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)

Dr. B V S VARMA
B.E., M. Tech., PhD,
Professor & Vice Principal, CSE(AIML)

Department of CSE(Artificial Intelligence & Machine Learning)
E-Mail: hodcsm@dnrcet.org
Mobile: +91-9666575424, Phone: 08816-221237

CIRCULAR

Ref: *DNRCET/CSE(AIML)/A.Y: 2025-26/BoS/C-1* **Date:** *20.01.2026*

It is to inform all BoS members of the CSE(AIML) department to attend the BoS meeting to be conducted at ***10:30 AM on 21stJan, 2026*** on online mode. The meeting link will send to each member of the BoS to their e-mail.The discussion on the following agenda.

Zoom Meeting Link:

https://us06web.zoom.us/j/84213375869?pwd=V77QepvkAxtGkZLW9vbzgILH0V9My0.1

Agenda:

1. Introducing the members of Board of Studies.
2. To discuss and finalize the proposed Course structure and Syllabus of DR-24 regulations for **III B. Tech - I & II Semesters.**
3. Ratification of Course Objectives and Course Outcomes for the proposed Curriculumin accordance to JNTUK course structure and syllabi.
4. Discussion and finalizing the model papers and List of Paper Setters.
5. Any other agenda with the permission of the chair.

20/1/26

Chairperson Board of Studies / Head of the Department

Copy to

1. The members of BoS,
2. The Principal, DNRCET(A),
3. The Dean, Academics, DNRCET(A),
4. Office file.

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Ph: 08816-221238 Email: dnrcet@gmail.com website: https://dnrcet.org

DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

Venue: Conference Room **Date:**20/01/2026

MEMBERS OF BOARD OF STUDIES (BOS) - 2nd Meeting

S.No.	Category	Name	Position	Signature
1	Chairman	Dr. B. V. S. VARMA	Professor Dept. of CSE(AIML) DNR College of Engineering &Technology, BVRM – 543202.	
2	Expert Nominated by the Vice-Chancellor (University Nominee)	Dr. D Haritha	Professor & Controller of Examinations (PG and Software Development Cell) JNTUK, Kakinada.	informed through e-mail.
3	Subject Experts from outside Parent Universities	Dr. Ande Prasad	Professor & Chairman BoS Dept. of CSE. Vikram Simhapuri University, Nellore.	informed through e-mail.
		Dr. G Sudhakar	Professor ,Dept. of CSE. Swarnandhra College of Engineering & Technology, Narsapuram.	informed through e-mail.
4	Representative from the Industry Expert	Rajiv Chand Kakarla	CEO, Amaravathi Software Innovations , Rajahmundry	informed through e-mail.
5	College Alumni	Mr. K S Sai Kumar	Asst .Prof., Vishnu Institute of Technology, Bhimavaram.	
6	Faculty Members	Mr. L BujjiBabu	Asst.Prof. , & Member Secretary, Dept. of CSE(AIML), DNRCET	
		Mr. P. Krupavaram	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mrs. M Naga Lakshmi	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mrs. B Naga Sushma	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mrs. B. Vanitha	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mr. G Balaji	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mr. A Naga Satish	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mrs. B Jyothi Priyanka	Asst. Prof, Dept. of CSE(AIML), DNRCET	

Member Secretary 20/1/26

(Dr.BVS VARMA)
HoD& Chairman, BOS 20/1/26

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Balusumudi, Bhimavaram – 534 202. W.G. Dist., (A.P.)

Fax No: 08816-221236, Phone: 08816-221237, 38, Email: dnrcet@gmail.com., web: www.dnrcet.org

Name of the Department: CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

Board of Studies:

Description	Designation in Committee	Name(s) of the Member(s)/Nominee(s)
Head of the Department concerned	**Chairperson**	Dr. B. V. S. VARMA Professor Department of CSE(Artificial Intelligence & Machine Learning) DNR College of Engineering and Technology, Balusumudi, Bhimavaram – 543202, West Godavari District, Andhra Pradesh.
One expert is to be nominated by the Vice-Chancellor from a panel of six recommended by the Autonomous College Principal	**Member (University Nominee)**	Dr. D Haritha Professor & Controller of Examinations (PG and Software Development Cell) JNTUK, Kakinada. harithadasari@jntucek.ac.in 7680994555, 9440810901
Two subject experts from outside the parent University are to be nominated by the Academic Council.	**Member**	Dr. Ande Prasad Professor & Chairman BoS Department of Computer Science & Engineering Vikram Simhapuri University, Nellore. andeprasadvsn@gmail.com 9885934309
	Member (Subject experts from outside the parent University)	Dr. G Sudhakar Professor Swarnandhra College of Engineering & Technology Department of Computer Science & Engineering sudha.godi@gmail.com Ph: 9705412233
One representative from industry/corporate sector/allied areas to be nominated by the principal	**Member (Industrial Expert)**	Rajiv Chand Kakarla CEO, Amaravathi Software Innovations Rajahmundry rajivnani69@gmail.com 96188999618
One member of the College alumni to be nominated by the principal	**Member (College alumni)**	Mr. K S Sai Kumar Assistant Professor Vishnu Institute of Technology Bhimavaram. Saikumar.k@vishnu.edu.in 7661078048

All faculty members of the Department	**Member**	Mr. L BujjiBabu Mr. P. Krupavaram Mrs. M Naga Lakshmi Mrs. B Naga Sushma Mrs. B. Vanitha Mr. G Balaji Mr. A Naga Satish Mrs. B Jyothi Priyanka

Term: The term of the nominated members shall be three years. Meetings: Meetings of the Board of Studies shall be held at least once every six months.

Functions:
The Board of Studies shall recommend the following to the Academic Council:
(a) Courses of studies;
(b) Measures for the improvement of the standards of teaching and research;
(c) Any other academic matter

Head of the Department

Department of Artificial Intelligence & Machine Learning

D. N. R. COLLEGE OF ENGINEERING & TECHNOLOGY

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Dr. B V S VARMA

B.E., M. Tech., PhD,

Professor & Vice Principal, CSE(AIML)

Department of CSE(Artificial Intelligence & Machine Learning)

E-Mail: hodcsm@dnrcet.org

Mobile: +91-9666575424, Phone: 08816-221237

Date: 20.01.2026

To

Dr. D Haritha,

Professor & Controller of Examinations (PG and Software Development Cell),

JNTUK, Kakinada.

Dear Madam,

Sub: DNR College of Engineering & Technology – Department of CSE (Artificial Intelligence & Machine Learning) – Board of Studies Meeting – Reg.

We take the privilege in inviting you for the Board of Studies Meeting of Department of CSE (AIML), 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-AIML) course curriculum.

In this regard, you are requested to attend the meeting scheduled to be held on **21.01.2026** at (10.30 AM) in online mode.

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

Thanking You Madam,

Yours Sincerely,

20/1/26

Chairperson Board of Studies /

Head of the Department

Board of Studies(BoS) Meeting x +

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Board of Studies(BoS) Meeting- CSE(AIML) Department-, DNRCET

hodcsm dnrcet
Good Afternoon Madam, I hereby informing you that Board of Studies(BoS) Meeting- DR24: III Year- I & II Sem Course structure & Syllabus, CSE(AIML) Department-

hodcsm dnrcet <hodcsm@dnrcet.org>
to harithadasari@rgukt.ac.in

——— Forwarded message ———
From: **hodcsm dnrcet** <hodcsm@dnrcet.org>
Date: Tue, Jan 20, 2026 at 3:55 PM
Subject: Board of Studies(BoS) Meeting- CSE(AIML) Department-, DNRCET
To: harithadasari@rgukt.ac.in <harithadasari@rgukt.ac.in>

Good Afternoon Madam,
I hereby informing you that Board of Studies(BoS) Meeting- DR24: III Year- I & II Sem Course structure & Syllabus, CSE(AI&ML) Department-, DNRCET is scheduled on **21-01-2026 at 11:30 AM**

2 Attachments · Scanned by Gmail | Add all to Drive

circular.pdf | Dr.D Haritha.pdf

D. N. R. COLLEGE OF ENGINEERING & TECHNOLOGY
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Dr. B V S VARMA
B.E., M. Tech., PhD,
Professor & Vice Principal, CSE(AIML)

Department of CSE(Artificial Intelligence & Machine Learning)
E-Mail: hodcsm@dnrcet.org
Mobile: +91-9666575424, Phone: 08816-221237

Date: 20.01.2026

To
Dr. Ande Prasad,
Professor & Chairman BoS
Dept. of CSE.
Vikram Simhapuri University,
Nellore

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of CSE (Artificial Intelligence & Machine Learning) – Board of Studies Meeting – Reg.

We take the privilege in inviting you for the Board of Studies Meeting of Department of CSE (AIML), DNR College of Engineering & Technology as Subject Expert from outside Parent University nominated by Principal, DNRCET. It is proposed to discuss and finalize the course structure and syllabi for the 3rd year of DR24 B. Tech (CSE-AIML) course curriculum.

In this regard, you are requested to attend the meeting scheduled to be held on **21.01.2026** at (10.30 AM) in online mode.

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

Thanking You Madam,

Yours Sincerely,

Chairperson Board of Studies / Head of the Department 20/1/26

Board of Studies(BoS) Meeting

mail.google.com/mail/u/0/#sent/QgrcJHsHqfbBXXCJNZRscKdPvqPswlhctg

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Labels

Board of Studies(BoS) Meeting- CSE(AIML) Department-, DNRCET

hodcsm dnrcet <hodcsm@dnrcet.org>
to ANDEPRASADVM

Good Afternoon Sir,

I hereby informing you that Board of Studies(BoS) Meeting- DR24: III Year- I & II Sem Course structure & Syllabus, CSE(AI&ML) Department-, DNRCET, is scheduled on 20-01-2026 at 11:30 AM.

In this regard we requesting you to please join the BoS meeting in Online mode.

Join Zoom Meeting

https://us06web.zoom.us/j/84213375869?pwd=V77QanykAvtGbZUW9zbzg1HDV9Nb.1

Thanking You,

Dr. B V S VARMA
Professor,
HoD-CSE(AIML)
DNRCET

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Dr.Ande Prasad.pdf

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Dr. B V S VARMA
B.E., M. Tech., PhD,
Professor & Vice Principal, CSE(AIML)

Department of CSE(Artificial Intelligence & Machine Learning)
E-Mail: hodcsm@dnrcet.org
Mobile: +91-9666575424, Phone: 08816-221237

Date: 20.01.2026

To
Dr. G Sudhakar,
Professor ,
Dept. of CSE.
Swarnandhra College of Engineering & Technology,
Narsapuram.

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of CSE (Artificial Intelligence & Machine Learning) – Board of Studies Meeting – Reg.

We take the privilege in inviting you for the Board of Studies Meeting of Department of CSE (AIML), DNR College of Engineering & Technology as Subject Expert from outside Parent University nominated by Principal, DNRCET. It is proposed to discuss and finalize the course structure and syllabi for the 3rd year of DR24 B. Tech (CSE-AIML) course curriculum.

In this regard, you are requested to attend the meeting scheduled to be held on **21.01.2026** at (10.30 AM) in online mode.

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

Thanking You Madam,

Yours Sincerely,

20/1/26

Chairperson Board of Studies / Head of the Department

sub:Board of Studies(BoS) Meeting- CSE(AIML) Department-, DNRCET

hodcsm dnrcet <hodcsm@dnrcet.org>
to suchakr

Good Afternoon Sir

I hereby informing you that Board of Studies(BoS) Meeting- DR24, II Year- I & II Sem Course structure & Syllabus, CSE(AIML) Department-, DNRCET, is scheduled on 20-01-2026 at 11.30 AM.
In this regard we requesting you to please join the BoS meeting in Online mode.

Join Zoom Meeting

https://us06web.zoom.us/j/84213375869?pwd=V7TCepvkAxnGkZUWkvbqgILH0Y9Mv0.1

Thanking You,

Dr. B V S VARMA
Professor,
HoD-CSE(AIML)
DNRCET

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D. N. R. COLLEGE OF ENGINEERING & TECHNOLOGY

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Dr. B V S VARMA
B.E., M. Tech., PhD,
Professor & Vice Principal, CSE(AIML)

Department of CSE(Artificial Intelligence & Machine Learning)
E-Mail: hodcsm@dnrcet.org
Mobile: +91-9666575424, Phone: 08816-221237

Date: 20.01.2026

To
Mr.Rajiv Chand Kakarla,
CEO,
Amaravathi Software Innovations,
Rajahmundry.

Dear Sir,

Sub: DNR College of Engineering & Technology – Department of CSE(Artificial Intelligence & Machine Learning) – Board of Studies Meeting – Reg.

We take the privilege in inviting you for the Board of Studies Meeting of Department of CSE(AIML), DNR College of Engineering & Technology as Representative from Industry/Corporate Sector/Allied Area Relating to Placement nominated by Principal, DNRCET. It is proposed to discuss and finalize the course structure and syllabi for the 3rd year of DR24 B. Tech (CSE-AIML) course curriculum.

In this regard, you are requested to attend the meeting scheduled to be held on **21.01.2026** at (10.30 AM) in online mode.

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

Thanking You Madam,

Yours Sincerely,

Chairperson Board of Studies / Head of the Department 20/1/26

sub:Board of Studies(BoS) Meeting- CSE(AIML) Department-, DNRCET

hodcsm dnrcet <hodcsm@dnrcet.org>

Good Afternoon Sir,

I hereby informing you that Board of Studies(BoS) Meeting- DR24 III Year- I & II Sem Course structure & Syllabus, CSE(AIML) Department-, DNRCET, is scheduled on 29-01-2026 at 11:30 AM

In this regard we requesting you to please join the BoS meeting in Online mode

Join Zoom Meeting

https://us06web.zoom.us/j/84213375869?pwd=V77Qanvk4vtGkZUWPxbzpIUH2V9My0.1

Thanking You,

Dr. B V S VARMA
Professor,
HoD-CSE(AIML)
DNRCET

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DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

Ref:*DNRCET/CSE(AIML)/2025-26/BoS/MoM-1* **Date:** *21.01.2026*

Zoom Meeting Link:
https://us06web.zoom.us/j/84213375869?pwd=V77QepvkAxtGkZLW9vbzgILH0V9My0.1

Board of Studies (BoS) Minutes of Meeting
21st Jan, 2026 at 10:30 AM

Agenda:

1. Introducing the members of Board of Studies.
2. To discuss and finalize the proposed Course structure and Syllabus of DR-24 regulations for **III B. Tech - I & II Semesters.**
3. Ratification of Course Objectives and Course Outcomes for the proposed Curriculum in accordance to JNTUK course structure and syllabi.
4. Discussion and finalizing the model papers and List of Paper Setters.
5. Any other agenda with the permission of the chair.

The Board of Studies meeting held on 21st Jan, 2026 at 10:30 A.M. through online mode with the welcome speech by Dr. BVS VARMA, Professor & Head of the 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 CSE (Artificial Intelligence & Machine Learning) 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 CSE (Artificial Intelligence & Machine Learning) to each other.

Agenda No.2 & 3: The BoS members discussed on the agenda 2 & 3 and made the following resolutions.

Resolutionon Agenda 2 & 3:

The members of the Board of Studies and the Chairperson resolved to adopt the JNTUK, Kakinada R-23 regulations for the III year B.Tech programme. This includes adherence to the prescribed syllabus, the Course Objectives and Course Outcomes for the proposed curriculum in accordance with JNTUK course structure, with no changes.

Agenda No.4: The BoS members discussed on the agenda 4 and made the following resolutions.

Resolution on Agenda 4:
As it is decided to adhere JNTUK, Kakinada R-23 model paper without any change in agenda 4. The chairperson of the BoS discussed with the members about the composition of the paper setters total 5 members for 1 year for UG and Program for the academic year 2026-27 i.e., one (1) from National Institute of Technology (NIT), one (1) from Government Universities, one (1) from Private / Deemed Universities, two (2) from Autonomous Colleges. All the members accepted unanimously and list is finalized and enclosed in annexure.

Agenda No.5: Hence there is no other agenda for discussion; hence the chairperson advised to conclude the meeting with the permission of all the BoS members.

The entire meeting is recorded as video and stored in the department.

The meeting concluded at 11:05 AM with a vote of thanks by Dr. BVS VARMA, Chairperson of BoS / Professor & Head of the department.

21/1/26

Chairperson Board of Studies /
Head of the Department

Copy to:

1. Principal, DNRCET(A),
2. Dean, Academics, DNRCET(A),
3. Controller of Examinations, DNRCET(A),
4. Circulation among the faculty members, CSE Department, DNRCET(A),
5. File.

