



Date: 28/08/2024

Ref. No. Dfcoot/MP/2024/ 189

NOTICE

Subject: Constitution of Board of Studies as per Deemed University norms

The Board of Studies (BoS) of the Computer Science and Engineering is constituted by the competent authority, according to the Deemed University norms, for a period of Three Years, as follows.

BoS COMPUTER SCIENCE AND ENIGNEERING DEPARTMENT

S.No	Name	Designation/Affiliation	Mobile No
1.	Dr. Manish Dixit (Head of the Department)	Chairperson	9425117866
Two experts nominated by the Vice chancellor, MITS-DU			
1.	Dr. Deepak Singh Tomar	Professor and Head Department of CSE, MANIT, Bhopal	deepaktomar@manit.ac.in 98272-25851
2.	Dr. Sriparna Saha	Associate Professor Dept of CSE, IIT, Patna	sriparna.saha@gmail.com 88095-59190
All Professors of the Department			
1.	Dr. R.S. Jadon		9425122675
2.	Dr. R.K. Gupta		9406503201
3.	Dr. Anshu Chaturvedi		9425337699
Associate Professors of the Department (in order of seniority)			
1.	Not Available		
Assistant Professors of the Department (in order of seniority)			
1.	Prof. Khushboo Agarwal		9981181018
2.	Dr. Jaimala Jha		9907313413
3.	Prof. Mahesh Parmar		9977825839


(Dr. Manjaree Pandit)
28/8/2024

Dean
Faculty of Engineering & Technology



Agenda of the BoS Meeting

(BoS Meeting Scheduled to be held on 06th December 2024)

Instructions for preparing BoS Proceedings

(All information is to be uploaded on the webpage under suitable heading (such as Board of Studies) and separate links to be provided for each category mentioned below)

Minutes should have a summary/cover page mentioning all the significant changes made in the following format :

Courses where revision was carried out*							
(Course name)	Course Code	Year/Date of introduction	Year/Date of revision	Percentage of content added or replaced	Agenda Item No.	Page No.	Link of relevant documents/minutes

1.

New Courses added*					
(Course name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.	Link of relevant documents/minutes

* Separate page(s) for each of the above points; Agenda point wise minutes to be appended with each point and a separate link to be given in the appropriate column for each point

2. The BoS minutes along with the cover/summary page (under point number 1, above) must be uploaded on the departmental web page and link for the same must be shared with the office of the Dean, Faculty of Engg. & Technology.

3. Minutes should have footer with department/centre name, page number, and date of the meeting:
"Recommended in the Board of Studies Meeting of <department/centre name> held on <date>

4. Each page should be signed by all faculty, scanned and then submitted to the Dean, Faculty of Engg. & Techno

BoS Agenda Items

Item 1 To confirm the minutes of previous BoS meeting held in the month of September 2024



Minutes of the last BoS held on 11 September 2024 are confirmed by the house.

To review the scheme structure for the Batch admitted in 2024-25 academic session under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) structure

Item 2 The scheme for the batch admitted in 2024-25 academic session under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) structure, CSE was discussed and finalized.

The Scheme of CSE is enclosed in Annexure- 1

To review and finalize the syllabi of all courses of B. Tech. II Semester (for batch admitted in 2024-25) under the flexible curriculum along with their Cos

Item 3 The syllabi for all courses of B. Tech. II Semester (for batch admitted in 2024-25) along with their Cos, was discussed and finalized.

The Syllabi of CSE II semester is enclosed in Annexure- 2

To review and finalize the Experiment list/ Lab manual and Micro Project-II for all the Laboratory Courses to be offered in B. Tech. II Semester (for batch admitted in 2024-25)

Item 4 The Experiment list/ Lab manual and Micro Project-II for all the Laboratory Courses to be offered in B. Tech. II Semester (for batch admitted in 2024-25), was discussed and finalized.

For CSE II semester is enclosed in Annexure- 3

To review and finalize the syllabi of II semester PG Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) (M.E./M.Tech./MCA/MBA/MUP) along with their Course Outcomes (COs)

Item 5 The syllabi of II semester PG Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) M.Tech (CSE) were discussed and finalized
Enclosed in Annexure-8

To review and finalize the syllabus/module of Classified Novel Engaging Course to be offered in II semester of PG programme.

Item 6

Classified Novel Engaging Course	
1.	Artificial Intelligence & Neural Networks
2.	Data Science using Python

Item 7

Any other Matter

Ph.D. course work syllabus is passed in BoS



Present online
Dr. Deepak Singh Tomar
Professor MANIT, Bhopal

Present online
Dr. Sriparna Saha,
Associate Professor, IIT, Patna

Dr. R. K. Gupta
Professor, MITS-DU, Gwalior

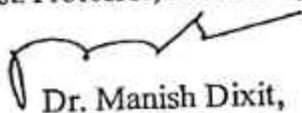

Dr. R. S. Jadon
Professor, MITS-DU, Gwalior

Dr. Anshu Chaturvedi
Professor, MITS-DU, Gwalior


Ms. Khushboo Agarwal
Asst. Professor, MITS-DU, Gwalior


Dr. Anamala Jha
Asst. Professor, MITS-DU, Gwalior


Mr. Mahesh Parmar
Asst. Professor, MITS-DU, Gwalior


Dr. Manish Dixit,
Professor & Head
Department of Computer Science and Engineering
MITS-DU, Gwalior



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Semester-Wise General Scheme Structure & Important Guidelines for Flexible Curriculum

(Batch admitted in Academic Session 2024-25 onwards)

Abbreviations Used

L	Lecture
T	Tutorial
P	Practical
HSMC	Humanities and Social Sciences including Management Courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
DC	Departmental Core
DE	Departmental Elective
SPC	Specialization Courses
OC	Open Category
DLC	Departmental Laboratory Courses
MOOC	Massive Open Online Course
MWS	Mandatory Workshop
SP	Semester Proficiency
SIP	Skill Internship Program
SLP	Self-learning Presentation
PDC	Professional Development Component
PBL	Project Based Learning
PC	Professional Certification
MAC	Mandatory Audit Course
NEC	Novel Engaging Course

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, WADGAON

(Deemed University)

(Declared Under Distinct Category by Ministry of Education, Government of India)

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Department of Computer Science and Engineering Scheme of Evaluation

B. Tech. I Semester (Computer Science and Engineering)

(for batch admitted in academic session 2024-25)

(for Batch quantified in Academic Session 2023-24)																				
No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Exam.	Duration of Major Exam.			
				Theory Block			Practical Block				L	T	P							
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation											
				Minor Evaluation I	Minor Evaluation II	Quiz/Assignment		Lab Work & Sessional												
1.	15241101	DC	Emerging Technologies in Computer Science	20	20	30	30			100	3	-	-	3	Face to Face	MCQ	2 Hrs			
2.	15241102	ESC	Computer Programming	20	20	30	30			100	2	-	-	2	Face to Face	MCQ	2 Hrs			
3.	15241103	DC	Digital Electronics	20	20	30	30			100	2	1	-	3	Face to Face	PP	2 Hrs			
4.	15241104	DC	Cyber World and Security Concern	20	20	30	30			100	2	1	-	3	Face to Face	MCQ	2 Hrs			
5.	15241105	BSC	Engineering Mathematics-I	20	20	30	30			100	3	-	-	3	Face to Face	PP	2 Hrs			
6.	15241106	DLC	Computer Programming Lab					70	30	100	-	-	2	1	Experimental	AO	-			
7.	15241107	DLC	Digital Electronics Lab					70	30	100	-	-	2	1	Experimental	AO	-			
8.	15241108	SP	Semester Proficiency ⁵					50	-	50	-	-	2	1	Face to Face	SO	-			
9.	15241109	PBL	Micro Project-I ⁶					70	30	100	-	-	2	1	Experiential	SO	-			
10.	15241110	HSMC	Language Lab					70	30	100	-	-	2	1	Blended	AO	-			
11.	NECXXXX	NEC	Novel Engaging Course (Activity Based Learning)					50		50	-	1	-	1	Interactive	SO	-			
Total				100	100	150	150	380	120	1000	12	03	10	20						
12.	15241122	MAC	Universal Human Values & Professional Ethics (UHVPE)	20	20	30	30			100	2	-	-	2	Blended	MCQ	1.5 Hrs			
13.	15241123	MWS	Mandatory Workshop on Indian Constitution and Traditional Knowledge at Department Level (Duration: Two Days)							GRADE	GRADE							Interactive	MCQ	-
Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.																				

