and testing prime numbers in asymmetric cryptography.	**2**	**3**	**6**
	ii).	Explain the Chinese Remainder Theorem and modular exponentiation with cryptographic relevance.	**2**	**3**	**6**
		UNIT-3			
3.A	**i).**	Explain the principles of block ciphers and describe the DES algorithm.	**3**	**3**	**6**
	ii).	Explain the AES algorithm and block cipher modes of operation.	**3**	**4**	**6**
		OR			
3.B	**i).**	Explain the working of the RSA algorithm and Diffie–Hellman key exchange.	**3**	**3**	**6**
	ii).	Describe Elliptic Curve Cryptography and compare it with traditional public key cryptosystems.	**3**	**3**	**6**
		UNIT-4			
4.A	**i).**	Explain the requirements and applications of cryptographic hash functions.	**4**	**2**	**6**
	ii).	Explain Secure Hash Algorithms and hash functions based on cipher block chaining.	**4**	**4**	**6**

		OR			
4.B	**i).**	Explain Message Authentication Codes and the working of HMAC and CMAC.	**4**	**3**	**6**
	ii).	Explain digital signature schemes including ElGamal, ECDSA.	**4**	**4**	**6**
		UNIT-5			
5.A	**i).**	Explain web security considerations and the working of Transport Layer Security and HTTPS.	**5**	**2**	**6**
	ii).	Explain the architecture and components of IP Security including AH and ESP.	**5**	**3**	**6**
		OR			
5.B	**i).**	Explain Internet email security issues and the mechanisms used for comprehensive email security.	**5**	**4**	**6**
	ii).	Discuss S/MIME and PGP as secure electronic mail protocols.	**5**	**4**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

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