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DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

Venue: Conference Room **Date:**21/01/2026

MEMBERS OF BOARD OF STUDIES (BOS) - 2nd Meeting

S.No.	Category	Name	Position	Signature
1	Chairman	Dr. B. V. S. VARMA	Professor Dept. of CSE(AIML) DNR College of Engineering &Technology, BVRM – 543202.	
2	Expert Nominated by the Vice-Chancellor (University Nominee)	Dr. D Haritha	Professor & Controller of Examinations (PG and Software Development Cell) JNTUK, Kakinada.	attended Online
3	Subject Experts from outside Parent Universities	Dr. Ande Prasad	Professor & Chairman BoS Dept. of CSE. Vikram Simhapuri University, Nellore.	attended Online
		Dr. G Sudhakar	Professor ,Dept. of CSE. Swarnandhra College of Engineering & Technology, Narsapuram.	G. Sudhakar
4	Representative from the Industry Expert	Rajiv Chand Kakarla	CEO, Amaravathi Software Innovations , Rajahmundry	attended Online
5	College Alumni	Mr. K S Sai Kumar	Asst .Prof., Vishnu Institute of Technology, Bhimavaram.	K. Sai Kumar
6	Faculty Members	Mr. L BujjiBabu	Asst.Prof. , & Member Secretary, Dept. of CSE(AIML), DNRCET	
		Mr. P. Krupavaram	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mrs. M Naga Lakshmi	Asst. Prof, Dept. of CSE(AIML), DNRCET	M.N.
		Mrs. B Naga Sushma	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mrs. B. Vanitha	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mr. G Balaji	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mr. A Naga Satish	Asst. Prof, Dept. of CSE(AIML), DNRCET	
		Mrs. B Jyothi Priyanka	Asst. Prof, Dept. of CSE(AIML), DNRCET	

Member Secretary 21/1/26

(Dr.BVS VARMA)
HoD& Chairman, BOS 21/1/26

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Dr. B V S VARMA
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Department of CSE(Artificial Intelligence & Machine Learning)
E-Mail: hodcsm@dvrcet.org
Mobile: +91-9666575424, Phone: 08816-221237

CIRCULAR

Ref: DVRCET/CSE(AIML)/A.Y. 2025-26/BoS/C-1 **Date:** 20.01.2026

It is to inform all BoS members of the CSE(AIML) department to attend the BoS meeting to be conducted at ***11:30 AM on 21st Jan, 2026*** on online mode. The meeting link will send to each member of the BoS to their e-mail.The discussion on the follo

Zoom Meeting Link:

https://us06web.zoom.us/j/84213375869?pwd=V7TQepdvAvtGbZLW9vbrg

Agenda:

1. Introducing the members of Board of Studies.
2. To discuss and finalize the proposed Course structure and Syllab regulations for **III B. Tech - I & II Semesters.**
3. Ratification of Course Objectives and Course Outcomes for t Curriculumin accordance to JNTUK course structure and syllabi.
4. Discussion and finalizing the model papers and List of Paper Setters.
5. Any other agenda with the permision of the chair.

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada
Accredited with A++ Grade by NAAC & ECE

B.Tech.-III Year II Semester

S.No.	Course Code	Title	Category	L	D	T	P	Credits
1	BT24ML3501	Natural Language Processing	Professional Core	3	0	0	0	3
2	BT24ML3502	Deep Learning	Professional Core	3	0	0	0	3
3	BT24ML3503	Data Visualization	Professional Core	3	0	0	0	3
4	BT24ML32P2A	Software Testing Methodology	Professional Elective-II	3	0	0	0	3
	BT24ML32P2B	Cryptography & Network Security						
	BT24ML32P2C	DevOps						
	BT24ML32P2D	Recommender Systems						
	BT24ML32P2E	Any of the 12-Week SWAYAM NPTEL Course suggested by the BoS						
5	BT24ML32P3A	Software Project Management	Professional Elective-III	3	0	0	0	3
	BT24ML32P3B	Mobile Adhoc and Sensor Networks						
	BT24ML32P3C	Computer Vision						
	BT24ML32P3D	NoSQL Databases						
	BT24ML32P3E	Any of the 12-Week SWAYAM NPTEL Course suggested by the BoS						
6			Open Elective – II	3	0	0	0	3
7	BT24ML3205	Deep Learning Lab	Professional Core	0	0	0	3	1.5
8	BT24ML3206	Data Visualization Lab	Professional Core	0	0	0	3	1.5
			Skill					

CO3	3	2
CO4	3	3
CO5	3	3
CO6	3	3

Unit I: Introduction to Information storage and retrieval systems: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation **Introduction to Data structures and algorithms related to Information Retrieval**: Basic Concepts, Data structures, Algorithms

Unit II: Inverted Files and Signature Files: Introduction, Structures used in Inverted Files, building an Inverted file using a sorted array, Modifications to the Basic Techniques.
Signature Files: Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

Unit III: New Indices for Text, Lexical Analysis and Stop lists: PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays. Stop lists.

Unit IV: Stemming Algorithms and Thesaurus Construction: Types of Stemming algorithms, Experimental Evaluations of Stemming, stemming to Compress Inverted Files.
Thesaurus Construction: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

Unit V: String Searching Algorithms: Introduction, Preliminaries, The Naïve Algorithm, The Knuth-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

Prof. Ande Prasad
K S R Prasad - A...
Dr. D. Haritha

(AUTONOMOUS)

III B. Tech. I Semester

OPERATING SYSTEMS

Time: 3hours **Max.Marks:70**

1. Answer all the questions from Section – A. Each question carries 2 Marks.
2. Answer any one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	20 Marks		
			BTL	CO	M
1	a	What is an operating system? Give an Example	L1	CO1	2
	b	Describe the operating system functions?	L2	CO1	2
	c	List out any four system calls in OS?	L1	CO1	2
	d	Explain about state process model in OS	L2	CO2	2
	e	Explain different types of schedulers?	L2	CO2	2
	f	Distinguish between Segmentation and paging	L2	CO3	2
	g	Name the various Page replacement algorithms?	L1	CO4	2
	h	Define a file and List the various File Attributes	L1	CO5	2
	i	List the various Disk-Scheduling Algorithms	L1	CO5	2
	j	What are goals of system protection?	L1	CO5	2
		PART – B (All Questions Carry Equal Marks)	**50 Marks**		
		UNIT – I	10 Marks		
2	a	Explain the various objectives and functions of Operating system?	L2	CO1	[5M]
	b	What are different types of operating system? Explain them in detail	L2	CO1	[5M]
		OR			
3	a	Explain structure of operating system with a neat diagram	L3	CO1	[5M]
	b	Explain in detail about the types of system calls in OS?	L2	CO1	[5M]

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DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

COURSE STRUCTURE & SYLLABUS

for

B.Tech. - CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

(Applicable for batches admitted from 2024-2025)

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

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B.Tech. CSE(AI&ML) DR24 Regulation III Year COURSE STRUCTURE & SYLLABUS

B.Tech.–III Year I Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24ML3101	Information Retrieval Systems	Professional Core	3	0	0	3
2	BT24ML3102	Computer Networks	Professional Core	3	0	0	3
3	BT24ML3103	Operating Systems	Professional Core	3	0	0	3
4	BT24ML31P1A	Software Engineering	Professional Elective-I	3	0	0	3
	BT24ML31P1B	Cloud Computing					
	BT24ML31P1C	Internet of Things					
	BT24ML31P1D	Exploratory Data Analysis with Python					
	BT24ML31P1E	Automata Theory & Compiler Design					
5	BT24HS3101	OR Entrepreneurship Development & Venture Creation	Open Elective- I	3	0	0	3
6	BT24ML3104	Information Retrieval Lab	Professional Core	0	0	3	1.5
7	BT24ML3105	Computer Networks Lab	Professional Core	0	0	3	1.5
8	BT24ML3106	Full Stack Development-2 / SWAYAM Plus – Data Engineer / AI Engineer	Skill Enhancement Course	0	1	2	2
9	BT24ML3107	Tinkering Lab (User Interface design using Flutter)	ES	0	0	2	1
10	BT24BS3102	Evaluation of Community Service Internship		-	-	-	2
Total				**15**	**1**	**10**	**23**
MC		Student may select from the same minor pool		3	0	3	4.5
MC		Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)		3	0	0	3
HC		Student may select from the same Honors pool		3	0	0	3
HC		Student may select from the same Honors pool		3	0	0	3

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B.Tech.–III Year II Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24ML3201	Natural Language Processing	Professional Core	3	0	0	3
2	BT24ML3202	Deep Learning	Professional Core	3	0	0	3
3	BT24ML3203	Data Visualization	Professional Core	3	0	0	3
4	BT24ML32P2A	Software Testing Methodology	Professional Elective-II	3	0	0	3
	BT24ML32P2B	Cryptography & Network Security					
	BT24ML32P2C	DevOps					
	BT24ML32P2D	Recommender Systems					
	BT24ML32P2E	Any of the 12-Week SWAYAM /NPTEL Course suggested by the BoS					
5	BT24ML32P3A	Software Project Management	Professional Elective-III	3	0	0	3
	BT24ML32P3B	Mobile Adhoc and Sensor Networks					
	BT24ML32P3C	Computer Vision					
	BT24ML32P3D	NoSQL Databases					
	BT24ML32P3E	Any of the 12-Week SWAYAM /NPTEL Course suggested by the BoS					
6			Open Elective – II	3	0	0	3
7	BT24ML3205	Deep Learning Lab	Professional Core	0	0	3	1.5
8	BT24ML3206	Data Visualization Lab	Professional Core	0	0	3	1.5
9	BT24BS3201	Soft skills	Skill Enhancement Course	0	1	2	2
10	BT24BS3202	Technical Paper Writing & IPR	Audit Course	2	0	0	-
Total				**20**	**1**	**8**	**23**
*Mandatory Industry Internship/Mini Project of 08 weeks duration during summer vacation							
MC		Student may select from the same minors pool		3	0	3	4.5
MC		Minor Course (Student may select from the same specialized minors pool)		3	0	0	3
HC		Student may select from the same honors pool		3	0	0	3
HC		Honors Course (Student may select from the honors pool)		3	0	0	3

* Under Industry Internship interested students can pursue SWAYAM Plus courses viz., Hands-on Master class on Data Analytics OR Artificial Intelligence for Real-World Application

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DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

III B. Tech I Semester	BT24ML3101	L	T	P	C
		3	0	0	3
INFORMATION RETRIEVAL SYSTEMS					

Course Objectives:

- To introduce the basic concepts, components, and evaluation methods of Information Retrieval (IR) systems.
- To understand and apply indexing techniques such as inverted files, signature files, and advanced text indices for efficient information storage and retrieval.
- To study lexical processing techniques including stop lists, stemming algorithms, and thesaurus construction for improving retrieval performance.
- To analyze and apply classical string searching algorithms and appropriate data structures in text retrieval applications.

Course Outcomes (COs): After completion of course, students would be able to

CO1: Understand the fundamentals of Information Retrieval (IR) systems, their components, and evaluation methods.
CO2: Explain and construct inverted files and signature files for efficient text retrieval.
CO3: Apply lexical analysis techniques, stop lists, and advanced text indexing methods such as PAT trees.
CO4: Analyze and implement stemming algorithms and thesaurus construction techniques for IR optimization.
CO5: Compare and apply classical string matching algorithms used in text searching.
CO6: Select appropriate data structures and algorithms to design efficient information retrieval solutions.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	1	-	-	-	-	-	-	2
CO2	3	3	2	2	2	-	-	-	-	-	-	2
CO3	3	3	2	2	2	-	-	-	-	-	-	2
CO4	3	3	2	3	2	-	-	-	-	-	-	2
CO5	3	3	2	2	2	-	-	-	-	-	-	2
CO6	3	3	3	2	3	-	-	-	2	1	-	3

CO / PSO	PSO-1	PSO-2
CO1	2	1
CO2	3	1
CO3	3	2
CO4	3	2
CO5	2	1
CO6	3	3

Unit I: Introduction to Information storage and retrieval systems: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation **Introduction to Data structures and algorithms related to Information Retrieval**: Basic Concepts, Data structures, Algorithms.

Unit II: Inverted Files and Signature Files: Introduction, Structures used in Inverted Files, building an Inverted file using a sorted array, Modifications to the Basic Techniques.
Signature Files: Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

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Thesaurus Construction: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

Unit V: String Searching Algorithms: Introduction, Preliminaries, The Naive Algorithm, The Knut-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

TEXT BOOKS

1. Modern Information Retrieval, Ricardo Baeza- Yates, Neto, PEA, 2007.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press, 2000.

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III B. Tech I Semester	BT24ML3102	L	T	P	C
		3	0	0	3
COMPUTER NETWORKS					

Course Objectives:

- To understand the Fundamental Concepts related to sources, shadows and shading
- To understand the Geometry of Multiple Views..

Course Outcomes (COs): After completion of course, students would be able to

CO1: Understand the fundamentals of computer networks, reference models, and the evolution of the Internet.
CO2: Explain data link layer functions, transmission media, and error control mechanisms.
CO3: Analyze multiple access protocols and Ethernet-based wired LAN technologies.
CO4: Apply network layer concepts including routing, congestion control, and IP addressing schemes.
CO5: Compare transport layer protocols such as TCP, UDP, and SCTP for reliable communication.
CO6: Describe application layer protocols and services including WWW, HTTP, DNS, email, and file transfer.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		1	-	-	-	-	-	-	-	2
CO2	3	3	2	2	1	-	-	-	-	-	-	2
CO3	3	2	2	1	2	-	-	-	-	-	-	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2
CO5	3	3	2	2	2	-	-	-	-	-	-	2
CO6	3	2	2	1	2	1	-	-	-	2	-	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	2	1
CO3	2	1
CO4	3	2
CO5	2	1
CO6	2	2

UNIT I: Introduction: Types of Computer Networks, Reference Models- The OSI Reference Model, The TCP/IP Reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP Reference Model. History of Internet.

UNIT II: The Data Link Layer: Transmission Media, Guided and Un-guided media, Data Link Layer Design Issues, Services Provided to the Network Layer, Error detecting and Error Correcting codes, Elementary Data Link Protocols, Sliding Window Protocols, HDLC, PPP. Multiple Access Protocols Wired Lanes: Ethernet, Fast Ethernet, Gigabit Ethernet

UNIT III: The Network Layer: Network Layer Design Issues, Routing Algorithms, Congestion, Congestion control algorithms. The Network Layer in the Internet, The IP Version 4 Protocol, IP Addresses- Classful, CIDR, NAT, IP Version 6 Protocol, Transition from IPV4 to IPV6

UNIT IV: The Transport Layer: The Transport Layer Services, Transport Layer Protocols: UDP, TCP and SCTP

UNIT V: The Application Layer: The World Wide Web, HTTP, Domain Name Space, Remote Logging, Electronic Mail and File Transfer

Text Books:

1. "Computer Networks", Andrew S Tanenbaum, David J Wetherall, 5th Edition, Pearson
2. "Data Communications and Networking", Behrouz A Forouzan, 4th Edition, Tata McGraw Hill Education

Reference Books:

1. "Data and Computer Communication" , William Stallings, Pearson
2. "TCP/IP Protocol Suite", Behrouz Forouzan, McGraw Hill.

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III B. Tech I Semester	BT24ML3103	L	T	P	C
		3	0	0	3

OPERATING SYSTEMS

Course Outcomes (COs): After completion of course, students would be able to

CO1: Understand operating system concepts, services, structures, and system call mechanisms.
CO2: Explain process management, inter-process communication, multithreading, and CPU scheduling techniques.
CO3: Analyze synchronization mechanisms and deadlock handling methods in concurrent systems.
CO4: Apply memory management and virtual memory techniques for efficient resource utilization.
CO5: Describe storage management concepts including disk scheduling and mass storage structures.
CO6: Explain file system organization, implementation, protection mechanisms, and access control.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	-	-	-	-	-	-	2
CO2	3	3	2	2	2	-	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	1	-	-	-	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2
CO5	3	2	2	1	2	-	-	-	-	-	-	2
CO6	3	2	2	2	2	1	-	2	-	-	-	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	2	1
CO3	2	2
CO4	3	2
CO5	2	1
CO6	2	2

UNIT-I:Operating Systems Overview: Introduction, operating system functions, operating systems operations, Computing environments, Free and Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, operating system Design and Implementation, operating system structure, Building and Booting an Operating System, Operating system debugging

UNIT-II: Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication. Threads and Concurrency: Multithreading models, Thread libraries, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT–III: Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, semaphores, Monitors, Classic problems of Synchronization. Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT-IV: Memory- Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement Allocation of frames, Thrashing Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT-V: File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing. Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix

Text Books:

1. Operating System Concepts, Silberschatz A, GalvinPB,GagneG, 10th Edition, Wiley,2018.
2. Modern Operating Systems,TanenbaumAS,4th Edition,Pearson,2016

Reference Books:

1. Operating Systems-Internals and Design Principles,StallingsW,9th edition,Pearson,2018
2. Operating Systems: A Concept Based Approach, D.MDhamdhere,3rd Edition, McGraw-Hill, 2013

Online Learning Resources:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

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III B. Tech I Semester	BT24ML31P1A	L	T	P	C
		3	0	0	3

SOFTWARE ENGINEERING

Course Objectives:

The objectives of this course are to introduce

- Software life cycle models, Software requirements and SRS document.
- Project Planning, quality control and ensuring good quality software.
- Software Testing strategies, use of CASE tools, Implementation issues, validation &verification procedures.

Course Outcomes (COs): After completion of course, students would be able to

CO1: Understand the evolution of software engineering and apply suitable software life cycle models.
CO2: Apply software project management techniques including estimation, metrics, and risk management.
CO3: Analyze software requirements and develop formal and structured specifications.
CO4: Design modular, agile, and user-friendly software systems using appropriate design methodologies.
CO5: Apply coding standards, testing strategies, and quality management practices to ensure software reliability.
CO6: Explain CASE tools, software maintenance, and reuse techniques for long-term software sustainability.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								2
CO2	3	3	2	2							3	2
CO3	3	3	2	2								2
CO4	3	3	3	2	2							2
CO5	3	3	2	3	2			2				2
CO6	3	2	2	2	3	1	2	1				3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	2	2
CO3	2	1
CO4	3	2
CO5	2	2
CO6	2	3

UNIT-I: Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.
Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, agile development model, Spiral model.

UNIT-II: Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.
Requirements Analysis and Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT-III: Software Design: Overview of the design process, how to characterize a good software design? Layered arrangement of modules. Cohesion and Coupling. Approaches to software design. Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)
Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, developing the DFD model of a system, structured design, detailed design, and Design Review.
User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

UNIT-IV: Coding and Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, testing object-oriented programs, Smoke testing, and Some general issues associated with testing.
Software Reliability and Quality Management: Software reliability. Statistical testing, Software quality Software quality management system, ISO9000.SEICapability maturity model. Few other important quality standards and Six Sigma.

UNIT-V: Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.
Software Maintenance: Characteristics of software maintenance, Software reverse engineering, and Software maintenance process models and Estimation of maintenance cost.
Software Reuse: Reuse-definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

Text Books:

1. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2. Software Engineering A Practitioner's Approach, Roger S. Pressman, 9th Edition, McGraw Hill International Edition.