³ Semester Proficiency- includes the weightage towards ability/ skill/ competency/knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral OB: Open Book

⁴ Micro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SIP	PDC	PBL	MAC	MWS
1	1	1	3	0	0	0	3	1	1	0	0	0	1	1	1

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, WALSURE
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)



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Department of Computer Science and Engineering

Mode of Learning										Mode of Examination					Total Credits
Theory		Lab					NEC	Theory				Lab	NEC		
Face to Face	Online	Face to Face	Blended	Experimental	Experimental	Interactive	PP	AO	MCQ	OB	SO	AO	SO		
14		1	1	1	2	1	6		8		2	3	1	20	
70		5	5	5	10	5	30		40		10	15	5	Credits %	

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE
(Deemed University)
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Department of Computer Science and Engineering

Scheme of Evaluation

B. Tech. II Semester (Computer Science and Engineering) (for batch admitted in academic session 2024-25)

B. Tech. II Semester (Computer Science and Engineering) for batch admitted in Academic Session 2022-23																	
S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Mode of Learning	Mode of Major Exam.	Duration of Major Exam.
				Theory Block				Practical Block									
				Minor Evaluation I	Minor Evaluation II	Quiz/Assignment	Major Evaluation	Continuous Evaluation Lab Work & Sessional	Major Evaluation	L		T	P				
1.	15241201	DC	Computer Graphics	20	20	30	30				100	3	-	-	Face to Face	MCQ	2 Hrs
2.	15241202	DC	Object oriented Programming & Methodology	20	20	30	30				100	2	1	-	Face to Face	MCQ	2 Hrs
3.	15241203	DC	Computer System and Organization	20	20	30	30				100	2	1	-	Face to Face	pp	2 Hrs
4.	15241204	DC	Operating Systems	20	20	30	30				100	2	1	-	Face to Face	pp	2 Hrs
5.	15241205	ESC	Basic Electrical & Electronics Engineering	20	20	30	30				100	2	-	-	Face to Face	MCQ	2 Hrs
6.	15241206	DLC	Computer Graphics & Modelling Lab					70	30		100	-	-	2	Experimental	AO	-
7.	15241207	DLC	Object oriented Programming & Methodology Lab					70	30		100	-	-	2	Experimental	AO	-
8.	15241208	DLC	Electrical & Electronics Engineering Lab					70	30		100	-	-	2	Experimental	AO	-
9.	15241209	SP	Semester Proficiency ⁵					50	50		50	-	-	2	Face to Face	SO	-
10.	15241210	PBL	Micro Project-II ⁶					70	30		100	-	-	2	Experimental	SO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)					50	50		50	-	1	-	Interactive	SO	-
12.	SIP1XXXX	SIP	Skill Internship Program (Soft Skill)					60	40		60	-	-	-	Experiential	SO	-
Total				100	100	150	150	440	120	1060	1	04	10		22		-
13.	15241211	MAC	Sustainability & Environmental Science	20	20	30	30				100	2	-	-	Blended	MCQ	1.5 Hrs
14.	15241212	MWS	Mandatory Workshop on Indian Knowledge System at Department Level (Duration: Two Days)												Interactive	MCQ	-
Summer Semester of six-eight week duration will be conducted for makeup of I & II semester examination.																	

Summer Semester of six-eight week duration will be conducted for makeup of I & II semester examination.

Semester Proficiency- includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral

*Micro Project-II will be presented and evaluated through an interdisciplinary project evaluation committee.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SPA	SLP	PDC	PBL	MAC	MWS
0	0	1	4	0	0	0	3	1	1	0	0	1	1	1

RS



MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR



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Department of Computer Science and Engineering

Mode of Learning				Mode of Examination				Total Credits		
Lab				Theory						
Theory		Lab		NEC	SIP	Theory		Lab	NEC	SIP
Face to Face	Online	Face to Face	Blended	Interactive	Experiential	PP	AO	MCQ	OB	SO
14	1	1	-	1	2	6		8		2
63.5	4.5	4.5		4.5	9	27.2		36.3		9
										Credits %

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
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Department of Computer Science and Engineering

Scheme of Evaluation

B. Tech. III Semester (Computer Science and Engineering) (for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted										Total Marks	Contact Hours per week			Mode of Learning	Mode of Major Exam.	Duration of Major Exam.
				Theory Block				Practical Block												
				Continuous Evaluation				Major Evaluation	Continuous Evaluation	Major Evaluation										
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment	Lab Work & Sessional													
1.	15242101	BSC	Engineering Mathematics-II	20	20	30	30	-	-	-	-	100	3	-	-	Face to Face	pp	2 Hrs		
2.	15242102	DC	Data Structures	20	20	30	30	-	-	-	-	100	2	1	-	Face to Face	pp	2 Hrs		
3.	15242103	DC	Database Management System	20	20	30	30	-	-	-	-	100	2	1	-	Face to Face	MCQ	2 Hrs		
4.	15242104	DC	Software Engineering	20	20	30	30	-	-	-	-	100	2	1	-	Face to Face	MCQ	2 Hrs		
5.	15242105	DC	Computer Networks	20	20	30	30	-	-	-	-	100	2	1	-	Face to Face	MCQ	2 Hrs		
6.	15242106	DLC	Data Structures Lab	-	-	-	-	70	30	-	-	100	-	-	2	Experimental	AO	-		
7.	15242107	DLC	Database Management System Lab	-	-	-	-	70	30	-	-	100	-	-	2	Experimental	AO	-		
8.	15242108	DLC	Problem Solving through Python Programming	-	-	-	-	70	30	-	-	100	-	-	2	Experimental	AO	-		
9.	15242109	SP	Semester Proficiency ³	-	-	-	-	50	-	-	-	50	-	-	2	Face to Face	SO	-		
10.	15242110	PBL	Macro Project-I ⁴	-	-	-	-	70	30	-	-	100	-	-	2	Experimental	SO	-		
11.	15242111	SLP	Self-learning/Presentation ⁵ (SWAYAM/NPTEL/MOOC)	-	-	-	-	40	-	-	-	40	-	-	2	Mentoring	SO	-		
12.	NECXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	-	-	50	-	1	-	Interactive	SO	-		
Total				100	100	150	150	420	120	-	-	1040	11	05	12	-	-	-		
13.	15242112	MAC	Cyber Security	20	20	30	30	-	-	-	-	100	2	-	-	Blended	MCQ	1.5 Hrs		
14.	15242113	MWS	Mandatory Workshop on Internet of Things (IoT) at Department Level (Duration: Two Days)	-	-	-	-	-	-	-	-	100	-	-	-	Interactive	MCQ	-		
Skill Internship Program (Institute Level) (Qualifier): Minimum 30 hours duration: To be Created in IV Semester																				

³ Semester Proficiency- includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral OB: Open Book

⁴ Macro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

⁵ compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance and presentation.