Reference Books:

1. Software Engineering, IanSommerville,10th Edition, Pearson.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
3) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview

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III B. Tech I Semester	BT24ML31P1B	L	T	P	C
		3	0	0	3
CLOUD COMPUTING					

Course Objectives:

- To explain the evolving utility computing model called cloud computing.
- To introduce the various levels of services offered by cloud.
- To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
- To emphasize the security and other challenges in cloud computing.
- To introduce the advanced concepts such as containers, server less computing and cloud-centric Internet of Things.

Course Outcomes (COs): After completion of course, students would be able to

CO1: Understand cloud computing fundamentals, service models, deployment models, and major cloud service providers.
CO2: Explain cloud enabling technologies including parallel, distributed computing, SOA, web services, and virtualization.
CO3: Analyze virtualization and container technologies and their role in cloud infrastructure management.
CO4: Evaluate cloud computing challenges related to scalability, security, interoperability, and energy efficiency.
CO5: Apply advanced cloud concepts such as serverless computing, DevOps, and infrastructure-as-code.
CO6: Identify emerging cloud paradigms including IoT integration, edge/fog computing, and quantum cloud computing.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	-	-	-	-	-	-	2
CO2	3	3	2	2	2	-	-	-	-	-	-	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2
CO4	3	3	2	3	2	1	2	2	-	-	-	2
CO5	3	3	3	2	3	-	-	-	2	1	2	3
CO6	3	2	2	2	2	-	-	-	-	-	-	3

CO / PSO	PSO-1	PSO-2
CO1	2	1
CO2	2	1
CO3	3	2
CO4	2	2
CO5	3	3
CO6	3	2

UNIT -I: **Introduction to Cloud Computing Fundamentals:** Cloud computing at a glance, defining cloud, cloud computing reference model, types of services (IaaS, SaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google App Engine).

UNIT-II: Cloud Enabling Technologies: Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, virtualization.

UNIT-III: Virtualization and Containers: Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. AmazonEC2) and container (e.g. Amazon Elastic Container Service) offerings.

UNIT-IV: Cloud computing challenges: Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.

UNIT -V: Advanced concepts in cloud computing: Server less computing, Function-as-a-Service, server less computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. Open FaaS) server less platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.

Text Books:

1. Mastering Cloud Computing, 2nd edition, RajkumarBuyya, Christian Vecchiola, ThamaraiSelvi, ShivanandaPoojara, Satish N. Srirama, Mc Graw Hill, 2024.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

Reference Books:

1. Cloud Computing, Theory and Practice, DanCMarinescu,2nd edition, MK Elsevier, 2018.
2. Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.
3. Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)

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III B. Tech I Semester	BT24ML31P1C	L	T	P	C
		3	0	0	3
INTERNET OF THINGS					

Course Objectives:

- Vision and Introduction to Internet of Things(IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art –IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

Course Outcomes (COs) : After completion of course, students would be able to

CO1: Understand the fundamentals, architecture, and communication principles of Internet of Things systems.

CO2: Explain IoT/M2M system layers, standards, business models, and device management mechanisms.

CO3: Analyze web and message-based communication protocols for connected IoT devices.

CO4: Apply data acquisition, organization, and analytics techniques in IoT/M2M applications.

CO5: Use cloud platforms and service models for IoT data collection, storage, and computation.

CO6: Identify sensing technologies including sensors, RFID, wireless sensor networks, and actuators.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	-	-	-	-	-	-	2
CO2	3	3	2	2	2	1	-	-	-	-	2	2
CO3	3	3	2	2	2	-	-	-	-	-	-	2
CO4	3	3	3	2	3	-	-	-	-	-	-	2
CO5	3	3	3	2	3	-	-	-	2	1	2	3
CO6	3	2	2	1	2	1	2	-	-	-	-	2

CO / PSO	PSO-1	PSO-2
CO1	2	1
CO2	2	1
CO3	2	1
CO4	3	2
CO5	3	3
CO6	2	1

UNIT I:The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles for Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT II: Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High- level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III: Design Principles for the Web Connectivity for Connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for Connected-Devices.

UNIT IV: Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT V: Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A. Bahgya and V. Madisetti, Univesity Press, 2015

Reference Books:

1. **Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley**
2. Getting Started with the Internet of Things, CunoPfister, Oreilly

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DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

III B. Tech I Semester	BT24ML31P1D	L	T	P	C
		3	0	0	3
EXPLORATORY DATA ANALYSIS WITH PYTHON					

Course Objectives: The main objectives of the course are to

- Introduce the fundamentals of Exploratory Data Analysis
- Cover essential exploratory techniques for understanding multi variate data by
- Summarizing it through statistical methods and graphical methods.
- Evaluate the Models and select the best model

Course Outcomes (COs): After completion of course, students would be able to

CO1: Understand the fundamentals, process, and tools of Exploratory Data Analysis for data-driven decision making.

CO2: Apply data visualization techniques to explore patterns, trends, and relationships in datasets.

CO3: Perform data transformation, cleaning, and preprocessing to prepare datasets for analysis.

CO4: Analyze datasets using descriptive statistics, probability distributions, and time series techniques.

CO5: Develop and evaluate machine learning models using appropriate performance metrics.

CO6: Conduct end-to-end data analysis using EDA and model evaluation on real-world datasets.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	-	-	-	-	-	-	2
CO2	3	3	2	2	3	-	-	-	-	-	-	2
CO3	3	3	2	2	3	-	-	-	-	-	-	2
CO4	3	3	2	3	2	-	-	-	-	-	-	2
CO5	3	3	3	2	3	-	-	-	2	1	2	3
CO6	3	3	3	3	3	-	-	-	2	2	-	3

CO / PSO	PSO-1	PSO-2
CO1	2	1
CO2	2	1
CO3	3	2
CO4	3	2
CO5	3	3
CO6	3	3

UNIT-I: Exploratory Data Analysis Fundamentals: Understanding data science, the significance of EDA, steps in EDA, Making sense of data, Numerical data, Categorical data, Measurement scales, Comparing EDA with classical and Bayesian analysis, Software tools available for EDA, Getting started with EDA.

Sample Experiments:

1. a) Download Data set from Kaggle using the following link:
   https://www.kaggle.com/datasets/sukhmanibedi/cars4u
   b) Install python libraries required for Exploratory Data Analysis (numpy, pandas, matplotlib, seaborn)
2. Perform Numpy Array basic operations and Explore Numpy Built-in functions.
3. Loading Data set into pandas data frame
4. Selecting rows and columns in the data frame

UNIT-II: Visual Aids for EDA: Technical requirements, Line chart, Bar charts, Scatter plot using sea born, Polar chart, Histogram, Choosing the best chart

Case Study: EDA with Personal Email, Technical requirements, Loading the dataset, Data transformation, Data cleansing, applying descriptive statistics, Data refactoring, Data analysis.

Sample Experiments:

1. Apply different visualization techniques using sample dataset
   a. Line Chart b. Bar Chart c. Scatter Plots d. Bubble Plot
2. Generate Scatter Plot using seaborn library for iris dataset
3. Apply following visualization Techniques for a sample dataset
   a. Area Plot b. Stacked Plot c. Pie chart d. Table Chart
4. Generate the following charts for a dataset.
   a. Polar Chart b. Histogram c. Lollipop chart
5. Case Study: Perform Exploratory Data Analysis with Personal Email Data

UNIT-III: Data Transformation: Merging database-style data frames, Concatenating along with an axis, Merging on index, Reshaping and pivoting, Transformation techniques, Handling missing data, Mathematical operations with NaN, Filling missing values, Discretization and binning, Outlier detectionandfiltering,Permutationandrandomsampling,Benefitsofdatatransformation,Challenges.

Sample Experiments:

1. Perform the following operations
   a) Merging Data frames b)Reshaping with Hierarchical Indexing
   c) Data Deduplication d) Replacing Values
2. Apply different Missing Data handling techniques
   a) NaN values in mathematical Operations b)Filling in missing data
   c) Forward and Backward filling of missing values d) Filling with index values
   e) Interpolation of missing values
3. Apply different data transformation techniques
   a) Renaming axis indexes b) Discretization and Binning
   c) Permutation and Random Sampling d) Dummy variables

UNIT- IV: Descriptive Statistics: Distribution function, Measures of central tendency, Measures of dispersion, Types of kurtosis, Calculating percentiles, Quartiles, Grouping Datasets, Correlation, Understanding univariate, bivariate, multivariate analysis, Time Series Analysis

Sample Experiments:

1. Study the following Distribution Techniques on a sample data
   a) Uniform Distribution b) Normal Distribution c) Gamma Distribution
   d) Exponential Distribution e) Poisson Distribution f)Binomial Distribution
2. Perform Data Cleaning on a sample dataset.
3. Compute measure of Central Tendency on a sample dataset
   a) Mean b) Median c) Mode
4. Explore Measures of Dispersion on a sample dataset
   a) Variance b)Standard Deviation c)Skewness d) Kurtosis
5. a) Calculating percentiles on sample dataset
   b) Calculate Inter Quartile Range(IQR) and Visualize using Box Plots
6. Perform the following analysis on automobile dataset.
   a) Bivariate analysis b) Multivariate analysis
7. Perform Time Series Analysis on Open Power systems dataset

UNIT-V: Model Development and Evaluation: Unified machine learning workflow, Data preprocessing, Data preparation, Training sets and corpus creation, Model creation and training, Model evaluation, Best model selection and evaluation, Model deployment
Case Study: EDA on Wine Quality Data Analysis

Sample Experiments:

1. Perform hypothesis testing using stats models library
   a) Z-Test b)T-Test
2. Develop model and Perform Model Evaluation using different metrics such as prediction score, R2 Score, MAE Score, MSE Score.

3. Case Study: Perform Exploratory Data Analysis with Wine Quality Dataset.Text Book:

1. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020.

Reference Books:

1. Ronald K. Pearson, Exploratory Data Analysis Using R,CRC Press, 2020
2. RadhikaDatar, Harish Garg, Hands-On Exploratory Data Analysis with R:Becomean expert in exploratory data analysis using R packages, 1st Edition, Packt Publishing, 2019

Web References:

1. https://github.com/PacktPublishing/Hands-on-Exploratory-Data-Analysis-with-Python
2. https://www.analyticsvidhya.com/blog/2022/07/step-by-step-exploratory-dataanalysis-eda-using-python/#h-conclusion
3. https://github.com/PacktPublishing/Exploratory-Data-Analysis-with-Python-Cookbook

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III B. Tech I Semester	BT24ML31P1E	L	T	P	C
		3	0	0	3

AUTOMATA THEORY AND COMPILER DESIGN

Course Outcomes (COs): After completion of course, students would be able to

CO1: Understand the fundamentals of automata theory including finite automata, languages, and regular expressions.

CO2: Analyze nondeterministic and deterministic finite automata and their conversions.

CO3: Apply context-free grammars, pushdown automata, and parsing techniques to language recognition problems.

CO4: Explain Turing machines, computability concepts, and undecidable problems.

CO5: Understand compiler phases including lexical analysis, syntax analysis, and parsing methods.

CO6: Apply syntax-directed translation and intermediate code generation techniques in compiler design.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	-	-	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2
CO3	3	3	3	2	-	-	-	-	-	-	-	2
CO4	3	3	2	3	-	-	-	-	-	-	-	2
CO5	3	2	2	2	2	-	-	-	-	-	-	2
CO6	3	3	3	2	2	-	-	-	2	1	-	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	2	1
CO3	3	2
CO4	2	2
CO5	2	1
CO6	3	3

UNIT – I: Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, and Problems. Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions. **Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA.

UNIT – II: Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions. Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma. **Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT – III: Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

UNIT - IV Introduction: The structure of a compiler, Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex, Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers R18 B.Tech. CS&D Syllabus JNTU Hyderabad

UNIT - V Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax Directed Translation Schemes, Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation,3rd Edition, John E. Hop croft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S.Lam, RaviSethi, Jeffry D. Ullman, 2nd Edition, Pearson.
3. Theory of Computer Science–Automata languages and computation, Mishraand Chandra shekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
2. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
3. Lex & yacc–John R. Levine, Tony Mason, Doug Brown, O'reilly
4. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

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III B. Tech I Semester	BT24ML3104	L	T	P	C
		0	0	3	1.5

INFORMATION RETRIEVAL LAB

Course Outcomes: On completion of this course, the student will be able to

CO1: Compute the similarity between text documents

CO2: Apply all pre-processing steps for text-data

CO3: Implement classification of text documents.

CO4: Perform document clustering using different algorithms.

CO5: Implement Page Rank algorithm for any network.

CO6: Apply advanced information retrieval techniques such as LSI, PageRank, and social media mining.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	-	-	-	-	-	2
CO2	3	3	2	1	2	-	-	-	-	-	-	2
CO3	3	3	3	3	3	-	-	-	2	1	-	3
CO4	3	3	3	3	3	-	-	-	2	1	-	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2
CO6	3	3	3	3	3	-	-	-	-	-	-	3

CO / PSO	PSO-1	PSO-2
CO1	3	1
CO2	3	1
CO3	3	2
CO4	3	2
CO5	2	2
CO6	3	3

Programming Language: Python/R

Lab Experiments:

1. Representation of a Text Document in Vector Space Model and Computing Similarity between two documents.
2. Pre-processing of a Text Document: stop word removal and stemming
3. Construction of an Inverted Index for a given document collection comprising of at least 50 documents with a total vocabulary size of at least 1000 words.
4. Classification of a set of Text Documents into known classes (You may use any of the

Classification algorithms like Naïve Bayes, Max Entropy, Rochio's, Support Vector Machine). Standard Datasets will have to be used to show the results.

5. Text Document Clustering using K-means. Demonstrate with a standard dataset and compute performance measures- Purity, Precision, Recall and F-measure.
6. Crawling/Searching the Web to collect news stories on a specific topic (based on user input). The program should have an option to limit the crawling to certain selected websites only.
7. To parse XML text, generate Web graph and compute topic specific page rank
8. Implement Matrix Decomposition and LSI for a standard dataset.
9. Mining Twitter to identify tweets for a specific period (and/or from a geographic allocation) and identify trends and named entities.
10. Implementation of Page Rank on Scholarly Citation Network.

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III B. Tech I Semester	BT24ML3105	L	T	P	C
		0	0	3	1.5

COMPUTER NETWORKS LAB

Course Outcomes: On completion of this course, the student will be able to

CO1: Identify, configure, and interconnect network devices to establish a Local Area Network.
CO2: Implement data link layer framing and error detection techniques such as stuffing, checksum, CRC, and Hamming code.
CO3: Implement and analyze flow control protocols including Stop-and-Wait, Go-Back-N, and Selective Repeat.
CO4: Apply congestion control and routing algorithms to optimize network performance.
CO5: Analyze network traffic and security features using tools such as Wireshark and Nmap.
CO6: Simulate and evaluate network performance parameters using NS2 simulator.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	–	2	–	–	–	2	1	–	1
CO2	3	3	2	–	2	–	–	–	–	–	–	1
CO3	3	3	3	–	2	–	–	–	–	–	–	1
CO4	3	3	3	2	2	–	–	–	–	–	–	1
CO5	2	2	–	2	3	–	–	1	–	2	–	2
CO6	2	3	2	3	3	–	–	–	–	1	–	2

CO / PSO	PSO-1	PSO-2
CO1	1	2
CO2	1	1
CO3	2	1
CO4	2	1
CO5	2	1
CO6	3	3

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a dataset of characters the three CRC polynomials–CRC12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Go back N.

7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra‘s algorithm to compute the Shortest path through a Graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broad cast tree by taking sub net of hosts.
13. Wire shark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate & Through put.

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III B. Tech I Semester	BT24ML3106	L	T	P	C
		0	0	2	1

FULL STACK DEVELOPMENT-2

Course Objectives:
The main objectives of the course are to

- Make use of router, template engine and authentication using sessions to develop application in Express JS.
- Build a single page application using REST ful API sin Express JS
- Apply router and hooks in designing React JS application
- Make use of Mongo DB queries to perform CRUD operations on document database

Course Outcomes: On completion of this course, the student will be able to

CO1: Apply Type Script features such as types, classes, generics, modules, and functions to develop structured applications.
CO2: Develop backend applications using Express JS with routing, middleware, authentication, and session management.
CO3: Build RESTful APIs and perform CRUD operations using Mongo DB and Mongoose.
CO4: Design dynamic and interactive user interfaces using React components, props, state, hooks, and routing.
CO5: Integrate frontend and backend to develop full-stack web applications following MVC and REST principles.
CO6: Work collaboratively to design, deploy, and document real-world web applications using modern development practices.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	–	3	–	–	–	–	–	–	2
CO2	3	2	3	–	3	–	–	2	2	–	–	2
CO3	3	3	3	2	3	–	–	2	–	–	–	2
CO4	2	2	3	–	3	–	–	–	2	2	–	2
CO5	3	3	3	2	3	–	–	2	2	2	2	2
CO6	2	–	2	–	2	2	–	3	3	3	2	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	1	2
CO3	2	1
CO4	2	2
CO5	3	2
CO6	2	3

Experiments covering the Topics:

- Typescript
- Express JS–Routing, HTTP Methods, Middleware, Templating, Form Data
- Express JS–Cookies, Sessions, Authentication, Database, REST ful APIs
- React JS–Render HTML, JSX, Components–function & Class, Props and States, Styles, Respond to Events
- React JS – Conditional Rendering, Rendering Lists, React Forms, React Router, Updating the Screen
- React JS–Hooks, Sharing data between Components, Applications –To-do list and Quiz
- Mongo DB–Installation, Configuration, CRUD operations, Databases, Collections and Records

Sample Experiments:

1. Type script

a. Write a program to understand simple and special types.
b. Write a program to understand function parameter and return types.
c. Write a program to show the importance with Arrow function. Use optional, default and REST parameters.
d. Write a program to understand the working of type script with class, constructor, properties, methods and access specifies.
e. Write a program to understand the working of name spaces and modules.
f. Write a program to understand generics with variables, functions and constraints.

2. Express JS–Routing, HTTP Methods, Middleware.

a. Write a program to define a route, Handling Routes, Route Parameters, Query Parameters and URL building.
b. Write a program to accept data, retrieve data and delete a specified resource using http methods.
c. Write a program to show the working of middleware.

3. Express JS– Templating, Form Data

a. Write a program using templating engine.
b. Write a program to work with form data.

4. Express JS –Cookies, Sessions, Authentication

a. Write a program for session management using cookies and sessions.

5. Write a program for user authentication. Express JS–Database, REST ful APIs

a. Write a program to connect Mongo DB database using Mongoose and perform CRUD operations.
b. Write a program to develop a single page application using REST ful APIs.

6. React JS–Render HTML, JSX, Components –function & Class

a. Write a program to render HTML to a web page.
b. Write a program for writing markup with JSX.
c. Write a program for creating and nesting components(function and class).

7. React JS–Props and States, Styles, Respond to Events

a. Write a program to work with props and states.
b. Write a program to add styles(CSS & Sass Styling) and display data.
c. Write a program for responding to events.

8. React JS–Condition a l Rendering, Rendering Lists, React Forms

a. Write a program for conditional rendering.
b. Write a program for rendering lists.
c. Write a program for working with different form fields using react forms.

9. React JS–React Router, Updating the Screen

a. Write a program for routing to different pages using react router.
b. Write a program for updating the screen.

10. React JS–Hooks, Sharing data between Components

a. Write a program to understand the importance of using hooks.
b. Write a program for sharing data between components.

11. React JS Applications–To-do list and Quiz

a. Design to-do list application.

12. Mongo DB–Installation, Configuration, CRUD operations

a. Install Mongo DB and configure ATLAS
b. Write Mongo DB queries to perform CRUD operations on document using insert(),find(), update(), remove()

13. Mongo DB–Databases, Collections and Records

a. Write Mongo DB queries to Create and drop databases and collections.
b. Write Mongo DB queries to work with records using find(),limit(),sort(),create Index(), aggregate().

14. Augmented Programs: (Any2mustbecompleted)

a. Design a to-do list application using Node JS and Express JS.
b. Design a Quiz app using React JS.
c. Complete the Mongo DB certification from Mongo DB University website.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, A Press, O'Reilly.

Web Links:

1. Express JS-https://www.tutorialspoint.com/expressjs
2. React JS-https://www.w3schools.com/REACT(and)https://react.dev/learn#
3. Mongo DB-https://learn.mongodb.com/learning-paths/introduction-to-mongodb

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III B. Tech I Semester	BT24ML3109	L	T	P	C
		0	0	3	1.5
TINKERING LAB (USER INTERFACE DESIGN USING FLUTTER)					

Course Objectives:

- Learns to Implement Flutter Wid gets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widges and customize wid gets for specific UI elements, Themes
- Understand to include animation a part from fetching data

Course Outcomes: On completion of this course, the student will be able to

CO1: Understand Dart programming fundamentals and set up the Flutter development environment.
CO2: Design user interfaces using Flutter widgets, layouts, and responsive design principles.
CO3: Implement navigation, state management, and reusable custom widgets in Flutter applications.
CO4: Develop interactive forms, apply validation techniques, and enhance UI using themes and animations.
CO5: Integrate REST APIs, fetch and display dynamic data, and handle asynchronous operations.
CO6: Apply testing, debugging, teamwork, and ethical development practices to deliver robust mobile applications.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	–	–	3	–	–	–	–	–	–	2
CO2	2	2	3	–	3	–	–	–	–	–	–	2
CO3	2	2	3	–	3	–	–	–	2	–	–	2
CO4	2	2	3	–	3	–	–	1	–	–	–	2
CO5	3	3	3	2	3	–	–	–	–	–	–	2
CO6	2	–	2	–	2	2	–	3	3	2	2	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	1	1
CO3	2	2
CO4	1	2
CO5	3	1
CO6	2	3

List of Experiments:

Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.

2. a) Explore various Flutter widgets(Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design are sponsive UI that adapts to different screen sizes.
   b) Implement media queries and break points for responsiveness.

4. a) Setup navigation between different screens using Navigator.
   b) Implement navigation with named routes.

5. a) Learn about state full and state less widgets.
   b) Implement state management using set State and Provider.

6. a) Create custom widgets for specific UI elements.
   b) Apply styling using themes and custom styles.

7. a) Design a form with various input fields.
   b) Implement form validation and error handling.

8. a) Add animations to UI elements using Flutter's animation framework.
   b) Experiment with different types of animations (fade, slide, etc.).

9. a) Fetch data from a REST API.
   b) Display the fetched data in a meaningful way in the UI.

10. a) Write unit tests for UI components.
    b) Use Flutter's debugging tools to identify and fix issues.

Text Book:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.
2. Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps 1st Edition, A pres.

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III B. Tech II Semester	BT24ML3201	L	T	P	C
		3	0	0	3
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: On completion of this course, the student will be able to

CO1: Explain the foundations of NLP including language modeling, morphology, tokenization, and spelling correction.
CO2: Analyze word-level language models and apply PoS tagging using rule-based and probabilistic approaches.
CO3: Apply syntactic parsing techniques using context-free grammars, dependency grammars, and probabilistic models.
CO4: Interpret semantic representations and apply word sense disambiguation using supervised and knowledge-based methods.
CO5: Analyze discourse phenomena including anaphora, coreference resolution, and coherence modeling.
CO6: Utilize standard NLP tools, corpora, and lexical resources to build and evaluate real-world NLP applications.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	1	–	–	–	–	–	–	2
CO2	3	3	–	2	2	–	–	–	–	–	–	2
CO3	3	3	2	3	2	–	–	–	–	–	–	2
CO4	3	3	2	3	2	–	–	–	–	–	–	2
CO5	2	3	2	3	2	–	–	–	1	–	–	2
CO6	2	2	3	2	3	–	–	1	2	2	–	3

.

CO / PSO	PSO-1	PSO-2
CO1	2	1
CO2	3	1
CO3	3	1
CO4	3	2
CO5	2	2
CO6	3	3

UNIT I: INTRODUCTION: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II: WORD LEVEL ANALYSIS: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Back off – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III: SYNTACTIC ANALYSIS: Context-Free Grammars, Grammar rules for English, Tree banks, 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

UNIT IV: SEMANTICS AND PRAGMATICS: Requirements forre presentation, 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.

UNIT V: 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, Word Net, Prop Bank, Frame Net, Brown Corpus, British National Corpus (BNC).

Text Books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2nd Edition, Daniel Juraf sky, 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, O ReillyMedia,2015.
3. Handbook of Natural Language Processing, Second, NitinIndurkhyaand Fred J. Damerau, Chapman and Hall/CRC Press, 2010.Edition
4. Natural Language Processing and Information Retrieval, 3rd Edition, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press,2008

III B. Tech II Semester	BT24ML3202	L	T	P	C
		3	0	0	3

DEEP LEARNING

Course Objectives:

1. The objective of this course is to cover the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short-term memory cells and convolution neural networks.

Course Outcomes: After completion of course, students would be able to:

CO1: Explain biological neuron models and apply perceptron learning algorithms for linear classification.
CO2: Design and train feed-forward neural networks using back propagation, regularization, and auto encoders.
CO3: Apply advanced optimization and regularization techniques to improve deep neural network training.
CO4: Implement recurrent and convolutional neural networks for sequential and spatial data modeling.
CO5: Analyze generative deep learning models including RBMs, deep Boltzmann machines, and variational auto encoders.
CO6: Evaluate recent deep learning architectures such as Transformers and GPT for vision, speech, and NLP applications.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	–	1	–	–	–	–	–	–	2
CO2	3	3	3	2	3	–	–	–	–	–	–	2
CO3	3	3	3	2	3	–	–	–	–	–	–	2
CO4	3	3	3	3	3	–	–	–	1	–	–	2
CO5	3	3	2	3	2	–	–	–	–	–	–	2
CO6	3	3	3	3	3	–	–	1	2	2	–	3

CO / PSO	PSO-1	PSO-2
CO1	2	1
CO2	3	1
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	3

UNIT-I: Basics- Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thres holding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability, Convergence theorem for Perceptron Learning Algorithm.

UNIT-II: Feed forward Networks-Multilayer Perceptron, Gradient Descent, Back propagation, Empirical Risk Minimization, regularization, auto encoders.
Deep Neural Networks: Difficulty of training deep neural networks, Greedy layer wise training.

UNIT-III: Better Training of Neural Networks-Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization).

UNIT IV: Recurrent Neural Networks- Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.
Convolutional Neural Networks: Le Net, Alex Net. Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

UNIT V: Recent trends- Variational Auto encoders, Transformers, GPT Applications: Vision, NLP, Speech

Text Books:

1. Deep Learning, I an Good fellow and Yoshu a Bengio and Aaron Courville, MITPress,2016.

Reference Books:

1. Neural Networks: A Systematic Introduction, Raúl Rojas,1996
2. Pattern Recognition and Machine Learning, Christopher Bishop,2007
3. Deep Learning with Python, Franço is Chollet, Manning Publications,2017

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III B. Tech II Semester	BT24ML3203	L	T	P	C
		3	0	0	3

DATA VISUALIZATION

Course Objective:

- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization
- Learn key techniques of the visualization process
- A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques.

Course Outcomes: After completion of course, students would be able to:

CO1: Explain visualization concepts, visual perception, and design principles for effective data representation.
CO2: Apply visualization reference models and visual mapping techniques to design visualization applications.
CO3: Analyze and classify visualization systems and apply interaction techniques for multidimensional data.
CO4: Visualize complex data structures such as trees, graphs, clusters, networks, and software systems.
CO5: Apply visualization techniques for volumetric, spatial, geographic, and simulation-based data.
CO6: Evaluate visualization effectiveness, address information overload, and explore recent trends and collaborative visualization techniques.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	–	1	–	–	–	–	2	–	2
CO2	2	2	3	–	3	–	–	–	–	2	–	2
CO3	2	3	2	2	3	–	–	–	–	2	–	2
CO4	2	3	3	2	3	–	–	–	–	1	–	2
CO5	2	3	3	3	3	–	–	–	–	1	–	2
CO6	2	2	2	2	2	–	–	1	2	3	–	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	2	1
CO3	2	1
CO4	2	2
CO5	3	1
CO6	2	3

UNIT-I: Introduction: What Is Visualization? History of Visualization, Relationship between Visualization and Other Fields the Visualization Process, Introduction of visual perception, visual representation of data, Gestalt principles, information overloads.

UNIT-II: Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT-III: Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT-IV: Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

UNIT-V: Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations **Recent trends** in various perception techniques, various visualization techniques, data structures used in data visualization.

TEXTBOOK:

1. WARD, GRINS TEIN, KEIM. Interactive Data Visualization: Foundations, Techniques, and Applications. Natick : A K Peters, Ltd.
2. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

Resources:

1. https://kdd.cs.ksu.edu/Courses/CIS536/Lectures/Slides/Lecture-34-Main_6up.pdf

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III B. Tech II Semester	BT24ML32P2A	L	T	P	C
		3	0	0	3
SOFTWARE TESTING METHODOLOGY					

Course Objectives

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using the latest tools.

Course Outcomes: After completion of course, students would be able to:

CO1: Explain the fundamentals of software testing, bug classification, and the impact of software defects.
CO2: Apply path testing techniques using flow graphs, predicates, and achievable paths.
CO3: Perform transaction flow, data flow, and domain testing to identify logical and data-related faults.
CO4: Apply logic-based testing methods using decision tables, path expressions, and specifications.
CO5: Design and execute state-based testing using state graphs and transition testing techniques.
CO6: Utilize graph-based testing methods and automated testing tools to evaluate software quality.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	–	–	1	–	2	–	–	–	2
CO2	2	3	2	2	–	–	–	–	–	–	–	2
CO3	2	3	3	2	–	–	–	–	–	–	–	2
CO4	2	3	3	2	–	–	–	–	–	–	–	2
CO5	2	3	3	2	–	–	–	–	–	–	–	2
CO6	2	2	2	2	3	–	–	1	2	1	–	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	1	1
CO3	2	1
CO4	2	1
CO5	2	2
CO6	2	3

UNIT – I: Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT–II: Transaction Flow Testing: transaction flows, transaction flow testing techniques.
Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.

Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT–III: Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.
Logic Based Testing: overview, decision tables, path expressions, k v charts, specifications.

UNIT – IV: State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT – V: Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like J meter /selenium/ soap UI / Catalon).

Text Books:

1. Software Testing techniques- Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools–Dr. K .V. K . K. Prasad, Dreamtech.

Reference Books:

1. The craft of software testing –Brian Marick, Pearson Education.
2. Software Testing Techniques –SPD(Oreille)
3. Software Testing in the Real World–Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing–Meyers, John Wiley.

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III B. Tech II Semester	BT24ML32P2B	L	T	P	C
		3	0	0	3
CRYPTOGRAPHY & NETWORK SECURITY					

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: After completion of course, students would be able to:

CO1: Explain security principles, attack models, and classical encryption techniques for protecting information.
CO2: Apply mathematical foundations and algebraic structures used in symmetric and asymmetric cryptography.
CO3: Implement and analyze symmetric and asymmetric key cryptographic algorithms for secure communication.
CO4: Apply cryptographic hash functions, message authentication codes, and digital signatures for data integrity and authentication.
CO5: Analyze network and internet security protocols including TLS, IPsec, and secure email mechanisms.
CO6: Design secure systems by integrating cryptographic techniques while addressing ethical and societal security challenges.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	–	–	2	–	2	–	–	–	2
CO2	3	3	2	2	–	–	–	–	–	–	–	2
CO3	3	3	3	2	2	–	–	–	–	–	–	2
CO4	3	3	3	2	2	–	–	1	–	–	–	2
CO5	3	3	3	3	2	1	–	1	–	–	–	2
CO6	2	2	3	2	2	3	–	3	2	2	–	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	2	1
CO3	2	1
CO4	2	1
CO5	2	2
CO6	3	3

UNIT – I: 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, Steganography.

UNIT – II: Introduction to Symmetric Cryptography: Algebraic Structures-Groups, Rings, Fields, GF(2^n) fields, Polynomials.
Mathematics of Asymmetric cryptography: Primes, checking for Primness, Euler's phi-functions, Fermat's Little Theorem, Euler's Theorem, Generating Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm.

UNIT – III: 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.

UNIT – IV: 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.

UNIT – V: 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.

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, McGraw Hill,3rd Edition, 2015

REFERENCE BOOKS:

1. Cryptography and Network Security: Atul Kahate, McGraw 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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III B. Tech II Semester	BT24ML32P2C	L	T	P	C
		3	0	3	4.5
DEVOPS					

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

1. Describe the agile relationship between development and IT operations.
2. Understand the skills etsand 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: After completion of course, students would be able to:

CO1: Explain DevOps principles, Agile practices, SDLC models, and CI/CD workflows for software delivery.
CO2: Apply source code management using Git and perform unit testing and code quality analysis.
CO3: Implement build automation and continuous integration using Jenkins pipelines and related tools.
CO4: Apply continuous delivery and deployment practices using Docker and automated testing tools.
CO5: Implement configuration management and container orchestration using Ansible and Kubernetes/Open Shift.
CO6: Design, manage, and evaluate end-to-end DevOps pipelines while following ethical and collaborative practices.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	–	1	–	–	–	–	1	–	2
CO2	2	2	2	–	3	–	–	–	2	–	–	2
CO3	2	2	3	2	3	–	–	–	2	–	–	2
CO4	2	2	3	2	3	–	–	–	1	–	–	2
CO5	2	3	3	2	3	–	–	–	1	–	–	2
CO6	2	2	3	2	3	2	–	3	3	2	2	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	2	1
CO3	2	1
CO4	2	1
CO5	2	2
CO6	3	3

UNIT-I: Introduction to DevOps: Introduction to SDLC, Agile Model. Introduction to DevOps. DevOps Features, DevOps Architecture, DevOps Lifecycle, Understanding Work flow and principles, Introduction to DevOps tools, Build Automation, Delivery Automation, Understanding Code Quality, Automation of CI/ CD. Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT-II: 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.
UNITTESTING-CODECOVERAGE: Junit, n Unit& Code Coverage with Sonar Qube, Sonar Qube - Code Quality Analysis.

UNIT-III: Build Automation-Continuous Integration(CI): Build Automation, what is CI Why Cl 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**.**

UNIT-IV: 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 Seleniumandits features, Java Script testing.

UNIT-V: Configuration Management - ANSIBLE: Introduction to Ansible, Ansibletasks Roles, Jinja2 templating, Vaults, Deployments using Ansible.
CONTAINERIZATION USING KUBERNETES (OPEN SHIFT): Introduction to Kubernetes Namespace & Resources, CI/CD - On OCP, BC, DC & Config Maps, Deploying Apps on Openshift Container Pods. Introduction to Puppet master and Chef.

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and Git Hub commands.
3. Practice Source code management on Git Hub. 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. Developtestcasesfortheabovecontainerizedapplicationusingselenium.

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 JeHumble, Patrick Debois, JohnWillis. The DevOps Handbook, 1st Edition, IT Revolution Press, 2016.
3. Verona, Joakim Practical DevOps,1st Edition,Packt Publishing,2016.
4. JoakimVerona. Practical Devops,2nd Edition. Ingram short title;2nd edition(2018). ISBN10:1788392574
5. Deepak Gaik wad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.ISBN:9788126579952

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		3	0	0	3

RECOMMENDER SYSTEMS

Course Objectives:

- This course covers the basic concepts of recommender systems, including personalization algorithms, evaluation tools, and user experiences.

Course Outcomes: After completion of course, students would be able to:

CO1: Explain the fundamentals, applications, mathematical foundations, and challenges of recommender systems.
CO2: Implement and analyze collaborative filtering techniques, including user-based, item-based, and model-based approaches.
CO3: Design content-based and knowledge-based recommender systems using feature extraction and user profiling techniques.
CO4: Develop hybrid recommender systems by integrating multiple recommendation strategies and architectures.
CO5: Evaluate recommender systems using statistical, decision-support, and user-centered evaluation metrics.
CO6: Analyze social, trust-based, and community-driven recommender systems while addressing ethical and security concerns.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	–	1	–	–	–	–	–	–	2
CO2	2	3	3	2	2	–	–	–	1	–	–	2
CO3	2	3	3	2	2	–	–	–	1	–	–	2
CO4	2	3	3	2	3	–	–	–	2	–	–	2
CO5	2	2	2	3	2	–	–	–	1	–	–	2
CO6	2	2	2	2	1	2	–	3	2	1	–	3

CO / PSO	PSO-1	PSO-2
CO1	2	1
CO2	3	1
CO3	3	1
CO4	3	2
CO5	2	2
CO6	2	3

UNIT-I: Introduction: Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses, covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.