HSMC	BSC	ESC	DC	DE	SPEC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	1	0	4	0	0	0	3	1	1	1	1	0	1	1	1

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(Deemed University)

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Department of Computer Science and Engineering

Theory		Mode of Learning					Mode of Examination					Total Credits	
		Lab			NEC		Theory			Lab	NEC		
Face to Face	Online	Face to Face	Mentoring	Experiential	Experimental	Interactive	PP	AO	MCQ	OB	SO	AO	SO
15		1	1	1	3	1	6		9		3	3	1
68.5		4.5	4.5	4.5	13.5	4.5	27.7		40.8		13.5	13.5	4.5
													22
													Credits %

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UNITED STATES DEPARTMENT OF AGRICULTURE

Scheme of Evaluation

(for batch admitted in academic session 2024-25)

Summer Semester of six-eight week duration will be conducted for makeup of previous semester examination.

Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree

Semester Proficiency- includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral OB: Open Book

* Macro Project-II will be presented and evaluated through an interdisciplinary project evaluation committee.

^{**} These credits will be transferred from Skill Internship Project.

PC	BSC	ESC	DE	SPG	OC	DLG	NEG	SP	SIP	SLP	PDC	PBL	MEAC	MWS
1	0	0	5	0	0	3	1	1	1	0	0	1	1	2

b-2	Aug 6	v	Q	Q
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MADHAV INSTITUTE OF TECHNOLOGY
(Deemed University)
(Recognized by the Ministry of Education, Government of India)

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Department of Computer Science and Engineering
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Department of Computer Science and Engineering

Scheme of Evaluation B. Tech. V Semester (Computer Science and Engineering)

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted										Total Marks	Contact Hours per week			Mode of Learning	Mode of Major Exam.	Duration of Major Exam.
				Theory Block				Practical Block			MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation Lab Work & Sessional	Major Evaluation	Assignment	Exam									
				Minor Evaluation	Minor Evaluation II	Quiz/ Assignment														
1.	15243101	DC	Compiler Design	20	20	30	30	-	-	-	-	-	100	2	1	-	Face to Face	pp	2 Hrs	
2.	15243102	DC	Soft Computing Techniques	20	20	30	30	-	-	-	-	-	100	2	1	-	Face to Face	MCQ	2 Hrs	
3.	15243103	DC	Data Science	20	20	30	30	-	-	-	-	-	100	2	1	-	Face to Face	MCQ	2 Hrs	
4.	15243104	DE	Departmental Elective* (DE-1)	-	-	-	-	-	-	-	25	75	100	3	-	-	Online	MCQ	3 Hrs	
5.	15243105	SPC	Specialization Course (SPC-1)	20	20	30	30	-	-	-	-	-	100	2	1	-	Face to Face	PP	2 Hrs	
6.	15243106	DLC	Augmented & Virtual Reality Lab	-	-	-	-	-	-	30	-	-	100	-	-	2	Experimental	AO	-	
7.	15243107	DLC	Data Science Lab	-	-	-	-	-	-	30	-	-	100	-	-	2	Experimental	AO	-	
8.	15243108	SP	Semester Proficiency ⁵	-	-	-	-	-	-	50	-	-	50	-	-	2	Face to Face	SO	-	
9.	15243109	PBL	Cornerstone Project	-	-	-	-	-	-	-	-	-	100	-	-	4	Experiential	SO	-	
Total				80	80	120	120	70	30	25	75	850	11	04	10	-	-	-	-	1.5 Hrs
10.	15243110	MAC	Supply Chain Management	20	20	30	30	-	-	-	-	-	100	2	-	-	Blended	MCQ	-	
11.	15243111	MWS	Mandatory Workshop on Blockchain at Department Level (Duration: Two Days)	-	-	-	-	-	-	-	-	-	GRADE	GRADE			Interactive	MCQ	-	
Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree																				

⁵Semester Proficiency-- includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral OB: Open Book

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	0	0	3	1	1	0	2	0	1	0	0	0	1	1	1

(Signature)



MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GATEWAY

(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)
NAAC Accredited with A++ Grade

Department of Computer Science and Engineering

Theory		Lab				NEC			SIP			Theory			Lab	NEC	SIP	Total Credits
		Face to Face	Blended	Experimental	Experimental	Interactive	Experiential	PP	AO	MCQ	OB	SO	AO	SO	SO	NEC	SIP	Total Credits
Face to Face	Online	1		2	2		-	6		9		3	2					20
12	3	5		10	10			30		45		15	10					Credits %
60	15																	

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Department of Computer Science and Engineering

Scheme of Evaluation

B. Tech. VI Semester (Computer Science and Engineering) (for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted										Total Marks	Contact Hours per week			Mode of Learning	Mode of Major Exam.	Duration of Major Exam.
				Theory Block				Practical Block			MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Assignment	Exam										
				Minor Evaluation I	Minor Evaluation II	Quiz/Assignment														
1.	15243201	DC	Cloud Computing and Virtualization	20	20	30	30	-	-	-	-	-	100	2	1	-	Face to Face	MCQ	2 Hrs	
2.	15243202	DC	Ad-hoc Networks	20	20	30	30	-	-	-	-	-	100	2	1	-	Face to Face	MCQ	2 Hrs	
3.	15243203	DE	Departmental Elective* (DE-2)	-	-	-	-	-	-	25	75	-	100	3	-	-	Online	MCQ	3 Hrs	
4.	15243204	OC	Open Category Course (OC-1)	20	20	30	30	-	-	-	-	-	100	2	1	-	Face to Face	PP	2 Hrs	
5.	15243205	SPC	Specialization Course (SPC-2)	20	20	30	30	-	-	-	-	-	100	3	-	-	Face to Face	PP	2 Hrs	
6.	15243206	DLC	IoT & Embedded System Lab	-	-	-	-	70	30	-	-	-	100	-	-	2	Experimental	AO	-	
7.	15243207	DLC	Java Programming Lab	-	-	-	-	70	30	-	-	-	100	-	-	2	Experimental	AO	-	
8.	15243208	SP	Semester Proficiency ⁵	-	-	-	-	50	50	-	-	-	50	-	-	2	Face to Face	SO	-	
9.	15243209	PBL	Capstone Project	-	-	-	-	70	30	-	-	-	100	-	-	4	Experiential	SO	-	
Total				80	80	120	120	260	90	25	75	-	850	12	03	10	-	-	-	-
10.	15243210	MA	Disaster Management	20	20	30	30	-	-	-	-	-	100	2	-	-	Blended	MCQ	1.5 Hrs	
11.	15243211	MW	Mandatory Workshop on Intellectual Property Rights at Department Level (Duration: Two Days)	-	-	-	-	-	-	-	-	-	100	-	-	-	Interactive	MCQ	-	

Skill Enhancement Program/Research Internship/On Job Training for Four weeks duration

Summer Semester of six-eight week duration will be conducted for makeup of previous semester examination.

Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree.