UNIT-II: Collaborative Filtering:User-based nearest neighbour recommendation, Item-based nearest neighbour recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems.

UNIT-III: Content-based recommendation: High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, discovering features of documents, obtaining item features from tags, representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

Knowledge based recommendation: Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders.

UNIT-IV: Hybrid approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies.

UNIT-V: Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centred metrics.

Recommender Systems and communities: Communities, collaboration and recommender systems in personalized web search, Social tagging recommender systems, Trust and recommendations

Text Books:

1. Jannach D.,Zanker M. and Fel Fering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.
2. RicciF.,RokachL.,ShapiraD.,KantorB.P.,RecommenderSystemsHandbook,Springer(2011),1st ed.

References:

1. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.

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III B. Tech II Semester	BT24ML32P3A	L	T	P	C
		3	0	0	3
SOFTWARE PROJECT MANAGEMENT					

Course Objectives: At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.

Course Outcomes: After completion of course, students would be able to:

CO1: Explain conventional and modern software management principles, software economics, and cost estimation techniques.
CO2: Analyze software life-cycle phases, process artifacts, and milestone-based project tracking methods.
CO3: Apply model-based software architectures and iterative process planning techniques for effective project execution.
CO4: Evaluate project organization structures, process automation strategies, and software metrics for project control.
CO5: Implement Agile and Scrum practices to manage iterative and adaptive software development projects.
CO6: Apply DevOps principles, toolchains, and delivery pipelines to enable continuous integration, deployment, and collaboration.

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	–	–	–	–	–	–	–	3	2
CO2	3	3	2	2	–	–	–	–	–	–	3	2
CO3	2	3	3	2	2	–	–	–	1	–	2	2
CO4	2	2	2	3	2	–	–	–	1	–	3	2
CO5	2	2	3	2	2	–	–	1	3	2	3	2
CO6	2	2	3	2	3	–	–	1	3	2	3	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	1	2
CO3	2	2
CO4	1	2
CO5	2	3
CO6	2	3

UNIT-I: Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation. **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.
The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II: Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, program aticarti facts.

UNIT-III: Model based software architectures: A Management perspective and technical perspective**.**
Work Flows of the process: Software process workflows, Iteration work flows.
Check points of the process: Major milestones, Minor Mile stones, Periodic status assessments. **Iterative Process Planning:** Work break down structures, planning guidelines, co stand schedule estimating, Iteration planning process, Pragmatic planning.

UNIT-IV: Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.
Project Control and Process in strumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT-V: Agile Methodology, ADAP Ting to Scrum, Patterns for Adopting Scrum, Iterating towards Agility**. Fundamentals of DevOps:** Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOp seco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Text Books:

1. Software Project Management, Walker Royce, PEA, 2005.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim, John Willis, Patrick Debois, Jez Humb,1st Edition, O'Reilly publications,2016.

Reference Books:

1. Software Project Management,BobHughes,3/e, Mike Cotterell, TMH
2. Software Project Management, Joel Henry, PEA
3. Software Project Management in practice,PankajJalote,PEA,2005,
4. Effective Software Project Management,RobertK.Wysocki,Wiley,2006.
5. Project Management in IT, Kathy Schwalbe, Cengage.

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III B. Tech II Semester	BT24ML32P3B	L	T	P	C
		3	0	0	3

MOBILE ADHOC AND SENSOR NETWORKS

Course Outcomes: After completion of course, students would be able to:

CO1: Explain the fundamentals, architecture, and standards of mobile ad hoc and wireless networks.

CO2: Analyze ad hoc network protocols, topology control, broadcasting, and scheduling techniques.

CO3: Apply routing, location discovery, energy-efficient communication, and security mechanisms in ad hoc networks.

CO4: Evaluate simulation and modeling techniques for wireless, mobile, and ad hoc networks.

CO5: Explain the design, challenges, and applications of wireless sensor networks.

CO6: Apply sensor network platforms, tools, and research concepts to solve real-world networking problems.

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	–	–	–	–	–	–	–	1
CO2	3	3	2	–	–	–	–	–	–	–	–	1
CO3	2	3	3	2	–	–	–	1	–	–	–	2
CO4	2	2	2	3	3	–	–	–	–	–	–	2
CO5	3	2	2	–	–	1	2	–	–	–	–	1
CO6	2	2	3	2	3	1	2	1	2	–	–	3

COs/ PSOs	PSO-1	PSO-2
CO1	1	1
CO2	1	1
CO3	2	1
CO4	2	2
CO5	2	2
CO6	3	3

UNIT-I: Introduction-Adhocnetworks.MobileAd-HocnetworkingwithaViewof4GWireless, Off-the-Shelf Enables of Ad Hoc, IEEE 802.11 in Ad Hoc Networks:

UNIT-II: Protocols, Performance and Open Issues, Scatter net Formation in Bluetooth Networks, Antenna Beam forming and Power Control for Ad Hoc Networks, Topology Control in Wireless Ad Hoc Networks, Broadcasting and Activity Scheduling in Ad Hoc Networks.

UNIT-III: Location Discovery, Routing Approaches in Mobile Ad Hoc Networks, Energy-Efficient Communication in Ad Hoc Wireless, Ad Hoc Networks Security, Self-Organized and Cooperative Ad Hoc Networking.

UNIT-IV: Simulation and Modeling of Wireless, Mobile, and Ad Hoc Networks, Modeling Cross-Layering Interaction Using Inverse Optimization Algorithmic Challenges in Ad Hoc Networks.

UNIT-V: Sensor Networks: Introduction to sensor network, Unique constraints and challenges, Localization and Tracking, Networking Sensors, Infrastructure establishment, Sensor Tasking and Control, Sensor network databases, Sensor Network Platforms and tools, Industrial Applications and Research directions.

Text Books:

1. Mobile Ad hoc Networks–Aggelou, George (McGraw-Hill).
2. Mobile Ad hoc Networking–Stefano Basagni (Editor),Marco Conti(Editor),Silvia Giordano(Editor),Ivan Stojmenovi & Cacute (Editor) (Wiley-IEEE Press).

References:

1. WirelessSensorNetworks:AnInformationProcessingApproach–FengZhao,LeonidasGuibas(Elsevier).
2. Hand book of Sensor Networks: Algorithms and Architectures–Ivan Stojmenovi & Cacute (Wiley).

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III B. Tech II Semester	BT24ML32P3C	L	T	P	C
		3	0	0	3
COMPUTER VISION					

Course Objectives:

- To understand the Fundamental Concepts related to sources, shadows and shading
- To understand the Geometry of Multiple Views

Course Outcomes: After completion of course, students would be able to:

CO1: Explain camera models, image formation, radiometry, shading, and color representation in images.
CO2: Apply linear filtering, edge detection, texture analysis, and frequency-domain techniques for image processing.
CO3: Analyze multi-view geometry, stereopsis, and image segmentation using clustering and graph-based methods.
CO4: Apply model-based segmentation, probabilistic methods, EM algorithm, and object tracking techniques.
CO5: Explain geometric camera models, calibration techniques, and analytical photogrammetry concepts.
CO6: Apply computer vision techniques to real-world applications such as robot localization and medical image registration.

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	–	–	–	–	–	–	–	1
CO2	3	3	2	–	2	–	–	–	–	–	–	1
CO3	2	3	2	2	–	–	–	–	–	–	–	2
CO4	2	3	3	3	2	–	–	–	–	–	–	2
CO5	3	2	2	–	2	–	–	–	–	–	–	1
CO6	2	2	3	2	3	1	–	1	2	–	–	3

COs/ PSOs	PSO-1	PSO-2
CO1	1	1
CO2	2	1
CO3	2	1
CO4	3	2
CO5	2	1
CO6	3	3

UNIT–I:CAMERAS: Pinhole Cameras Radiometry –Measuring Light: Lightin Space, Light Surfaces, Important Special Cases Sources, Shadows, And Shading: Qualitative Radio metry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, **inter reflections**: Global Shading Models Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

UNIT-II: Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, **Edge Detection:** Noise, Estimating Derivatives, Detecting Edges Texture0: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT-III: The Geometry of Multiple Views: Two Views Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras Segmentation by Clustering: What is Segmentation? Human Vision: Grouping and Get stalt, **Applications:** Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

UNIT-IV: Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, fitting as a Probabilistic Inference Problem, Robustness Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, tracking with Linear Dynamic Models : Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples

UNIT-V: Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection EquationsGeometricCameraCalibration:Least-SquaresParameterEstimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photo grammetry**,**
Case study: Mobile Robot Localization Model- Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Case study: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

Text Books:

1. David A. Forsyth and Jean Ponce: Computer Vision–A Modern Approach, PHI Learning (Indian Edition), 2009.

Reference Books:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. R. C. Gonzalez and R. E. Woods "Digital Image Processing" Addison Wesley 2008. 3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

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III B. Tech II Semester	BT24ML32P3D	L	T	P	C
		3	0	0	3
No SQL Databases					

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

CO1: Explain the evolution, principles, and need for NoSQL databases compared to relational databases.
CO2: Compare different NoSQL data models such as key–value, document, column-family, and graph databases.
CO3: Apply document-oriented NoSQL databases (MongoDB) for scalable data storage and real-time applications.
CO4: Analyze column-oriented NoSQL databases (HBase and Cassandra) for distributed storage and analytics use cases.
CO5: Apply key–value and graph NoSQL databases (Riak and Neo4j) to model relationships and large-scale data.
CO6: Select and design appropriate NoSQL database solutions for modern applications considering scalability, consistency, and availability.

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	–	–	–	–	–	–	–	1
CO2	3	3	2	–	–	–	–	–	–	–	–	1
CO3	2	2	3	–	3	–	–	–	–	–	–	2
CO4	2	3	2	2	3	–	–	–	–	–	–	2
CO5	2	2	3	–	3	–	–	–	–	–	–	2
CO6	2	3	3	2	3	1	–	1	2	–	–	3

CO / PSO	PSO-1	PSO-2
CO1	1	1
CO2	2	1
CO3	3	2
CO4	3	2
CO5	2	2
CO6	3	3

UNIT-I: Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

UNIT-II: Comparison of relational databases to new NoSQL stores, Mongo DB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave

Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT-III: NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT-IV: Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT-V:NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

TEXT BOOKS:

1. Sadal age, P.& Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition,2019.

WEB REFERENCES:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

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III B. Tech II Semester	BT24ML3205	L	T	P	C
		0	0	3	1.5
DEEP LEARNING LAB					

Course Outcomes: On completion of this course, the student will be able to

CO1: Implement basic neural networks like multilayer perceptron for regression and classification tasks.

CO2: Design and train neural networks for text classification problems using datasets like IMDB and Reuters.

CO3: Build convolutional neural networks (CNNs) for image classification tasks.

CO4: Apply pre-trained CNN models such as VGG16 for transfer learning and image recognition.

CO5: Implement word encoding and embedding techniques for NLP applications.

CO6: Implement recurrent neural networks (RNNs) for sequence-based data like sentiment analysis.

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	–	–	–	1	2	–	2
CO2	3	3	3	2	3	–	–	–	2	2	–	2
CO3	3	2	3	2	3	–	–	–	1	2	–	2
CO4	3	2	3	2	3	–	–	–	1	2	–	2
CO5	3	3	3	2	3	–	–	–	1	2	–	2
CO6	3	3	3	2	3	–	–	–	1	2	–	2

CO / PSO	PSO-1	PSO-2
CO1	3	1
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Software Packages required:

- Keras
- Tensor flow
- Py Torch

List of Experiments:

1. Implement multi-layer perceptron algorithm for MNISTH and written Digit Classification.
2. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.

3. Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
4. Design a neural network for predicting house prices using Boston Housing Price dataset.
5. Build a Convolution Neural Network for MNIST Handwritten Digit Classification.
6. Build a Convolution Neural Network for simple image (dogs and Cats) Classification
7. Use a pre-trained convolution neural network (VGG16) for image classification.
8. Implement one hot encoding of words or characters.
9. Implement word embedding's for IMDB dataset.
10. Implement a Recurrent Neural Network for IMDB movie review classification problem.

Text Books:

1. RezaZadehandBharathRamsundar,"TensorflowforDeepLearning",O'Reilly publishers,2018

References:

1. https://github.com/fchollet/deep-learning-with-python-notebooks

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III B. Tech II Semester	BT24ML3206	L	T	P	C
		0	0	3	1.5
DATA VISUALIZATION LAB					

Course Objectives:

- To visualize the different datasets using histograms, line charts.
- To understand the use of bar charts and box plots.
- To understand Scatter plots, mosaic plots
- To understand different Map visualizations
- To learn advanced graphs such as correlogram, heat map and 3D graphs.

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

CO1: Load and explore datasets in R to understand data structure and types.

CO2: Apply basic visualization techniques such as histograms, line charts, and bar charts to represent data.

CO3: Use advanced visualizations like box plots, scatter plots, and scatter plot matrices for multivariate data analysis.

CO4: Implement visualizations for large datasets using hexbin plots, heat maps, and correlograms.

CO5: Create interactive map visualizations using R libraries like `leaflet` and `maps`.

CO6: Apply 3D visualization techniques for better understanding of complex datasets.

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	–	–	1	1	1	–	2
CO2	3	2	2	2	2	–	–	1	1	1	–	2
CO3	3	2	2	2	2	–	–	2	1	2	–	2
CO4	3	2	2	2	2	–	–	2	2	2	–	2
CO5	3	2	2	2	2	–	–	2	2	2	–	2
CO6	3	2	2	2	2	–	–	2	2	2	–	2

COs / PSOs	PSO-1	PSO-2
CO1	3	1
CO2	3	1
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

List of Experiments:

1. a) Load VA Deaths (Death Rates in Virginia)dataset in R and visualize the data using different histograms.
   b) Load air quality dataset in Rand visualize LaGuardia Airport's dialy maximum temperature using histogram.
2. Load Air Passengers dataset in R and visualize the data using line chart that shows increase in air passengers over given time period.
3. a) Load iris dataset in R, visualize the data using different Bar Charts and also demonstrate the use of stacked plots.
   b) Load air quality dataset in R and visualize ozone concentration in air.
4. a) Load iris dataset in R, visualize the data using different Box plots including group by option and also use color palette to represent species.
   b) Load air quality dataset in Rand visualize air quality parameters using box plots.
5. Visualize iris dataset using simple scatter, multivariate scatter plot and also visualize scatter plot matrix to visualize multiple variables across each other.
6. Load diamonds dataset in R and visualize the structure in datasets with large data points using hexagon binning and also add color palette then use the
7. Load Hair Eye Color dataset in Rand plot categorical data using mosaic plot.
8. Load mt cars dataset in Rand visualize data using heat map.
9. Install leaf let library in Rand perform different map visualizations.
10. Visualize iris data set using 3d graphs such as scatter 3d, cloud, xy plot.
11. Make use of correlogram to visualize data in correlation matrices for iris dataset.
12. Install maps library in Rand draw different map visualizations.

Web References:

1. https://www.analyticsvidhya.com/blog/2015/07/guide-data-visualization-r/
2. https://www.geeksforgeeks.org/data-visualization-in-r/

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III B. Tech II Semester	BT24BS3201	L	T	P	C
		0	1	2	2
SOFT SKILLS					

Course Objectives:

- To equip the students with the skills to effectively communicate in English
- To train the students in interview skills, group discussions and presentation skills
- To motivate the students to develop confidence
- To enhance the students' interpersonal skills
- To improve the students' writing skills

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

CO1: Demonstrate effective verbal and non-verbal communication skills.

CO2: Develop analytical thinking, positive attitude, and self-awareness.

CO3: Apply self-management techniques including time, stress, and anger management.

CO4: Exhibit proper social, business, and telephone etiquette.

CO5: Prepare professional documents, resumes, emails, and perform well in group discussions and interviews.

CO6: Build and maintain effective interpersonal relationships in personal and professional contexts.

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	–	–	2	1	1	–	2
CO2	3	2	2	2	2	–	–	2	1	1	–	2
CO3	3	2	2	2	2	–	–	2	2	1	–	2
CO4	3	2	2	2	2	–	–	2	2	2	–	2
CO5	3	2	2	2	2	–	–	2	2	2	–	2
CO6	3	2	2	2	2	–	–	2	2	2	–	2

COs / PSOs	PSO-1	PSO-2
CO1	2	3
CO2	2	3
CO3	2	3
CO4	1	3
CO5	2	3
CO6	1	3

UNIT–I: Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds –A Talk by Azim Premji (Listening Activity), Self –Analysis, Developing Positive Attitude, Perception.
Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT – II: Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT – III: Standard Operation Methods: Basic Grammars, Tenses, Prepositions, Pronunciation, Letter Writing; Note Making, Note Taking, Minutes Preparation, Email & Letter Writing

UNIT-IV: Job-Oriented Skills: Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

UNIT-V: Interpersonal relationships: Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships, Accommodating different styles, Consequences of interpersonal relationships

Textbooks:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford UniversityPress,2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan,2010.

Reference books:

1. R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand & Company Ltd., 2018.
2. Raman, Meenakshi &Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

E-resources:

1. https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01

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III B. Tech II Semester	BT24BS3202	L	T	P	C
		2	0	0	-
TECHNICAL PAPER WRITING & IPR					

Course Objective:

- The course will explain the basic related to writing the technical reports and understanding the concepts related to formatting and structuring the report. This will help students to comprehend the concept of proofreading, proposals and practice

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

CO1: Demonstrate effective technical writing skills including sentence formation, transitions, and proper use of tenses.

CO2: Plan, structure, and draft technical reports tailored to target readers.

CO3: Apply editing, proofreading, and summarization techniques to improve readability and clarity.