Semester Proficiency- includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral OB: Open Book

* Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAG	MWS
0	0	0	2	1	1	1	2	0	1	0	0	0	1	1	1

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, G. H. H. ROAD,
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)



NAAC Accredited with A++ Grade

Department of Computer Science and Engineering

Theory			Mode of Learning				Mode of Examination				Total Credits		
			Lab				Theory				Lab	NEC	
Face to Face	Online	Face to Face	Blended	Experiential	Experiential	Interactive	PP	AO	MCQ	OB	SO	AO	SO
12	3	1		2	2		6		9		3	2	
60	15	5		10	10		30		45		15	10	
													20
													Credits %

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A-R



MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GATEWAY

(Deemed University)

(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Department of Computer Science and Engineering
Scheme of Evaluation

B. Tech. VII Semester (Computer Science and Engineering)

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted										Total Marks	Contact Hours per week			Mode of Learning	Mode of Major Exam.	Duration of Major Exam.		
				Theory Block				Practical Block														
				Continuous Evaluation			Major Evaluation	Continuous Evaluation Lab Work & Sessional	Major Evaluation	Assignment	Exam											
				Minor Evaluation - I	Minor Evaluation - II	Quiz/Assignment																
1.	15244101	DE	Departmental Elective* (DE-3)	20	20	30	30	-	-	-	-	75	-	100	3	-	-	3	Blended	PP	2 Hrs	
2.	15244102	DE	Departmental Elective* (DE-4)	-	-	-	-	-	-	-	-	25	-	100	3	-	-	3	Online	MCQ	3 Hrs	
3.	15244103	OC	Open Category Course * (OC-2)	-	-	-	-	-	-	-	-	25	-	100	3	-	-	3	Online	MCQ	3 Hrs	
4.	15244104	SPC	Specialization Course* (SPC-3)	20	20	30	30	-	-	-	-	-	-	100	2	1	-	3	Blended	MCQ	2 Hrs	
5.	15244105	SEP	Skill Enhancement Program/Research Internship/ On Job Training	-	-	-	-	-	-	-	-	-	50	50	-	-	-	1**	Experiential	SO	-	
6.	15244106	DLC	Creative Problem Solving	-	-	-	-	-	-	-	-	-	50	50	-	-	2	1	Experiential	SO	-	
Total				40	40	60	60	-	-	-	-	100	50	150	500	11	01	02	14	-	-	-

For minor degree courses for the award of Honours or Minor Degree

*Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree

†Semester Proficiency- includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral OB: Open Book

*Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

† Course run through MITS-DU MOOC

** This credit will be transferred from Skill Enhancement Program/Research Internship/ On Job Training

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SLP	PDC	PBL	MAG	MWS
0	0	0	0	2	1	1	1	0	1	0	0	0	0	1

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Department of Computer Science and Engineering

Theory		Mode of Learning				Lab	NEC	Theory				Mode of Examination		Lab	NEC	Total Credits
		Face to Face	Blended	Experiential	Experimental			Interactive	AO	MCQ	OB	SO	AO			
Face to Face	Online	6	6	2				3		9			2			14
		42.8	42.8	14.4				21.4		64.2			14.4			Credits %

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Department of Computer Science and Engineering

Scheme of Evaluation

B. Tech. VIII Semester (Computer Science and Engineering) (for batch admitted in academic session 2024-25)

Maximum Marks Allotted																												
S. No.	Course Code	Category Code	Course Name	Theory Block										Practical Block					MOOGS		Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Exam.	Duration of Major Exam.
				Continuous Evaluation			Quiz/ Assignment		Major Evaluation	Continuous Evaluation	Major Evaluation	Continuous Evaluation	Assignment	Exam														
				Minor Evaluation I	Minor Evaluation II																							
1.	15244201	DE	Departmental Elective* (DE-5)														25		75	100	3	-	-	3	Online	MCQ	3 Hrs	
2.	15244202	OC	Open Category Course* (OC-3)														25		75	100	3	-	-	3	Online	MCQ	3 Hrs	
3.	15244203	PBL	Industry Internship/ Research Internship/ Innovation & Start-up									280			120					400	-	-	20	10	Experiential	SO	-	
4.	15244204	PDC	Professional Development**												50					50	-	-	4	2	Interactive	SO	-	
Total											280			170			50		150	650	06	-	24	18	-	-	-	-

Summer Semester of six-eight week duration will be conducted to complete any backlog courses.

Additional Course for Honours or Minor Degree: Permitted to opt for maximum two additional courses for the award of Honours or Minor Degree

MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral OB: Open Book

*Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform

**Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.)

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEG	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0

Mode of Learning				Mode of Examination				Total Credits
Theory		Lab		Theory		Lab		
Face to Face	Online	Blended	Experimental	PP	AO	MCQ	OB	
6		10		2		6		12
33.3		55.5		11.2		33.3		66.7
								18
								Credits %

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MAMBAH INSTITUTE OF TECHNOLOGY & SCIENCE
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Department of Computer Science and Engineering

MAHARAJA INSTITUTE OF TECHNOLOGY & SCIENCE

Specialization in Visual Information Processing					
Description		This module will help in			
Courses and Credits required		3 courses and 9 credits			
Course Category	Course ID	Course Title	Contact Hours per week		
			L	T	P
SPC-1		Information Retrieval and Extraction	2	1	
SPC-2		Image Processing	2	1	2
SPC-3	Elective-1	Pattern Recognition	2	1	
SPC-3	Elective-2	Human Computer Interaction	2	1	

Specialization in Information Security					
Description		This module will help in			
Courses and Credits required		3 courses and 9 credits			
Course Category	Course ID	Course Title	Contact Hours per week		
			L	T	P
SPC-1		Cryptography	2	1	
SPC-2		Network Security	2	1	
SPC-3	Elective-1	IoT and its Security	2	1	
SPC-3	Elective-2	Digital Forensics	2	1	

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

OBJECT ORIENTED PROGRAMMING & METHODOLOGY

15241202

COURSE OBJECTIVES

- To study about the concept of object oriented programming.
- To create C++ programs that leverage the object oriented features of the C++ Language.
- To apply object oriented or non-object oriented techniques to solve bigger computing problems.

Unit-I

Introduction to C++ and Object Oriented Concepts: Basics of C++, Tokens, I/O Statements, Structure of Program, Operators and Expressions, Flow of Control, Arrays, Structures, Functions and its type, Function Prototyping, Pointers, Pointer Variables, Pointers and Arrays, Array of Pointers, Pointers and Structures, Dynamic Memory Allocation. **Programming Techniques:** Unstructured & Structured Programming, Object Oriented Paradigm, Features of OOPS, Comparison with Procedural Oriented Programming & Object Oriented Programming, Abstract Data Types, Reference Variable, Scope Resolution Operator.

Unit-II

Classes & Objects: Specification of Class, Visibility Modes: Private, Public, Protected, Defining Member Functions, Creating of Objects, Characteristics of Object, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Inline Function, Default Arguments, Friend Function, Recursion. **Constructors and Destructors:** Introduction, Types of Constructors- Default Constructor, User Defined Constructor, Parameterized Constructor, Copy Constructor, Constructor with Default Arguments, Rules of Constructor Definition and Usage, Destructs

Unit-III

Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, Function Overloading, Operator Overloading: Binary Operators, Arithmetic Assignment Operators, Unary Operators, Rules for Operator Overloading, Pitfalls of Operator Overloading, Data Conversion, Type Casting.

Unit-IV

Inheritance: Introduction to Code Reuse, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath. Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Nesting of Classes, Overriding Member Function. **Containership:** Classes with in Classes, Function Overriding.