CO4: Present technical reports effectively in written, printed, and verbal formats.

CO5: Utilize advanced word processing tools for professional document preparation, formatting, and collaboration.

CO6: Understand the fundamentals of Intellectual Property, patenting processes, and global IP practices.

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	–	–	–	2	–	1	–	2
CO2	3	2	2	2	–	–	–	2	–	1	–	2
CO3	3	2	2	2	–	–	–	2	–	1	–	2
CO4	3	2	2	2	–	–	–	2	–	2	–	2
CO5	3	2	2	2	–	–	–	2	–	2	–	2
CO6	2	2	2	2	–	–	–	2	–	2	–	2

COs / PSOs	PSO-1	PSO-2
CO1	2	3
CO2	2	3
CO3	2	3
CO4	1	3
CO5	2	3
CO6	1	3

Unit I: Introduction: An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing.
Planning and Structuring: Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing.

Unit II: Drafting report and design issues: The use of drafts, Illustrations and graphics.
Final edits: Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.

Unit III: Proof reading and summaries: Proofreading, summaries, Activities on summaries.
Presenting final reports: Printed presentation, Verbal presentation skills, Introduction to proposals and practice.

Unit IV: Using word processor: Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes, Working with Footnotes and Endnotes, Inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros,

Unit V: **Nature of Intellectual Property:** Patents, Designs, Trade and Copyright. Process of **Patenting and Development:** technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property

Text Books:

1. Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
2. WilliamS.PfeifferandKayeA.Adkins,"TechnicalCommunication:APracticalApproach", Pearson.
3. Ramappa,T.,"IntellectualPropertyRightsUnderWTO",2nd Ed.,SChand,2015.

Reference Books:

1. Adrian Wall work, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
2. Day R, How to Write and Publish a Scientific Paper, Cam bridge University Press(2006)

E-resources:

1. https://www.udemy.com/course/reportwriting/
2. https://www.udemy.com/course/professional-business-english-and-technical-report-writing/
3. https://www.udemy.com/course/betterbusinesswriting/

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AI DS

DEPARTMENT OF MASTER OF BUSINESS ADMINISTRATION

CIRCULAR

Bhimavaram,
Dt: 06-01-2026.

To

The faculty members,

MBA Department,

DNRCET

Dear sir/madam,

Sub: DNR College of Engineering & Technology, MBA Department – Board of Studies Meeting-Reg..

I take the privilege in inviting you for the Board of Studies (BOS) Meeting of MBA Department, DNR College of Engineering & Technology. It is proposed to discuss and finalize the following agenda for the AY: 2026-27.

1. Welcome Speech by the Chairperson.
2. To discuss and finalize the proposed DR – 24 B.Tech III Year I Semesters Subject Entrepreneurship Development & Venture Creation Course Code: BT24HS3101 and Syllabus, offered by CSE, ECE, EEE, CIVIL and ME Branches.
3. To discuss and finalize the proposed DR – 24 B.Tech III Year I Semesters Subject Entrepreneurship Course Code: BT24HS3102 and Syllabus, offered by Mechanical Engineering Branch.
4. To discuss and finalize the proposed DR – 24 B.Tech III Year II Semesters Subject Research Methodology & IPR Course Code: BT24HS3201 and Syllabus, offered by ECE and EEE Branches.
5. To discuss and finalize the proposed DR – 25 M.Tech II Year I Semesters Subject Research Methodology & IPR Course Code: D2530000 and Syllabus, offered by CSE, ECE, CIVIL and ME Branches.
6. Any other item with the Permission of the Chair.

In this regard, you are requested to attend the online meeting Scheduled to be held on 08-01-2026, Thursday at 11:30 AM in the Board Room.

HOD and Chairman, BOS

Copy To:

- Faculty Members, MBA Dept
- Dean Academics DNRCET
- Principal DNRCET

Circulation among Faculty Members:

1. Mr. K. Chandra Mouli Raju :
2. Mr. K.S.V.N. Satyanarayana :
3. Mr. V.R.E.S.Santosh Kumar :
4. Mr. M Raju :
5. Mrs.P.Naga Jyothi :
6. Ms. S. Beula Kiran :
7. Ms.Ch. Ratnavali :
8. Ms.P.Yasaswini :
9. Mrs. Ch. K. L. Prasanna :
10. Mrs. Ch. Manju :
11. Mr.P V M K Raju :

Members Present:

S.NO	Designation in Committee	Name(s) of the Member(s)	Designation	Signature
1.	Chairman	Dr. G.V. Jagapathi Rao	HOD & Assoc. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	Typed
2.	Expert Nominated by the Vice-Chancellor (University Nominee)	Prof. P. Uma Maheswari Devi	Professor, Dept of Commerce & Management Studies Adikavi Nannaya University Rajamahendravaram	Attended online
3.	Subject experts from outside the parent University	Prof. D. Surya Chandra Rao	Rector, Krishna University, Machilipatnem	Attended online
		Dr. BVR Naidu	Professor & Head Dept. of Management Studies Godavari Institute of Engg & Tech(A), Rajamahendravaram	Attended online
4.	Representative from industry Expert	Mr. T. C. V. Narasimha Rao	Mg Partner, UNO Feeds, Komarada, Bhimavaram Mandal, WG dt.	Attended online
5.	Faculty Members	Mr. K. Chandra Mouli Raju	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram – 534202	K
		Mr. K.S.V.N. Satyanarayana	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	KSVNS
		Mr. V.R.E.S.Santosh Kumar	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	VRESKumar
		Ms. S. Beula Kiran	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram – 534202	S.Beula
		Ms.Ch. Ratnavali	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	Ch.Ratnavali
		Mrs.Ch. K. L. Prasanna	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	K.Prasanna
		Mrs.Ch. Manju	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	

		Mr. M Raju	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	M Raju
		Mrs.P.Naga Jyothi	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	P.Naga Jyothi
		Ms.P.Yasaswini	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	P Yasaswini
		Mr.P V M K Raju	Asst. Prof, MBA Department, DNR College of Engineering & Technology, Bhimavaram - 534202	P.V.M.K.Raju

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MASTER OF BUSINESS ADMINISTRATION

MEETING OF BOS SCHEDULE, AY: 2026-27

Minutes of meeting of Board of Studies, Dept of Master of Business Administration held on 08-01-2026 at 11:30 AM.

Venue: Board Room

Meeting held on: 08-01-2026, 11:30 AM

Mode of conduction Meeting: Zoom online platform

Meeting Link: https://us06web.zoom.us/j/84496320710?pwd=ULox5dfR7sacgnIqcChJ1haLbOLt4k.1

AGENDA:

1. Welcome Speech by the Chairperson.
2. To discuss and finalize the proposed DR – 24 B.Tech III Year I Semesters Subject: Entrepreneurship Development & Venture Creation Course Code: BT24HS3101 and Syllabus, offered by CSE, ECE, EEE, CIVIL and ME Branches.
3. To discuss and finalize the proposed DR – 24 B.Tech III Year I Semesters Subject: Entrepreneurship Course Code: BT24HS3102 and Syllabus, offered by Mechanical Engineering Branch.
4. To discuss and finalize the proposed DR – 24 B.Tech III Year II Semesters Subject: Research Methodology & IPR Course Code: BT24HS3201 and Syllabus, offered by ECE and EEE Branches.
5. To discuss and finalize the proposed DR – 25 M.Tech II Year I Semesters Subject: Research Methodology & IPR Course Code: D2530000 and Syllabus, offered by CSE, ECE, CIVIL and ME Branches.
6. Any other item with the Permission of the Chair.

HOD, MBA

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Minutes of Meeting

At the outset, the Principal of D.N.R College of Engg. &Tech. expressed his gratitude to the University Nominee and other Members of BOS and handed over the session to the Chairman of BOS.

1. **Welcome speech by the Chairperson.**

Resolution:

The BOS chairman welcomed the Members of the Meeting. He briefed them about structure and pattern of the course. The chairman of BOS placed the Agenda for the deliberation of the members. The following deliberations were made as per the items of Circular Agenda.

2. **Approval the proposed DR – 24 III B.Tech I Semester Subject: Entrepreneurship Development & Venture Creation (Open Elective – 1) Course Code: BT24HS3101 and Syllabus, offered by CSE, ECE, EEE, CIVIL and ME Branches. (Annexure – I)**

Suggestion: Discussions made to finalize the proposed DR – 24 III B.Tech I Semester Subject Entrepreneurship Development & Venture Creation (Open Elective – 1) Course Code: BT24HS3101 and Syllabus, offered by CSE, ECE, EEE, CIVIL and ME Branches to implement.

Prof. P. Uma maheshware Devi, University Nominee suggested to introduce Mini Project on the EDVC subject along with regular class teaching.

Resolution: BOS members resolved to implement the proposed DR – 24 III B.Tech I Semester Subject Entrepreneurship Development & Venture Creation(Open Elective – 1) Course Code: BT24HS3101 and Syllabus, offered by CSE, ECE, EEE, CIVIL and ME Branches from the AY: 2026-2027 onwards.

3. **Approve the proposed DR – 24 III B.Tech I Semester Subject: Entrepreneurship (Open Elective – 1) Course Code: BT24HS3102 and Syllabus, offered by Mechanical Engineering Branch. (Annexure – II)**

Suggestion: Discussion held on DR – 24 III B.Tech I Semester Subject Entrepreneurship (Open Elective – 1) Course Code: BT24HS3102 and Syllabus, offered by Mechanical Engineering Branch to implement.

Prof. D. Surya Chandra Rao Subject expert, proposed to implement syllabus deviation in III B.Tech Open Elective Subject.

Resolution: Since the paper introduced from this academic year onwards, as per the guideline of the JNTUK, no deviation is possible. It is resolved and approved the Entrepreneurship Syllabus prescribed by the DNRCET.

4. a) Approve the proposed DR – 24 III B.Tech II Semester Subject Research Methodology & IPR Course Code: BT24HS3201 and Syllabus, offered by ECE and EEE Branches. (Annexure – III)

Suggestion: Discussions made on the III B.Tech II Sem, Research methodology & IPR Subject.

Resolution: Unanimously resolved to implement the Syllabus Prescribed by the DNRCET.

b) Ratification of Course Objectives and Course Outcomes of B.Tech III Year, I & II Semesters Entrepreneurship Development and Venture Creation, Entrepreneurship and Research Methodology & IPR Subjects.

Suggestion: Discussion was held on the course objectives as well as course outcomes of the subjects.

Resolution: Resolved the course objectives and course outcomes of B.Tech III Year, I & II Semesters Subjects to adopt.

5.a) Approve the proposed DR – 25 M.Tech II Year I Semester Subject Research Methodology & IPR Course Code: D2530000 and Syllabus, offered by CSE, ECE, CIVIL and ME Branches. (Annexure – IV)

Suggestion: Discussions made on the M.Tech II Year I Sem, Research Methodology & IPR Subject.

Resolution: Unanimously resolved to implement the Syllabus Prescribed by the DNRCET.

b) Ratification of Course Objectives and Course Outcomes of M.Tech II Year, I Semester Research Methodology & IPR Subject.

Suggestion: Discussion was held on the course objectives as well as course outcomes of the subject.

Resolution: Resolved the course objectives and course outcomes of M.Tech II Year, I Semester Subject to adopt.

6. No further item to discuss proposed by BOS Members

The chairman of BOS concluded the meeting by summarizing all the agenda points and resolutions.

HOD and Chairman, BOS

Prof. P. Uma Maheswari Devi
University Nominee
Adikavi Nannaya University

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Common to CSE,ECE,EEE,CE,ME,CSE(AIML)&CSE(AIDS) Branches

III Year-I Semester	Course Code: BT24HS3101	L	T	P	C
		3	0	0	3
ENTRPRENEURSHIP DEVELOPMENT&VENTURE CREATION (Open Elective - 1)					

Course Objectives:

By the end of the program, students will be/able to:

1. Inspired; develop entrepreneurial mind-set and attributes; entrepreneurial skill sets for venture creation and entrepreneurial leadership
2. Apply process of problem-opportunity identification and feasibility assessment through developing a macro perspective of the real market, industries, domains and customers while using design thinking principles to refine and pivot their venture idea.
3. Analyze Customer and Market segmentation, estimate Market size, develop and validate Customer Persona.
4. Initiate Solution design, Prototype for Proof of Concept. Understand MVP development and validation techniques to determine Product-Market fit
5. Craft initial Business and Revenue models, financial planning and pricing strategy for profitability and financial feasibility of a venture. Understand relevance and viability of informal and formal funding with respect to different business models.
6. UnderstandanddevelopGo-to-Marketstrategieswithafocusondigitalmarketingchannels.

Course Outcomes

At the end of the course, students will be able to

1. Develop an entrepreneurial mindset and appreciate the concepts of entrepreneurship, cultivate essential attributes to become an entrepreneur or Entrepreneur and demonstrate skills such as problem solving, team building, creativity and leadership
2. Comprehendtheprocessofproblem-opportunityidentificationthroughdesignthinking, identify market potential and customers while developing a compelling value proposition solution
3. Analyse and refine business models to ensure sustainability and profitability
4. Build Proto type for Proof of Concept and validate MVP of their practice venture idea
5. Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture
6. Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders

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Mapping of Course Outcomes with Program Outcomes and Program SpecificOutcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	-	-	2	1	2	3	2	1	3	-	-
CO2	1	3	2	1	-	1	1	-	2	2	-	2	-	-
CO3	1	3	3	-	-	2	2	-	1	1	3	2	-	-
CO4	2	2	3	3	3	-	-	-	2	1	1	1	2	3
CO5	1	2	2	1	-	2	1	-	1	1	3	2	-	1
CO6	-	1	1	-	-	1	-	-	2	3	2	2	-	-
Avg	1	2	2	1	3	2	1	2	2	2	2	2	2	2

Course Content
Twelve learning modules organized over 14weeks in the following logical flow of units

Unit I: Entrepreneurship Fundamentals & Context

Meaning and concept, attributes and mindset of entrepreneurial and entrepreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skillets, attributes and networks while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity.

Unit II: Problem &Customer Identification

Understanding and analyzing the macro-Problem and Industry perspective, technological, socio economic and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problem using Design thinking principles. Analyzing problem and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas. Competition and Industry trends mapping and assessing initial opportunity.

Core Teaching Tool: Several types of activities including Class, game, Gen AI, 'Get out of the Building' And Venture Activity.

Unit III: Solution design, Prototyping & Opportunity Assessment and Sizing

Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Understanding prototyping and MVP. Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-of-concept and iterate on the prototype. Assess relative market position via competition analysis, sizing the market and assess scope and potential scale of the opportunity.
Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

Unit IV: Business & Financial Model, Go-to-Market Plan

Introduction to Business model and types, Lean approach,9block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach.

Business planning: components of Business plan- Sales plan, People plan and financial plan. Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analyzing financial performance.

Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy.

Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options.

Core Teaching Tool: Founder Case Studies–Sama and Securely Share; Class activity and discussions; Venture Activities

Unit V: Scale Outlook and Venture Pitch readiness

Understand and identify potential and aspiration for scale visa is your venture idea. Persuasive Story telling and its key components. Build an Investor ready pitch deck.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

Suggested Reading:

- RobertD.Hisrich,MichaelP.Peters,DeanA.Shepherd,SabyasachiSinha(2020). Entrepreneurship, McGrawHill, 11th Edition.
- Ries,E.(2011).TheLeanStartup:HowToday'sEntrepreneursUseContinuous Innovation to Create Radically Successful Businesses. Crown Business
- Osterwalder,A.,&Pigneur,Y.(2010).BusinessModelGeneration:AHandbookfor Visionaries, Game Changers, and Challengers. John Wiley & Sons.
- SimonSinek(2011)StartwithWhy,PenguinBookslimited
- BrownTim(2019)ChangebyDesignRevised&Updated:HowDesignThinking Transforms Organizations and Inspires Innovation, Harper Business
- NamitaThapar(2022)TheDolphinandtheShark:StoriesonEntrepreneurship,Penguin Books Limited
- SarasD.Sarasvathy,(2008)Effectuation:ElementsofEntrepreneurialExpertise,Elgar Publishing Ltd

Web Resources

- Learningresource-Ignite5.0CourseWadhwaniplatform(Includes200+componentsof customcreatedmodularcontent +500+componentsofthemostrelevantcuratedcontent)

HOD, MBA

SupportedEvaluation

Evaluationisdesignedtomeasureindividualandgroupwork.

OngoingAssessmentcomponents:

Enableremedialactionintheclassroombythefacultyandadditionalassistancebyai Tutor.

1. ThreeSystem-assessed,randomizedshortanswertypeassessmentsduringthe14weekstoassess individuallearner'sunderstandingandinternalizationofcoreconcepts-includesquestionsof
   a. multiplechoice
   b. fillinthe blanks
   c. matchthe options
   d. 'trueandfalse'

2. Two interim assessments of the Venture application milestones submission via the platform (teamwork). Simple and easy way for the faculty to assess the milestones and the team's work.

FinalAssessmentcomponent:

Assessmentthatprovidesanoverallassessmentoflearningandapplication.Evaluatedbyfaculty against an assessment rubric.

1. Final Venture Idea Pitch submission and presentation (team application work) (Students build a Practice Venture with Venture activities progressively leading to the development of a pitch presentationdeckwithvariousmilestonestomarkadvancement.Itisreflectionoftheirlearningaswell as a practical application of concepts to identifying, building and validating a venture idea.)

Additionalevaluationmechanisms:InAdditiontothis,mandatoryindividualexercisesare embedded in the course, faculty can use those for any additional evaluation that they mayneedtoscorethestudents

TeachingLearningProcess(Pedagogy),Tools,StudentExperience

I. **ProgramFacilitationandLearningTools**
   a. **DynamicFacilitation**:Ledbyexpertfacilitatorsutilizingacomprehensivesuiteofmicro-learning materials.
      - Audio-visualcontent,writtenmaterials,andinfographics.
      - Real-worldexamplesenhancingthelearningexperience.

   b. **InteractiveLearning**:Engagingcasestudies,games,simulations,andkinesthetic classroom activities.
      - FocusoncurrentIndianstartupstoprovidecontext-relevantlearning.
      - AimedatGenZlearnersforinformative,immersiveandauthenticlearning experience.

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II. VentureDevelopmentActivities

a. **InnovationandStrategicApplication**:Fosteringinnovativethinkingandstrategic problem-solving.
   - StudentscreateVentureIdeasPitchandfeasibilityprototypesaddressingreal- world scalable problem-opportunities.

b. **PracticalExperience**:Combiningacademicrigorwithpractical,hands-onentrepreneurial activities.
   - Functionsasanincubatorforaspiringentrepreneursandintrapreneurialleaders.

III. Anytime,anywhereGenAISupportedDigitalLearning

a. **Multi-ModalDigitalTools**:Arangeofdigitalresourcesavailableforstudents.
   - Comprehensiveconceptandreferenceguidesandhandbooks.
   - AITutorandAIAssistanttoenhancelearningandapplicationviadevelopmentof a feasible Venture Idea Pitch.

IV. Ongoing Inspiration and Learning with Practitioners

1. **Seminars, Workshops and Masterclasses**: Access to live talks and specialized classes running through each semester.
   - Founderstories,includingsocial entrepreneurs.
   - TechnologyTrendandIndustryOpportunitysessions
   - InnovationandIPRManagementsession
   - StartupEcosystemoverview

V. Certification and CommunityEngagement

a. **RecognitionandNetworking**:Opportunitiesavailableuponcoursecompletion.
   - VentureIdeasPitchDeckevaluationforcertificationbyorganizationslikethe Wadhwani Foundation.
   - Accesstoaglobalcommunityfosteringconnectionsandsupportforcompetitions. Groupmentoringandindividualmentorshipsessionstofurtherguidestudents

Jayakethi Rao
HOD, MBA

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DEPARTMENT OF BASIC SCIENCES & HUMANITIES

Year/Semester	III B.Tech- I & II Semesters	L	T	P	C
Regulation Year	DR-24	0	1	2	2
Name of the Subject	**SOFT SKILLS- *BT24BS3101,BT24BS3201***				
Branch	**EEE, CSE, AI&DS & AI&ML**				

Course Objectives:

- To equip the students with the skills to effectively communicate in English
- To train the students in interview skills, group discussions and presentation skills
- To motivate the students to develop confidence
- To enhance the students' interpersonal skills
- To improve the students' writing skills

Course Outcomes:

COs	Statements	Blooms Level
CO1	**Demonstrate** analytical thinking and active listening skills to make informed decisions and effectively solve real-world problems.	K5
CO2	**Implement** self-management strategies to develop resilience, and goal-oriented behavior in academic and professional environments.	K3
CO3	**Use** standard grammar structures accurately in both speaking and writing to ensure clear and effective communication in global contexts.	K3
CO4	**Develop** job-oriented communication and presentation skills that align with current industry standards and digital tools.	K6
CO5	**Build** and sustain effective interpersonal relationships through empathy, teamwork in diverse professional settings.	K4
CO6	**Integrate** critical thinking, workplace readiness, and social intelligence to succeed in today's competitive job market.	K6

UNIT – I: Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing PositiveAttitude, Perception.
Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT – II: Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT – III: Standard Operation Methods: Basic Grammars, Tenses, Prepositions, Pronunciation, Letter Writing; Note Making, Note Taking, Minutes Preparation, Email & Letter Writing

UNIT-IV: Job-Oriented Skills: Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

UNIT-V: Interpersonal relationships: Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships, Accommodating different styles, Consequences of interpersonal relationships

Text books:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

Reference books:

1. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.
2. Raman, Meenakshi& Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

E-resources:
https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01

29/11/24

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Annexure –B

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Model Practical Question Paper
INTERNAL PRACTICAL EXAMINATIONS

Name of the Lab & Code: **SOFT SKILLS-** ***BT24BS3101,BT24BS3201***

Class: III B. Tech I & II Semesters Time: 3 hours Max Marks: 30

I Answer Any ONE of the Following questions. Each question carries 5M

A. Write a short note on Shaping Young Mind by Azim Premji

(Or)

B. Write a easy on self management skills

(Or)

C. Answer the following questions each question carries ½ mark

1. Which of the following is the *best* way to manage anger?
   a) Shouting to release emotions
   b) Ignoring the situation completely
   c) Taking deep breaths and calming down before responding
   d) Blaming others for the problem
2. Which activity is most effective for reducing stress?
   a) Overworking to avoid thinking about stress
   b) Regular exercise and relaxation techniques
   c) Ignoring signs of fatigue
   d) Arguing with coworkers
3. The first step in managing time effectively is to:
   a) Avoid making a schedule
   b) Wait until deadlines are near
   c) Do tasks randomly
   d) Identify priorities and set goals
4. The *Yellow Hat* in the Six Thinking Hats method represents:
   a) Caution and critical thinking
   b) Feelings and emotions
   c) Optimism and positive thinking
   d) Creativity and new ideas
5. The *Black Hat* focuses on:
   a) Identifying risks and problems
   b) Exploring creative ideas
   c) Expressing emotions
   d) Generating optimism
6. A successful team is built on:
   a) Competition and secrecy
   b) Trust, communication, and cooperation
   c) Individual success only
   d) Conflict and misunderstanding
7. A good leader should primarily:
   a) Command and control without listening
   b) Avoid responsibility
   c) Work alone to avoid mistakes
   d) Inspire and guide the team toward goals
8. Which of the following is a *physical symptom* of stress?
   a) Increased concentration
   b) Headaches and muscle tension
   c) Calm breathing
   d) Happiness

9. Using a *to-do list* helps a person:
   a) Organize and track daily activities
   b) Forget important tasks
   c) Waste more time
   d) Avoid planning altogether

10. Which of the following best describes a *team player*?
    a) Someone who focuses only on personal goals
    b) Someone who avoids responsibility
    c) Someone who supports and collaborates with others
    d) Someone who dominates team discussions

II ACTIVITY (Oral Presentation – Group/Individual)	**5M**
Group discussion/Debate/Role play/JAM on given topic	
III Viva-Voce	**5M**
IV. Day to Day & Record	**15M**

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Annexure –B

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INTERNAL EXAMINATIONS

Name of the Lab & Code: **SOFT SKILLS-** ***BT24BS3101, BT24BS3201***
Class: **III B. Tech I Semester** Time: 3 hours Max Marks: **30**

Scheme of Evaluation

I Answer Any ONE of the Following questions. Each question carries 5M
(For 1&2 questions)

- Introduction **(1 Mark)**
- Detailed explanation of the key concept **(2 Marks)**
- Importance and Application **(1 Mark)**
- Conclusion **(1 Mark)**

3. Question Key

1. C 2. B 3.D 4.C 5.A 6.B 7.D 8.B 9.A 10.C

II ACTIVITY (Oral Presentation – Group/Individual) 5M

- Content **(3 Marks)**
- Fluency **(1 Mark)**
- Body Language **(1 Mark)**

III Viva-Voce 5M

- Content relevance **(3 Mark)**
- Fluency & Body Language **(2 Marks**

IV. Day to Day & Record 15M

- Observation & Record **(5 Marks)**
- Assignments (Oral/written on each unit) **(10 Marks)**

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Annexure –B

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EXTERNAL EXAMINATIONS

Name of the Lab & Code: **SOFT SKILLS-** ***BT24BS3101, BT24BS3201***

Class: III B. Tech I Semester Time: 3 hours Max Marks: 70

I Answer Any THREE of the Following questions. Each question carries 30M

1. How does self-analysis help in developing a positive attitude and improving one's perception towards life and work? Discuss with relevant examples.
2. Discuss how good leadership qualities contribute to successful team building and achievement of organizational goals.
3. Write an email to your college principal requesting permission to organize a cultural event on campus. Mention the purpose, date, and benefits of the event.

II ACTIVITY (Oral Presentation – Group/Individual) 20M

Group discussion/Debate/Role play/JAM on given topic

III Viva-Voce 20M

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Annexure –B

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Model Practical Question Paper
EXTERNAL PRACTICAL EXAMINATIONS

Name of the Lab & Code: **SOFT SKILLS-** ***BT24BS3101, BT24BS3201***
Class: **III B. Tech I & II Semester** Time: 3 hours Max Marks: **70**

Scheme of Evaluation

I Answer Any THREE of the Following questions. Each question carries 10 Marks 3X10=30M

- Introduction **(2 Mark)**
- Detailed explanation of the key concept **(4 Marks)**
- Importance and Application **(3 Mark)**
- Conclusion **(1 Mark)**

II ACTIVITY (Oral Presentation – Group/Individual) **20 M**

- Content **(10 Marks)**
- Fluency **(5 Marks)**
- Body Language **(5 Marks)**

III Viva-Voce **20 M**

- Content relevance **(10 Marks)**
- Fluency & Body Language **(10 Marks)**

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Annexure –C

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY
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III B Tech I & II Semester

Course Name: **SOFT SKILLS-** ***BT24BS3101, BT24BS3201***

COURSE OUT COMES

After completion of this course the student will be able to learn

COs	Statements	Blooms Level
CO1	**Demonstrate** analytical thinking and active listening skills to make informed decisions and effectively solve real-world problems.	K5
CO2	**Implement** self-management strategies to develop resilience, and goal-oriented behavior in academic and professional environments.	K3
CO3	**Use** standard grammar structures accurately in both speaking and writing to ensure clear and effective communication in global contexts.	K3
CO4	**Develop** job-oriented communication and presentation skills that align with current industry standards and digital tools.	K6
CO5	**Build** and sustain effective interpersonal relationships through empathy, teamwork in diverse professional settings.	K4
CO6	**Integrate** critical thinking, workplace readiness, and social intelligence to succeed in today's competitive job market.	K6

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	-	-	-	-	-	-	-	2	2	3	-	2
CO 2	-	-	-	-	-	-	-	2	3	2	-	3
CO 3	-	-	-	-	-	-	-	2	2	3	-	2
CO 4	-	-	-	-	-	-	-	2	3	3	-	2
CO 5	-	-	-	-	-	-	-	2	3	2	-	2
CO 6	-	-	-	-	-	-	-	3	3	3	-	3
Overall	-	-	-	-	-	-	-	**2.1**	**2.6**	**2.6**	-	**2.3**

MAPPING LEVELS:

Correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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Annexure –D

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Department of Basic Sciences and Humanities

Course Name: SOFT SKILLS- ***BT24BS3101, BT24BS3201***

The following books were approved as the primary textbooks for Soft Skills Laboratory

Text books:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

Reference books:

1. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.
2. Raman, Meenakshi& Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

E-resources:

https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01

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IIIYearII Semester	TECHNICALPAPERWRITING&IPR	L	T	P	C
		2	0	0	-

Course Objective : The course will explain the basic related to writing the technical reports
andunderstandingtheconceptsrelatedtoformattingandstructuringthereport.Thiswillhelp students to comprehend the concept of proofreading, proposals and practice

Course Outcomes

COs	Statements	Blooms Level
CO1	*Apply* basic principles of technical writing to plan, structure, and write clear technical reports and minutes of meetings.	K3
CO2	*Draft* and *edit* technical reports using proper design, grammar, plain English, and effective illustrations.	K6
CO3	*Prepare* accurate summaries and *present* final technical reports and proposals using effective written and verbal skills.	K3
CO4	*Use* word processing tools to format, edit, review, protect, and manage technical documents efficiently.	K3
CO5	*Understand* the concepts, processes, and international aspects of intellectual property and patent development.	K2
CO6	*Develop* clear, well-structured technical documents by applying effective writing, editing, presentation, word-processing, and intellectual property principles.	K6

Unit I: Introduction: An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing. Planning and Structuring: Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing.

Unit II: Drafting report and design issues: The use of drafts, Illustrations and graphics.Final edits: Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, and Ambiguity.

Unit III: Proof reading and summaries: Proofreading, summaries, Activities on summaries. Presenting final reports: Printed presentation, Verbal presentation skills, Introduction to proposals and practice.

Unit IV: Using word processor: Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes , Working with Footnotes and Endnotes, Inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros,

Unit V:Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property

TextBooks:

1. Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
2. WilliamS.PfeifferandKayeA.Adkins,"TechnicalCommunication:APractical Approach", Pearson.
3. Ramappa,T.,"IntellectualPropertyRightsUnderWTO",2nd Ed.,SChand,2015.

ReferenceBooks:

1. AdrianWallwork,EnglishforWritingResearchPapers,SpringerNewYork Dordrecht Heidelberg London, 2011.
2. DayR,HowtoWriteandPublishaScientificPaper,CambridgeUniversity Press(2006)

E-resources:

1. https://www.udemy.com/course/reportwriting/
2. https://www.udemy.com/course/professional-business-english-and-technical-report-writing/
3. https://www.udemy.com/course/betterbusinesswriting/

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III B Tech II Semester

Course Name: **Technical Paper Writing and IPR**

COURSE OUT COMES

After completion of this course the student will be able to learn

COs	Statements	Blooms Level
CO1	*Apply* basic principles of technical writing to plan, structure, and write clear technical reports and minutes of meetings.	K3
CO2	*Draft* and *edit* technical reports using proper design, grammar, plain English, and effective illustrations.	K6
CO3	*Prepare* accurate summaries and *present* final technical reports and proposals using effective written and verbal skills.	K3
CO4	*Use* word processing tools to format, edit, review, protect, and manage technical documents efficiently.	K3
CO5	*Understand* the concepts, processes, and international aspects of intellectual property and patent development.	K2
CO6	*Develop* clear, well-structured technical documents by applying effective writing, editing, presentation, word-processing, and intellectual property principles.	K6

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	–	–	–	–	–	–	–	–	3	–	1
CO 2	2	–	–	–	1	–	–	–	–	3	–	1
CO 3	–	–	–	–	–	–	–	–	2	3	–	1
CO 4	–	–	–	–	3	–	–	–	–	2	–	2
CO 5	–	–	–	–	–	–	–	3	–	–	2	2
CO 6	2	–	–	–	2	–	–	2	2	3	–	2
Overall	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**2.5**		**2.8**	**1**	**1.5**

MAPPING LEVELS:

Correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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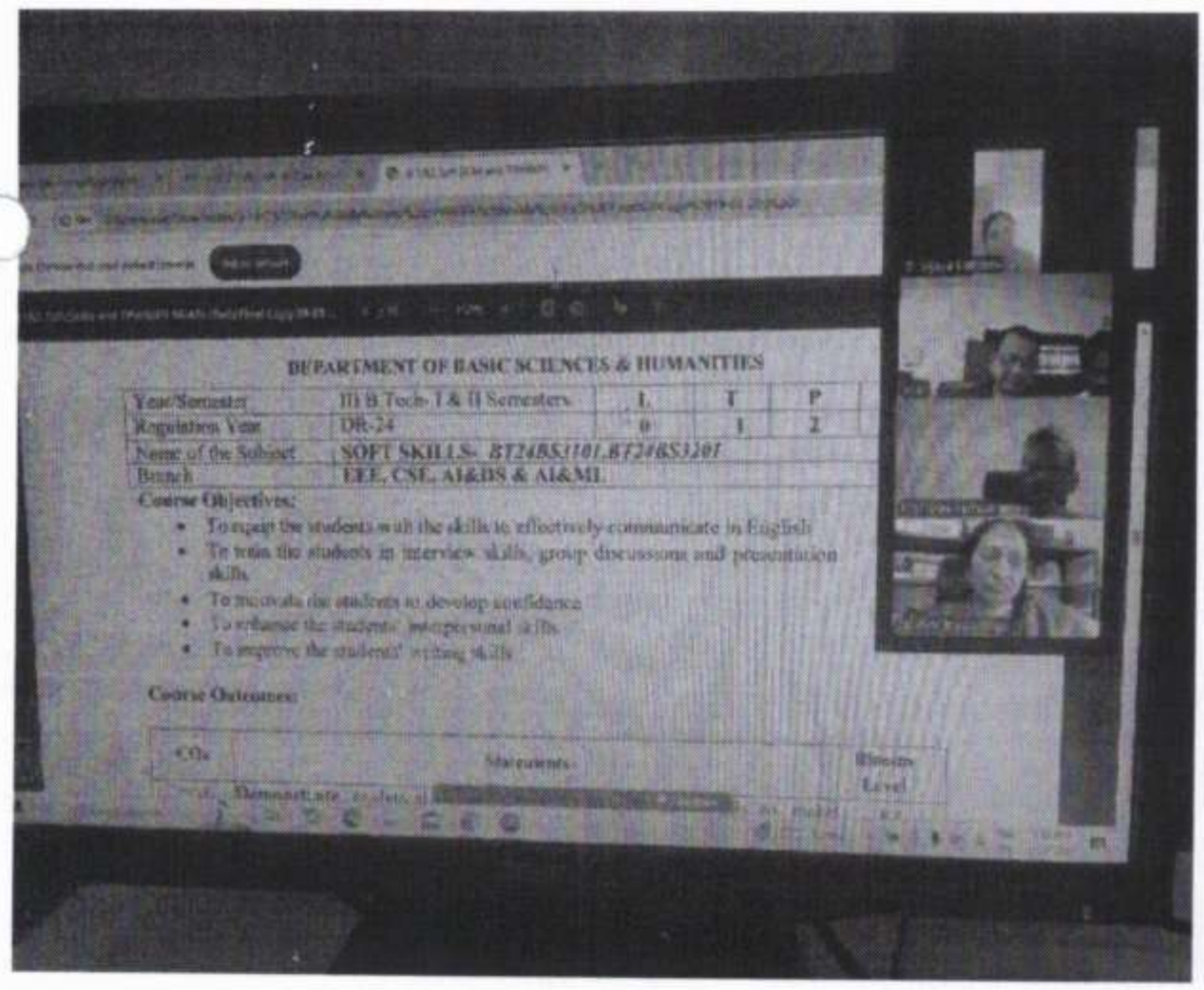
SOFTSKILLS AND TECHNICAL PAPER WRITING AND COMMUNITY SERVICES
PROJECT
I II B TECH BOS MEETING SCREEN SHORTS