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Unit-V

Pointer & File Concept: Pointers Overview, Pointers to Objects, This Pointer, Pointers to Derived Classes, Virtual Functions & Pure Virtual Function, Association, Type of Association, Aggregation, File Concepts, Study of Various Files and Streams, Opening and Closing of Files Functions Get(), Getline(), Put(), Opening The Files Using Function Open(), File Manipulator Function Interfaces), Reactive Programming in OOP, Microservices and OOP, Domain-Driven Design (DDD), AI and OOP Integration, AI- Driven Code Generation and OOP, Distributed Object-Oriented Systems

RECOMMENDED BOOKS

- C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
- Programming with C++, D Ravichandran, T.M.H.
- Computing Concepts with C++ Essentials, Horstmann, John Wiley.
- The Complete Reference in C++, Herbert Schildt, TMH.
- Object-Oriented Programming in C++, E Balagurusam
- Fundamentals of Programming C++, Richard L. Halterman.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. Describe various fundamental of object oriented design for programming practices.

CO2. Apply fundamental Object-Oriented Programming principles such as encapsulation, inheritance, and polymorphism in real problem.

CO3. Develop robust and scalable software systems and applications.

CO4. Create modular, maintainable, and extensible code that adheres to industry best practices.

CO5. Evaluate Object-Oriented solutions and make informed design decisions

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 - Substantially



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COMPUTER SYSTEM AND ORGANIZATION

15241203

COURSE OBJECTIVES

- To provide the fundamental knowledge of a computer system and its processing units.
- To provide the details of input & output operations, memory management and performance measurement of the computer system.
- To understand how computer represents and manipulate data.

Unit -I

Introduction: Von-Neumann Model, Various Subsystems, CPU, Memory, I/O, System Bus, CPU and Memory Registers, Program Counter, Accumulator, Register Transfer and Micro Operations: Register Transfer Language, Register Transfer, Tree-State Bus Buffers, Bus and Memory Transfers, Arithmetic Micro-Operation, Logic Micro-Operation, Shift Micro-Operation Register Transfer Micro Operations, Arithmetic Micro-Operations, Logic Micro-Operations and Shift Micro-Operations.

Unit- II

Computer Arithmetic: Addition and Subtraction with Signed-Magnitude, Multiplication Algorithm, Division Algorithm, Division Algorithms, Floating-Point Arithmetic Operations.

Central Processing Unit (CPU): General Purpose Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC). Hardwired and Micro programmed Control.

Unit -III

Microprocessors: Introduction of 8085 Microprocessor: Architecture, Instruction Set, Addressing Modes, Interrupts and Basic Assembly Language Programming, Introduction to Pipelining & Multiprocessors.

Unit -IV

Input-Output Organization: Peripheral Devices, I/O Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA (DMA Controller, DMA Transfer),

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Input-Output Processor (IOP), Data Transfer- Serial/Parallel, Simplex/ Half Duplex/ Full Duplex.

Unit-V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory- Organization and Mappings, Memory Management Hardware, Parallel & Distributed systems, Storage Systems and file system: RAID, Distributed File System, Storage Class Memory.

RECOMMENDED BOOKS

- Computer System Architecture, Morris Mano, PHI.
- Microprocessor Architecture, Programming and Applications with the 8085, Gaonkar,
- Computer Organization, Carl Hamacher, THM.
- Computer Architecture and Organization, J P Hayes, Mc-Graw Hills, New Delhi.

COURSE OUTCOMES

After completion of the course students would be able to:

- CO1. Understand the Fundamental Components of Computer Systems.
- CO2. Perform and Analyze Computer Arithmetic Operations
- CO3. Analyze Instruction Set and Addressing Modes of 8085
- CO4. Understand the working of IOPs and various communication modes to optimize data exchange in computing systems.
- CO5. Explain and Utilize Memory Management Hardware

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 - Substantially

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

OPERATING SYSTEMS

15241204

COURSE OBJECTIVES

- Provide basic knowledge of computer operating system structures and functioning.
- Compare several different approaches to memory management, file management and process management
- Understand various problems related to concurrent operations and their solutions.

Unit- I

Basics of operating systems: Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

Process management: Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

Unit-II

Process synchronization: Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Unit-III

Memory management: Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit-IV

Storage management: Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, RAID Structure.

Unit-V

File system interface: File Concept, Access Methods, Directory Structure, File System Structure, Allocation Methods, and Free-Space Management.

System Protection: Goals, Principles, Domain of Protection, Access Matrix, Access Control.

Emerging topics: Real-Time Operating systems (RTOS), Sustainable Software Lifecycle Management in Software engineering, Ethical Software Designed Development

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RECOMMENDED BOOKS

- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.
- Operating Systems, Internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- OPERATING SYSTEMS, Dr. Sukomal Pal, AICTE
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.

COURSE OUTCOMES

After the successful completion of this course, the student will be able to:

- CO1. **Outline** the basic concept of operating systems
- CO2. **Analyze** the working of operating system
- CO3. **Examine** the working of various scheduling/allocation approaches
- CO4. **Measure** the performance of various scheduling/allocation approaches
- CO5. **Develop** the Solution of various operating system problems/issues

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 - Substantially

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

15241205

Course Objectives:

- To impart basic knowledge of the DC and AC circuits and their applications.
- To familiarize the students with the basic knowledge of magnetic circuits, transformer, rotating electrical machine and its terminology.
- To make familiarize the students about the working of, various electronic circuits and its importance.

Unit I - D.C. Circuits Analysis: Voltage and Current Sources: Dependent and independent source, Source conversion, Kirchhoff's Law, Mesh and Nodal analysis. Network theorems: Superposition theorem, Thevenin's theorem & Norton's theorem and their applications.

Unit II - Single-phase AC Circuits: Generation of sinusoidal AC voltage, definitions: Average value, R.M.S. value, Form factor and Peak factor of AC quantity, Concept of Phasor, analysis of R-L, R-C, R-L-C Series and Parallel circuit, Power and importance of Power factor.

Unit III- Magnetic Circuits & Resonance: Magnetic Circuits: Concept of MMF, flux and magnetic reluctance, Self and mutual inductances, Dot convention, coefficient of coupling and coupled circuits. Resonance: Series and Parallel resonance, Bandwidth, Q-factor and selectivity.

Unit IV- Single-phase Transformer & Rotating Electrical Machines: Single phase transformer, Basic concepts, construction and working principal, Ideal Transformer and its phasor diagram at No Load, Voltage, current and impedance transformation, Equivalent circuits and its Phasor diagram, voltage regulation, losses and efficiency, testing of transformers, Construction & working principle of DC and AC machine.

Unit V - Digital Electronics, Devices & Circuits: Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, Demorgan's theorem, Logic gates- symbolic representation and their truth table, Introduction to semiconductors, Diodes, V-I characteristic, Bipolar junction transistors and their working, Introduction to CB, CE & CC transistor configurations.

Recommended Books:

1. Basic Electrical and Electronics Engineering, D.P. Kothari & I.J. Nagrath-Tata McGraw Hill
2. Basic Electrical and Electronics Engineering, V N Mittle & Arvind Mittal -Tata McGraw Hill
3. Basic Electrical and Electronics Engineering, S. K Bhattacharya -Pearson
4. Electrical Machinery- A.E. Fitzgerald, C. Kingsley and Umans - TMH
5. Principles of Electrical Engineering- Vincent Del Toro- Prentice Hall.
6. Basic Electrical Engineering -A.E. Fitzgerald, Higginbotham and Grabel -TMH
7. Integrated Electronics- Millmann & Halkias

Course Outcomes

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

- CO 1. Solve dc & ac circuits by applying fundamental laws & theorems
CO 2. Analyze magnetic circuits and resonance characteristics of ac electric circuits

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CO 3. Describe the working principle, construction, applications of single phase transformer & rotating electrical machines

CO 4. Select the logic gates for various applications in digital electronic circuits.

CO 5. Explain the characteristics and parameters of Diode and Transistor.

Course Articulation Matrix

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

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Computer Graphics & Modelling Lab 15241206

List of Experiments

1. Installation and Introduction to OpenGL basics, graphic functions, commands for compiling and executing an OpenGL Program.
2. Write an OpenGL Program to create an output window, to plot a point with given coordinates and other basic demonstrations.
3. Write an OpenGL Program to implement DDA Line Drawing Algorithm.
4. Write an OpenGL Program to implement Bresenham Line Algorithm.
5. Write an OpenGL Program to implement Mid-Point Circle Algorithm.
6. Write an OpenGL Program to implement following 2D transformations:
 - i. Translation of a point, line and polygon.
 - ii. Scaling of a line and polygon.
 - iii. Rotation of a line and polygon around origin.
7. Write an OpenGL Program to implement:
 - i. Flood Filling Algorithm using polygon.
 - ii. Boundary Filling Algorithm using polygon.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1. Develop the ability to implement and manipulate algorithms for drawing geometric shapes, transformations, and color models.

CO2. Implement and apply 2D and 3D transformations (translation, rotation, scaling, reflection, etc.) on graphical objects.

CO3. Develop the ability to design and implement a complete graphical application with user interaction and dynamic graphics.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1												
CO2			2		1								1	
CO3					2						1	2	2	1

1 - Slightly; 2 - Moderately; 3 - Substantially





DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Object Oriented Programming & Methodology Lab

15241207

List of Experiments

1. Write a program to swap two integers without using third variable. The swapping must be done in a function of a particular class.
2. Write a program that uses a class where the member functions are defined outside a class.
3. Design a class to represent a bank account. Which includes account number, name of the depositor, type of the account, balance amount in the account. Define Methods, to assign initial values, to Deposit an amount, to Withdraw amount after checking balance, to display name and balance.
4. Write a program to find the greater of two given numbers in two different classes using friend function.
5. Create an inheritance hierarchy of Rodent, Mouse, Gerbil, Hamster etc. In the base class provide methods that are common to all Rodents and override these in the derived classes to perform different behaviors, depending on the specific type of Rodent. Create an array of Rodent, fill it with different specific types of Rodents and call your base class methods.
6. Create two classes: Polar and Cartesian, to represent Polar and Cartesian coordinates of a point. Demonstrate how to convert Polar coordinates to Cartesian coordinates by writing the conversion code in source class.
7. Write a program to demonstrate anomaly caused in Multi-path Inheritance. Also, write a program to overcome the anomaly.
8. Create an abstract class Shape which has a field $P1=3.14$ as final and it has an abstract method Volume. Make two sub-classes 'Cone' and 'Sphere' from this class and they should print their volume
9. Create a class called LIST with two pure virtual function store() and retrieve(). To store a value call store and to retrieve call retrieve function. Derive two classes stack and queue from it and override store and retrieve
10. Write a program to demonstrate working of various file handling operations in C++



COURSE OUTCOMES

After completion of the course students would be able to:

CO1. Demonstrate the use of various OOPs concepts with the help of programs.

CO2. Formulate solutions to problems demonstrating usage of control structures, modularity, I/O and other standard language constructs.

CO3. Enumerate Implement appropriate object orient programming concepts for solving real world problems.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		1											1
CO2		1	2				1						1	
CO3		1			1									2

1 - Slightly; 2 - Moderately; 3 - Substantially

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Basic Electrical & Electronics Engineering Lab 15241208

LIST OF EXPERIMENT

1. To verify Kirchhoff's Current Law & Kirchhoff's Voltage Law.
2. To verify Superposition Theorem
3. To determine resistance & inductance of a choke coil.
4. To determine active & reactive power in a single phase A.C circuit.
5. To determine voltage ratio & current ratio of a single phase transformer.
6. To determine the polarity of a single phase transformer.
7. To perform open circuit & short circuit test on a single phase transformer.
8. To study multimeter & measure various electrical quantities
9. To study of constructional details of DC machine.
10. To determine the V-I characteristics of diode in forward bias & reverse bias condition.

Course Outcomes:

After the completion of the lab, the student will be able to –

- CO1 Demonstrate the ability to operate lab equipment and instruments relevant to the electrical engineering field
- CO2 Collect experimental data accurately and effectively
- CO3 Integrate theoretical knowledge from coursework into practical applications and experiments
- CO4 Communicate experimental results effectively through oral presentations and written documentation
- CO5 Demonstrate responsibility and professionalism in the completion of lab tasks and assignments
- CO6 Show willingness to learn new techniques, tools, or methods to enhance practical engineering skills

Course Articulation Matrix

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

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Department of CSE

Scheme of Evaluation

M. Tech. I Semester (CSE) for batch admitted in academic session 2024-25

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted					Contact Hours per week			Total Credits	Mode of Learning	Mode of Exam
				Continuous Evaluation			Major Evaluation	Practical Block	L	T	P			
				Theory Block		Total Marks								
				Minor Evaluation I	Minor Evaluation II									
1.	62241101	DC	Database Systems	20	20	30	30	-	3	-	-	3	Face to Face	pp
2.	62241102	DC	Distributed Computing	20	20	30	30	-	2	1	-	3	Face to Face	pp
3.	62241103	DC	Image Processing & Computer Vision	20	20	30	30	-	2	1	-	3	Face to Face	pp
4.	62241104	DE	Departmental Elective (DE-I)	20	20	30	30	-	3	-	-	3	Face to Face	pp
5.	62241105	SC	Specialization Course (SC-I)	20	20	30	30	-	3	-	-	3	Face to Face	pp
6.	62241106	DLC	Lab-I	-	-	-	-	70	-	-	4	2	Experiential	SO
7.	62241107	DLC	Seminar/Presentation ²	-	-	-	-	70	-	-	4	2	Blended	SO
8.	62241108	NEC	Classified Novel Engaging Course (Activity Based Learning)	-	-	-	-	-	-	1	-	1	Interactive	SO
Total				100	100	150	150	140	13	03	08	20	-	-

MCQ: Multiple Choice Question **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.
Seminar Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

DE-I	
S. No.	Course Name
1.	Mobile Computing & M-Commerce
2.	Adhoc & Sensor Based Networks
3.	Network Security
4.	High-speed Networks

Mode of Learning				Mode of Examination				Lab	Total results
Theory	Online	Blended	Experimental	CNOC	Theory	MCQ	OB		
Face to Face	15	2	2	1	PP	15	15	5	20
		10		4		75		15	Credits %



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Department of CSE

Scheme of Evaluation

M. Tech. II Semester (CSE)

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted										Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Exam.
				Theory Block				Practical Block							MOOCs					
				Continuous Evaluation		Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam	L	T	P							
				Minor Evaluation	Minor Evaluation										Quiz/ Assignment					
1.	62241201	DC	Algorithm Design Techniques & Analysis	20	20	30	30	-	-	-	-	100	3	-	-	3	Face to Face	pp		
2.	62241202	DC	Digital Watermarking & Steganalysis	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	pp		
3.	62241203	DC	Natural Language Processing	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	pp		
4.		DE	Departmental Elective (DE-2)	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCO		
5.		SC	Specialization Course (SC-2)	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	pp		
6.	62241204	DLC	Lab-II	-	-	-	-	-	70	30	-	100	-	-	4	2	Experimental	SO		
7.	62241205	DLC	Seminar/Presentation	-	-	-	-	-	70	30	-	100	-	-	4	2	Mentoring	SO		
8.	622412XX	NEC	Classified Novel Engaging Course (Activity Based Learning)	-	-	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO		
Total				80	80	120	120	120	140	110	25	75	750	12	04	08	20	-	-	