DEPARTMENT OF BASIC SCIENCES & HUMANITIES

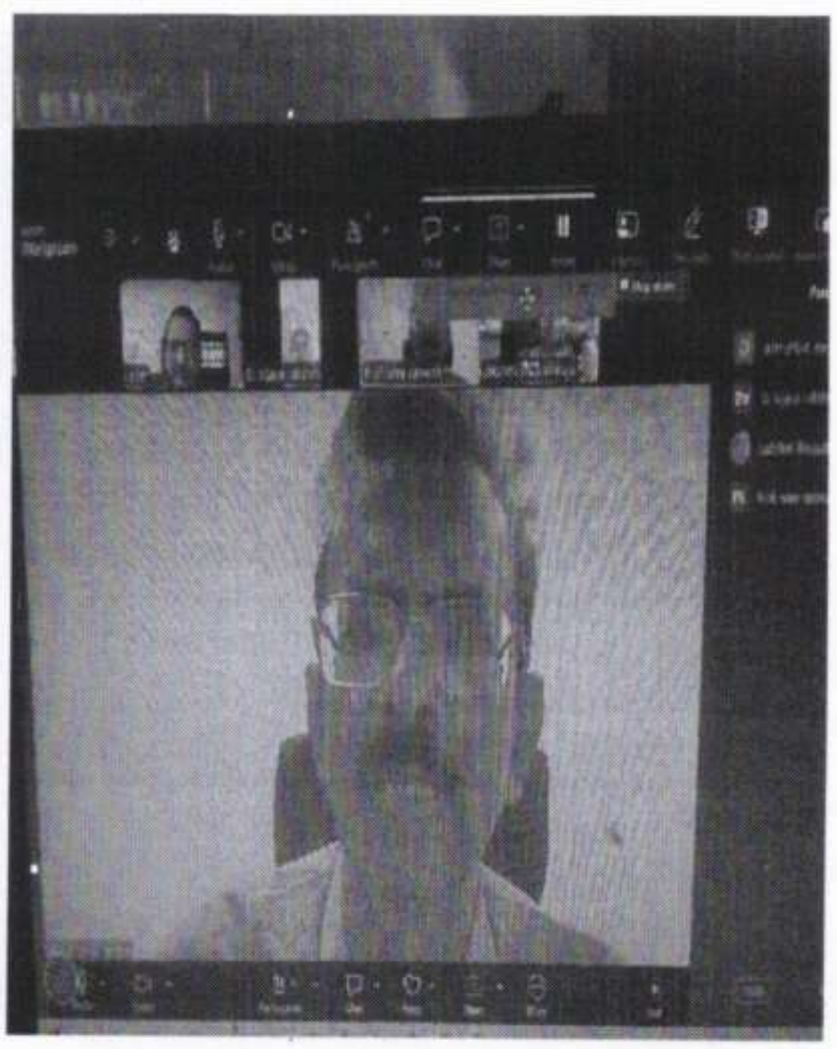
Year/Semester	III B.Tech- I & II Semesters	L	T	P
Regulation Year	DR-24	0	1	2
Name of the Subject	SOFT SKILLS- *BT24BS3101,BT24BS3201*			
Branch	EEE, CSE, AI&DS & AI&ML			

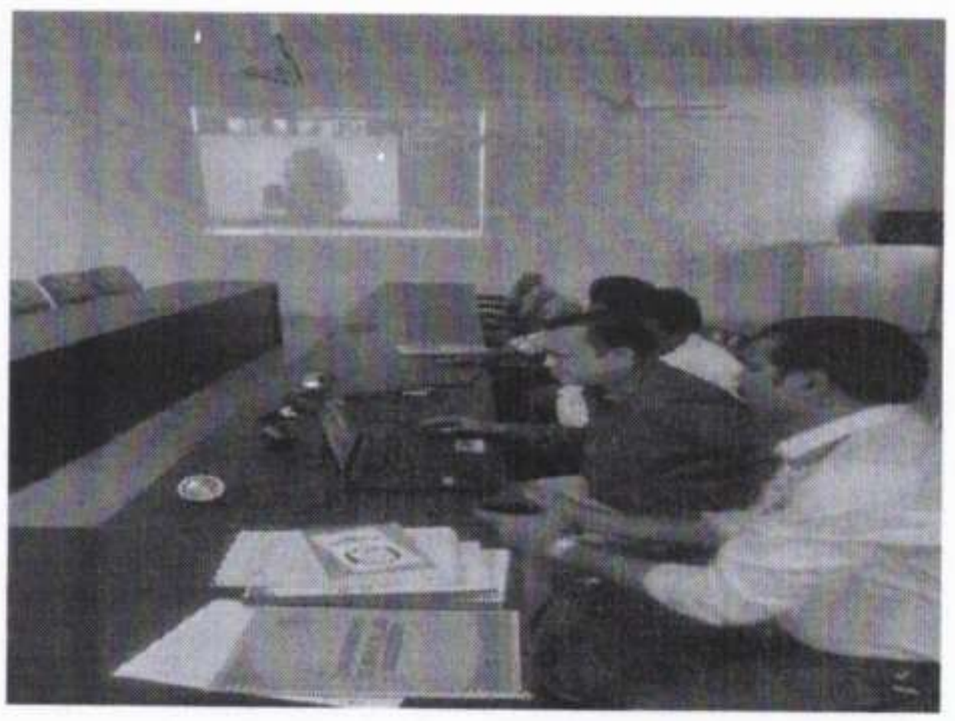
Course Objectives:

- To expose the students with the skills to effectively communicate in English
- To train the students in interview skills, group discussions and presentation skills
- To motivate the students to develop confidence
- To enhance the students' interpersonal skills
- To improve the students' writing skills

Course Outcomes:

COs	Statements	Bloom's Level
	Demonstrate	





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H. T. No: | | | | | | | | | | | **DR24** Course Code: BT24ML3103

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech. I Semester Regular End Examinations (Model Question Paper)

OPERATING SYSTEMS

Time: 3hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer any one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	20 Marks		
			BTL	CO	M
1	a	What is an operating system? Give an Example	L1	CO1	2
	b	Describe the operating system functions?	L2	CO1	2
	c	List out any four system calls in OS?	L1	CO1	2
	d	Explain about state process model in OS	L2	CO2	2
	e	Explain different types of schedulers?	L2	CO2	2
	f	Distinguish between Segmentation and paging	L2	CO3	2
	g	Name the various Page replacement algorithms?	L1	CO4	2
	h	Define a file and List the various File Attributes	L1	CO5	2
	i	List the various Disk-Scheduling Algorithms	L1	CO5	2
	j	What are goals of system protection?	L1	CO5	2
		PART – B (All Questions Carry Equal Marks)	**50 Marks**		
		UNIT – I	10 Marks		
2	a	Explain the various objectives and functions of Operating systems?	L2	CO1	[5M]
	b	What is different types of operating system? Explain them in detail	L2	CO1	[5M]
		OR			
3	a	Explain structure of operating system with a neat diagram	L2	CO1	[5M]
	b	Explain in detail about the types of system calls in OS?	L2	CO1	[5M]
		UNIT – II	10 Marks		
4	a	Draw and explain five state process model	L2	CO2	[5M]
	b	Explain about various CPU scheduling criteria in OS	L2	CO2	[5M]
		OR			
5	a	Explain Round Robin scheduling algorithm with example.	L2	CO2	[5M]
	b	Explain about Readers and writers Problem with an example	L2	CO3	[5M]
		UNIT – III	10 Marks		
6	a	Explain about first fit, best fit, worst fit, next fit algorithms?	L2	CO3	[5M]
	b	Distinguish between the paging and segmentation?	L2	CO3	[5M]
		OR			
7	a	Explain the LRU and Optimal page replacement algorithms	L2	CO4	[5M]
	b	What is thrashing and explain the methods to avoid thrashing?	L2	CO4	[5M]

		UNIT – IV	10 Marks		
8	a	Explain about necessary conditions of deadlock	L2	CO4	[5M]
	b	Explain deadlock Avoidance in detail	L2	CO4	[5M]
		OR			
9	a	Explain about single-level, two-level directory structure?	L2	CO5	[5M]
	b	Briefly discuss various Disk-scheduling algorithms.	L2	CO5	[5M]
		UNIT – V	10 Marks		
10	a	Explain goals and principles of system protection in detail.	L2	CO5	[5M]
	b	Discuss about the system and network threats in OS	L4	CO5	[5M]
		OR			
11	a	What are the features of fire wall? How fire wall protects the system	L2	CO5	[5M]
	b	Summarize Computer security classification.	L2	CO5	[5M]

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

H. T. No: | | | | | | | | | | |

DR24

Course Code: BT24ML3101

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III B. Tech. I Semester Regular End Examinations (Model Question Paper)

INFORMATION RETRIEVAL SYSTEMS

CSE(AIML)

Time: 3hours **Max.Marks:70 M**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer any one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	20 Marks		
			BTL	CO	M
1	a	Define Information Retrieval (IR) system.	L1	CO1	2M
	b	What is meant by domain analysis in IR systems?	L2	CO1	2M
	c	What is an inverted file?	L1	CO2	2M
	d	Define signature files.	L1	CO2	2M
	e	What is a PAT Tree?	L1	CO3	2M
	f	Define stop lists.	L1	CO3	2M
	g	What is stemming?	L1	CO4	2M
	h	Define thesaurus in Information Retrieval.	L1	CO5	2M
	i	What is string searching?	L1	CO6	2M
	j	Name any two string searching algorithms.	L1	CO6	2M
		PART – B (All Questions Carry Equal Marks)	**50 Marks**		
		UNIT – I	10 Marks		
2	a	Explain the components and functions of an Information Retrieval system.	L2	CO1	[5M]
	b	Compare Information Retrieval systems with other types of Information Systems.	L4	CO1	[5M]
		OR			
3	a	Discuss different IR system evaluation measures.	L2	CO1	[5M]
	b	Explain basic data structures and algorithms used in Information Retrieval.	L2	CO1	[5M]
		UNIT – II	10 Marks		
4	a	Explain the structure and construction of inverted files.	L2	CO2	[5M]
	b	Describe the process of building an inverted file using a sorted array.	L3	CO2	[5M]
		OR			
5	a	Explain signature files and their role in Information Retrieval systems.	L2	CO2	[5M]
	b	Discuss compression techniques and vertical and horizontal partitioning in signature files.	L4	CO3	[5M]
		UNIT – III	10 Marks		
6	a	Explain the structure of PAT Trees.	L2	CO3	[5M]
	b	Describe algorithms used on PAT Trees.	L3	CO3	[5M]
		OR			
7	a	Explain building PAT Trees as PATRICIA Trees and their array representation.	L3	CO3	[5M]
	b	Discuss the importance of lexical analysis and stop lists in IR systems.	L4	CO3	[5M]
		UNIT – IV	10 Marks		
8	a	Explain different types of stemming algorithms.	L2	CO4	[5M]
	b	Discuss experimental evaluation of stemming algorithms.	L4	CO4	[5M]
		OR			
9	a	Explain how stemming helps in compressing inverted files.	L4	CO4	[5M]
	b	Describe thesaurus construction from texts and merging of existing thesauri.	L3	CO5	[5M]

		UNIT – V	10 Marks		
10	a	Explain the Naive string searching algorithm with an example.	L2	CO6	[5M]
	b	Describe the Knuth-Morris-Pratt (KMP) algorithm.	L3	CO5	[5M]
		OR			
11	a	Explain the Boyer-Moore algorithm and its advantages.	L4	CO5	[5M]
	b	Discuss the Karp-Rabin and Shift-Or algorithms.	L2	CO6	[5M]

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

H. T. No: | | | | | | | | | | | **DR24** Course Code: BT24ML3203

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

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III B. Tech. II Semester Regular End Examinations (Model Question Paper)

DATA VISUALIZATION

CSE(AIML)

Time: 3hours **Max.Marks:70M**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer any one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	20 Marks		
			BTL	CO	M
1	a	Define data visualization?	L1	CO1	2 M
	b	Explain the role of Gestalt principles in visual perception?	L2	CO1	2 M
	c	What is visual mapping?	L1	CO2	2 M
	d	Define visual analytics?	L1	CO2	2 M
	e	Explain misleading visualization with an example.?	L2	CO3	2 M
	f	List any two interaction techniques used in visualization?	L2	CO3	2 M
	g	What is metaphorical visualization?	L1	CO4	2 M
	h	Define graph visualization?	L1	CO5	2 M
	i	What is volumetric data visualization?	L1	CO5	2 M
	j	What is collaborative visualization?	L1	CO6	2 M
		PART – B (All Questions Carry Equal Marks)	**50 Marks**		
		UNIT – I	10 Marks		
2	a	Explain the history and evolution of visualization?	L2	CO1	[5M]
	b	Describe the relationship between visualization and other fields such as HCI and data mining?	L2	CO1	[5M]
		OR			
3	a	Explain the visualization process with a neat diagram?	L3	CO1	[5M]
	b	Discuss Gestalt principles and their role in visual perception?	L4	CO1	[5M]
		UNIT – II	10 Marks		
4	a	Explain the visualization reference model in detail?	L2	CO2	[5M]
	b	Describe different techniques used in creating visual representations?	L2	CO2	[5M]
		OR			
5	a	Explain the steps involved in designing visualization applications?	L3	CO2	[5M]
	b	Analyze the role of visual analytics in decision-making?	L4	CO2	[5M]
		UNIT – III	10 Marks		
6	a	Classify different types of visualization systems?	L2	CO3	[5M]
	b	Explain visualization techniques for one-dimensional and two-dimensional data?	L2	CO3	[5M]
		OR			
7	a	Describe visualization methods for multi-dimensional data?	L3	CO3	[5M]
	b	Explain visualization of text and text documents with examples.?	L4	CO3	[5M]

		UNIT – IV	10 Marks		
8	a	Explain visualization techniques for groups and clusters?	L2	CO4	[5M]
	b	Describe tree and graph visualization techniques?	L2	CO4	[5M]
		OR			
9	a	Explain network visualization with suitable example?	L3	CO4	[5M]
	b	Discuss visualization techniques used in software systems?	L4	CO5	[5M]
		UNIT – V	10 Marks		
10	a	Explain visualization techniques for volumetric data and vector fields?	L2	CO5	[5M]
	b	Describe visualization of processes and simulations?	L3	CO5	[5M]
		OR			
11	a	Explain GIS systems and geographic information visualization?	L3	CO6	[5M]
	b	Discuss evaluation of visualizations and recent trends in perception techniques?	L4	CO6	[5M]

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

H. T. No: | | | | | | | | | | |

DR24 Course Code: BT24ML3202

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

III B. Tech. II Semester Regular End Examinations (Model Question Paper)

DEEP LEARNING

CSE(AIML)

Time: 3hours **Max.Marks:70**

1. Answer all the questions form Section – A. Each question carries 2 Marks.
2. Answer any one question from each unit in section – B. Each question carries 10 Marks.

S. No.		PART – A (Answer All Questions	20 Marks		
			BTL	CO	M
1	a	Define a biological neuron and its main components.	L1	CO1	2
	b	What is linear separability in perceptron models?	L2	CO1	2
	c	What is a Multilayer Perceptron (MLP)?	L1	CO2	2
	d	Define regularization in neural networks.	L1	CO2	2
	e	What is Adam optimizer?	L1	CO3	2
	f	Define dropout in neural networks.	L1	CO3	2
	g	What is Back propagation Through Time (BPTT)?	L1	CO4	2
	h	Name any two CNN architectures.	L1	CO5	2
	i	What is a Variational Auto encoder (VAE)?	L1	CO5	2
	j	Mention any two applications of GPT.	L1	CO6	2
		PART – B (All Questions Carry Equal Marks)	**50 Marks**		
		UNIT – I	10 Marks		
2	a	Explain the McCulloch–Pitts neuron model and threshold logic with a diagram.	L2	CO1	[5M]
	b	Describe the Linear Perceptron model and its working mechanism.	L2	CO1	[5M]
		OR			
3	a	Explain the Perceptron Learning Algorithm with steps and example.	L3	CO1	[5M]
	b	Discuss the convergence theorem of the perceptron learning algorithm.	L4	CO1	[5M]
		UNIT – II	10 Marks		
4	a	Explain Gradient Descent and Backpropagation algorithms in detail.	L3	CO2	[5M]
	b	Describe Empirical Risk Minimization and its significance in neural networks.	L2	CO2	[5M]
		OR			
5	a	Explain auto encoders and their applications.	L2	CO2	[5M]
	b	Discuss the difficulties in training deep neural networks and greedy layer-wise training.	L4	CO2	[5M]
		UNIT – III	10 Marks		
6	a	Explain newer optimization algorithms: Adagrad, Adadelta, RMS Prop, Adam, and NAG.	L2	CO3	[5M]
	b	Describe second-order methods for training neural networks.	L3	CO3	[5M]

		OR			
7	a	Explain the saddle point problem in neural networks.	L4	CO3	[5M]
	b	Discuss regularization techniques: dropout, drop connect, and batch normalization.	L4	CO3	[5M]
		UNIT – IV	10 Marks		
8	a	Explain RNN architecture and Back propagation Through Time.	L2	CO4	[5M]
	b	Describe LSTM and GRU models with diagrams.	L2	CO4	[5M]
		OR			
9	a	Explain LeNet and AlexNet architectures and their features.	L3	CO5	[5M]
	b	Discuss RBMs, Gibbs Sampling, and gradient computation in RBMs.	L4	CO4	[5M]
		UNIT – V	10 Marks		
10	a	Explain the architecture and working of Variational Auto encoders.	L2	CO5	[5M]
	b	Describe Transformers and their advantages over RNNs.	L3	CO6	[5M]
		OR			
11	a	Explain GPT models and their applications in Vision, NLP, and Speech.	L3	CO5	[5M]
	b	Discuss the impact of transformers and generative models in modern AI.	L5	CO6	[5M]

Note: In Part – B, a long answer question may be split into two or three sub questions totaling ten marks or given as a single question worth of ten marks.

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

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DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

Date: 21-01-2026

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