MCQ: Multiple Choice Question PP: Pen Paper SO: Submission - Oral OB: Open Book

This course will run through SWAYAM: NPTEL/MOOC based learning platform (with credit transfer facility). The course can be related & relevant to other domain as well. During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc. Seminar/Presentation through SWAYAM / NPTEL. (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

DE-2 (through SWAYAM / NPTEL / MOOC)

S. No.	Course Code	Course Name
1.	62241206	Cloud Computingnoc24-cs118
2.	62241207	Social Networksoc24-cs120

Theory				Mode of Learning				Mode of Examination				Total Credits
Face to Face	Online	Face to Face	Blended	Experimental	Experimental	Mentoring	CNOC	pp	MCQ	OB	Lab	
12	3			2		2	1	12	3		5	
10				10		10	5	60			5	
											5	

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Department of CSE

Scheme of Evaluation

M. Tech. III Semester (CSE) (for batch admitted in academic session 2024-25)

Sl. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted							Contact Hours per week			Total Credits	Mode of Learning	Mode of Eval
				Theory Block			Major Evaluation	Practical Block		L	T	P				
				Continuous Evaluation		Continuous Evaluation		Major Evaluation								
				Minor Evaluation I	Minor Evaluation II				Quiz/ Assignment				Lab Work & Sessional			
1.	22CSE3011	DLC	Preliminary Dissertation (Literature Review, Problem Formulation, Synopsis, survey, project, etc.)	-	-	-	-	175	75	-	-	28	250	-	Interactive	SC
Total				-	-	-	-	175	75	-	-	28	250	-	-	-

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Department of CSE

Scheme of Evaluation

M. Tech. IV Semester (CSE)

(for batch admitted in academic session-2024-25)

Sl. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Exam
				Theory Block			Practical Block										
				Continuous Evaluation			Major Evaluation	Continuous Evaluation Lab Work & Sessional	Major Evaluation	L		T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment											
1.	62242201	DLC	Dissertation	-	-	-	-	350	150	-	-	32	16	Interactive	SC		
Total				-	-	-	-	350	150	-	-	32	16	-	-	-	

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Specialization in AI and ML					
Description	This module will help in Employability & Real-world problem solving				
Courses and Credits required	2 courses and 6 credits				
Course Category	Course ID	Course Title	Contact Hours per week		
			L	T	P
SPC-1	62241110	Pattern Recognition & Machine learning	2	1	
SPC-2	62241208	Deep Learning	2	1	

Specialization in Computing and Data Science					
Description	This module will help in Skill Enhancement				
Courses and Credits required	2 courses and 6 credits				
Course Category	Course ID	Course Title	Contact Hours per week		
			L	T	P
SPC-1	62241111	Big Data and Cloud Computing	2	1	
SPC-2	62241209	Data Analytics	2	1	

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Department of CSE

Classified Novel Engaging Course (Activity Based Learning)

M. Tech. I Semester (CSE)

S.No.	Course Name	Course Code
1.	Applied IoT	62241112
2.	Probability and Statistics	62241113

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Department of CSE

Classified Novel Engaging Course (Activity Based Learning)

M. Tech. II Semester (CSE)

Classified Novel Engaging Course		
1.	Artificial Intelligence & Neural Networks	62241210
2.	Data Science using Python	62241211

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
ALGORITHM DESIGN TECHNIQUES & ANALYSIS
62241201

COURSE OBJECTIVE:

- To introduce the topic of algorithms as a precise mathematical concept.
- To demonstrate the familiarity with major algorithm design paradigms and methods of analysis.
- To design efficient algorithms for common computer engineering problems.
- To enhance the skills using well-known algorithms and data structures for solving real-life problems.

UNIT I

Introduction: What is an algorithm, Functions and Relations, Vectors and Matrices, Linear Inequalities and Linear Equations, Asymptotic Notations and Basic Efficiency Classes, Master's Theorem, Mathematical Analysis of Recursive and Non-recursive Algorithms, Empirical Analysis of Algorithms. Brute Force and Exhaustive Search- Sequential Search and Brute-Force, String Matching, Closest-Pair and Convex-Hull Problems.

UNIT II

Decrease-and-Conquer: Topological Sorting, Fake-Coin Problem, Russian Peasant Multiplication, Josephus Problem, Computing a Median and the Selection Problem, Game of Nim. **Transform-and-Conquer:** 2-3 Trees, B-Trees, B+ Trees, Various Algorithms: Krushkal & Prim's Algorithm, Huffman Encoding, Job Scheduling Algorithm, Kirchoff's Law, Travelling Salesman Problem

UNIT III

Space and Time Trade-Offs: Sorting by Counting, Input Enhancement in String Matching, Boyer-Moore Algorithm, Open Hashing (Separate Chaining), Closed Hashing (Open Addressing), Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem, Assembly Line Scheduling, Knapsack problem, Matrix chain multiplication

UNIT IV

Iterative Improvement: Simplex Method, Maximum-Flow Problem, Maximum Matching in Bipartite Graphs, Stable Marriage Problem. **Limitations of Algorithm**

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Power: Lower-Bound Arguments, Trivial Lower Bounds, Information-Theoretic Arguments, Adversary Arguments, Problem Reduction, Decision Trees, Decision Trees for Sorting, Decision Trees for Searching a Sorted Array.

UNIT V

Introduction to P, NP, NP-Hard and NP-Complete, P and NP Problems - Partition problem, Bin-packing problem, NP-Complete Problems, Travelling Salesman problem, Hamiltonian problem, Approximation algorithms.

Recommended Books:

1. Introduction to Design and Analysis of Computer Algorithms, 3rd Edition, Anany Levitin, Pearson Education
2. Fundamentals of Computer Algorithms, Horowitz & Sahani, Universities press.
3. Introduction to Algorithms, Cormen Thomas, Leiserson CE, Rivest RL, PHI.
4. Design & Analysis of Computer Algorithms, Ullmann, Pearson.
5. Algorithm Design, Michael T Goodrich, Roberto Tamassia, Wiley India.

COURSE OUTCOMES

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

CO1: Recall fundamental algorithm concepts and mathematical foundations.

CO2: Explain algorithm design strategies with examples.

CO3: Apply techniques like dynamic programming to solve problems.

CO4: Analyze complexity and trade-offs of algorithms.

CO5: Evaluate algorithm limitations and classify problems (P, NP, NP-Hard).

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

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DIGITAL WATERMARKING & STEGANALYSIS 62241202

COURSE OBJECTIVES

- To provide the importance of digital watermarking and Steganography
- To discuss the properties of watermarking and steganography systems
- To discuss the different models of watermarking and steganography
- To understand the various evaluation metrics
- To examine various applications of watermarking and steganography

UNIT-I

INTRODUCTION: Information Hiding, Steganography, and Watermarking. History of Watermarking. History of Steganography, Importance of Digital Watermarking. Importance of Steganography, Applications and Properties.

UNIT-II

WATERMARKING: Evaluating watermarking systems. Notation, Communications, Communication-based models, Geometric models, Mapping messages into message vectors, Error correction coding, Detecting multi-symbol watermarks, Attacks.

UNIT-III

MODELS OF WATERMARKING: Notation, Communications, Components of Communications Systems, Classes of Transmission Channels, Secure Transmission, Communication-Based Models of Watermarking, Basic Model, Watermarking as Communications with Side Information at the Transmitter, Watermarking as Multiplexed Communications, Geometric Models of Watermarking, Distributions and Regions in Media Space, Marking Spaces, Modeling Watermark Detection by Correlation, Robust Watermarking Approaches.

UNIT-IV

STEGANOGRAPHY & STEGANALYSIS: Steganographic Communication, The Channel, The Building Blocks, Notation and Terminology, Information – Theoretic Foundations of Steganography, Cachin's Definition of Steganographic Security, Practical Steganographic Methods, Statistics Preserving Steganography, Model-Based Steganography, Steganalysis Scenarios, Detection, Forensic Steganalysis, The Influence of the Cover Work on Steganalysis, Some Significant Steganalysis Algorithms, LSB

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Embedding, and the Histogram Attack.

UNIT-V

APPLICATIONS: Applications of Watermarking, Broadcast Monitoring, Copyrights, Proof of Ownership, Transaction Tracking, Content Authentication, Copy Control, Device Control, Legacy Enhancement. Applications of Steganography, Steganography for Dissidents, Steganography for Criminals.

RECOMMENDED BOOKS

- Ingemar J. Cox, Mathew L. Miller, Jeffrey A. Bloom, Jesica Fridrich, Ton Kalker, "Digital Watermarking and Steganography", Morgan Kaufmann Publishers, New York, 2008.
- Ingemar J. Cox, Mathew L. Miller, Jeffrey A. Bloom, "Digital Watermarking", Morgan Kaufmann Publishers, New York, 2003.
- Ingemar Cox, Mathew Miller, Jeffrey Blom, Jesica Fridrich and Ton Kalker, "Digital Watermarking and Steganography", Morgan Kaufmann Publishers, Nov 2007.
- Juergen Seits, "Digital Watermarking for Digital Media", IDEA Group Publisher, New York, 2005.
- Jesica Fridrich, "Steganography in Digital Media: Principles, Algorithms, and Applications", Cambridge University press, 2010.
- Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, "Techniques and Applications of Digital Watermarking and Content Protection", Artech House, London, 2003.
- Peter Wayner, "Disappearing Cryptography – Information Hiding: Steganography & Watermarking", Morgan Kaufmann Publishers, New York, 2002.
- Stefan Katzenbelser and Fabien A. P. Peticolas, "Information hiding techniques for Steganography and Digital Watermarking", ARTECH House Publishers, January 2004.

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COURSE OUTCOMES

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

- CO1. Describe watermarking and steganography fundamental concepts and principles
- CO2. Explain & Detect different watermarking attacks.
- CO3. Identify and assess the different models of watermarking.
- CO4. Carry out system security for various threat environments using steganography techniques.
- CO5. Explain the various applications of watermarking and steganography.

Course Articulation Matrix

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

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

NATURAL LANGUAGE PROCESSING

62241203

COURSE OBJECTIVES

- Develop a comprehensive understanding of fundamental concepts and techniques in Natural Language Processing.
 - Introduce advanced machine learning and deep learning approaches for NLP tasks.
 - Prepare students for designing and implementing NLP solutions for real-world applications.
-

Unit-I

Introduction to Natural Language Processing: Foundations of NLP, levels of linguistic analysis (phonology, morphology, syntax, semantics, pragmatics), challenges in NLP, applications of NLP, brief history and evolution of NLP, ethics in NLP.

Unit-II

Text Processing and Language Modeling: Text preprocessing techniques, tokenization, stemming, lemmatization, part-of-speech tagging, named entity recognition, n-gram models, statistical language models, neural language models, transformers and attention mechanisms.

Unit-III

Syntactic and Semantic Analysis: Constituency and dependency parsing, context-free grammars, probabilistic context-free grammars, semantic role labeling, word sense disambiguation, lexical semantics, distributional semantics, word embeddings (Word2Vec, GloVe, FastText).

Unit-IV

Machine Learning for NLP: Supervised learning algorithms for text classification and sequence labeling, unsupervised learning for topic modeling and clustering, deep learning architectures for NLP (RNNs, LSTMs, GRUs, CNNs), transfer learning and fine-tuning in NLP, evaluation metrics for NLP tasks.



Unit-V

Advanced NLP Applications: Machine translation (statistical and neural approaches), sentiment analysis and opinion mining, text summarization, question answering systems, dialogue systems and chatbots, information retrieval and extraction, multi-modal NLP (text-to-speech, speech recognition, image captioning), recent advancements in NLP (e.g., GPT, BERT, XLNet).

RECOMMENDED BOOKS

- Daniel Jurafsky, James H. Martin, "Speech and Language Processing", Prentice Hall.
- Christopher D. Manning, Hinrich Schütze, "Foundations of Statistical Natural Language Processing", MIT Press.
- Yoav Goldberg, "Neural Network Methods for Natural Language Processing", Morgan & Claypool Publishers.
- Emily M. Bender, Alex Lascarides, "Linguistic Fundamentals for Natural Language Processing: 100 Essentials from Morphology and Syntax", Morgan & Claypool Publishers.
- Jacob Eisenstein, "Introduction to Natural Language Processing", MIT Press.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. Explain the fundamental concepts of Natural Language Processing, including linguistic levels of analysis and challenges in NLP.

CO2. Apply various text processing techniques and implement language models for NLP tasks.

CO3. Analyse and implement syntactic and semantic analysis methods in natural language.

CO4. Design and develop machine learning and deep learning models for various NLP applications.

CO5. Evaluate and implement advanced NLP applications, addressing real-world problems and ethical considerations.

Course Articulation Matrix

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

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DEEP LEARNING 62241208

COURSE OBJECTIVES

- Introduce major deep neural network frameworks and issues in basic neural networks.
 - To solve real world applications using Deep learning
-

Unit-I

Introduction to machine learning, scope and limitations, Types of machine learning, Linearity vs non linearity, Neural Networks Basics – layers in Neural networks – Activation function, Loss function - Function approximation - Classification and Clustering problems - Deep networks basics - Shallow neural networks,

Unit-II

Multilayer network, Gradient descent, backpropagation, weight initialization, training, testing, underfitting and overfitting, batch normalization, dropout, L1 and L2 regularization, unstable gradient problem tuning hyper parameters, momentum, Mini-batch Gradient Descent – Exponential Weighted Averages – Gradient Descent with Momentum – RMSProp and Adam Optimization – Hyperparameter tuning.

Unit-III

Foundations of Convolutional Neural Networks – CNN operations – Architecture – Simple Convolution Network – Deep Convolutional Models – ResNet, AlexNet, InceptionNet and others. data augmentation, Transfer Learning, Transfer Learning Models, Generative Adversarial Network.

Unit-IV

Recurrent neural network, long short-term memory, gated recurrent unit, translation, Auto encoders beam search and width, Bleu score, attention model.

Unit-V

Reinforcement Learning, RL-framework, MDP, Bellman equations, Value Iteration and Policy Iteration, Actor-critic model, Q-learning, SARSA

RECOMMENDED BOOKS

- Ian Goodfellow Yoshua Bengio Aaron Courville, Deep Learning, MIT Press, 2017.
- Michael Nielsen, Neural Networks and Deep Learning, Determination Press, first Edition, 2013



Edition, 2013

- Deep Learning Foundations and Concepts, Christopher M. Bishop, Hugh Bishop

COURSE OUTCOMES

After completing the course, the student will be able to:

CO1: Understand the fundamental concepts and types of machine learning, including linearity and non-linearity.

CO2: Apply principles of neural networks, including multilayer networks, gradient descent, and back propagation, to solve real-world problems.

CO3: Analyze and design convolutional neural networks (CNNs) for image recognition.

CO4: Evaluate the use of recurrent neural networks (RNNs), LSTMs, and GRUs for sequence modeling tasks, and implement attention mechanisms for improved performance.

CO5: Create solutions using reinforcement learning algorithms, including Q-learning and SARSA.

Course Articulation Matrix

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

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