MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)
NAAC Accredited with A++ Grade
Department of Electronics Engineering

Online Board of Studies Meeting of Electronics Engineering held on 11.09.2024

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Department of Electronics Engineering

The Board of Studies (BoS) meeting of the Electronics Engineering department was held on 11th Sept 2024 at 1:00 PM onwards. Following external and internal members have attended online meeting through google link : https://meet.google.com/eez-qjnz-ukg .

1. Dr. Aditya Trivedi, Professor, Department of Information Technology, ABV-IIITM , Gwalior, External Member.
2. Dr. Urmila Patil, Professor, Department of Electronics and Communication, Dr. D.Y.Patil Institute of Technology, Pune, External Member.
3. Dr. P. K Singhal, Professor
4. Dr.Vandana Vikas Thakare, Professor & Head
5. Dr. Laxmi Shrivastava, Professor
6. Dr. Karuna Markam, Associate Professor
7. Dr. R. P. Narwaria, Assistant Professor,
8. Prof Madhav Singh, Assistant Professor
9. Prof Pooja Sahoo, Assistant Professor
10. Prof D. K. Parsedia, Assistant Professor
11. Dr. Vikas Mahor, Assistant Professor
12. Dr. Rahul Dubey, Assistant Professor
13. Dr. Hemant Choubey, Assistant Professor
14. Dr. Deepak Batham, Assistant Professor
15. Dr. Varun Sharma, Assistant Professor
16. Dr. Shubhi Kansal, Assistant Professor
17. Dr. Himanshu Singh, Assistant Professor
18. Dr. Varun Mishra, Assistant Professor
19. Dr. Mukesh Kumar Mishra, Assistant Professor
20. Dr. Dablu Kumar, Assistant Professor
21. Prof. Prateek Bhadauria, Assistant Professor
22. Dr. R. Jenkin Suji, Assistant Professor
23. Dr. Jaydeep Parmar, Assistant Professor
24. Dr. Pawan Dubey, Assistant Professor
25. Dr. Tej Singh, Assistant Professor
26. Dr.Vikram, Assistant Professor
27. Dr. Vibha Tiwari, Assistant Professor
28. Dr. Priyanka Garg, Assistant Professor
29. Dr. Nookala Venu, Assistant Professor
30. Mr. Manoj Kumar, Assistant Professor

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BoS Agenda Items	
Item 1	To propose the scheme structure for the Batch admitted in 2024-25 academic session under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) **(The total credits from I-VIII semester should not be less than 160 for this batch).** **The scheme structure of B.Tech. Ist Semester for the Batch admitted in 2024-25 under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) has been discussed and finalized. AnnexureI**
Item 2	To review & finalize the syllabi for all courses of B. Tech I Semester (for batch admitted in 2024-25) under the flexible curriculum along with their COs. **The syllabi for all courses of B. Tech I Semester (for batch admitted in 2024-25) under the flexible curriculum along with their COs has been discussed and finalized. Annexure II**
Item 3	To review and finalize the Experiment list/ Lab manual for all the Laboratory Courses and Micro Project-I to be offered in B.Tech. I semester along with their COs. **The Experiment list/ Lab manual for all the Laboratory Courses and Micro Project-I to be offered in B.Tech. I semester along with their COs has been discussed and finalized. Annexure III**
Item 4	To discuss and recommend the scheme structure for the Batch admitted in 2024-25 academic session & syllabi of I 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). **The scheme structure for the Batch admitted in 2024-25 academic session & syllabi of I 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) has been discussed and finalized. Annexure IV**
Item 5	To review and finalize the syllabus/module of Classified Novel Engaging Course to be offered in I semester of PG programme. **The syllabus/module of Classified Novel Engaging Course to be offered in I semester of PG programme has been discussed and finalized Annexure V**
Item6	To review and finalize the scheme structure for the Batch admitted in 2024-25 academic session syllabus of Research Methodology and Ethics for Ph.D. Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU). **The scheme structure for the Batch admitted in 2024-25 academic session syllabus of Research Methodology and Ethics for Ph.D. Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) has been discussed and finalized. Annexure VI**
Item 7	Any other matter.

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The following suggestions were provided by the external BOS members:

1. **As per the suggestion given by external members, level of COs in few subject have been reconstructed.**
2. **M.Tech IIIrd and IVth semester scheme must include a MOOC course along with the dissertation work.**
3. **It has been suggested that Minor evaluation may be MCQ and Major Evaluation in PP mode.**
4. **For Specialisation Course the prerequisite must be taken care of in the scheme structure.**

Dr. Aditya Trivedi
Professor, ABV-IITM, Gwalior
External Member

Dr. Urmila Patil
Professor, Dr. D.Y.Patil Institute of Technology, Pune
External Member

Dr. P. K. Singhal	**Dr. Laxmi Shrivastava**	**Dr. R. P. Narwaria**	**Dr. Karuna Markam**	**Prof Madhav Singh**
Prof Pooja Sahoo	**Prof D. K. Parsedia**	**Dr. Vikas Mahor**	**Dr. Rahul Dubey**	**Dr. Hemant Choubey**
Dr. Deepak Batham	**Dr. Varun Sharma**	**Dr. Shubhi Kansal**	**Dr. Pawan Dubey**	**Dr. Tej Singh**
Dr. Vikram	**Dr. Vibha Tiwari**	**Dr. Priyanka Garg**	**Dr. Nookala Venu**	**Dr. Himanshu Singh**
Dr. Varun Mishra	**Dr. Mukesh Kumar Mishra**	**Dr. Dablu Kumar**	**Dr. R. Jenkin Suji**	**Prof. Prateek Bhadauria**
Dr. Jaydeep Parmar	**Mr. Manoj Kumar**			

Dr. Vandana Vikas Thakare
Head of the Department

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Annexure I

Item 1	To propose the scheme structure for the Batch admitted in 2024-25 academic session under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) **(The total credits from I-VIII semester should not be less than 160 for this batch).**

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Scheme of Evaluation

B. Tech. I Semester (EL) *(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	14241101	DC	Instrumentation & Sensors	20	20	30	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	14241102	ESC	**Computer Programming**	20	20	30	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
3.	14241103	DC	Electronic Devices	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
4.	14241104	DC	Network Theory	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
5.	14241105	ESC	**Basic Electrical & Electronics Engineering**	20	20	30	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
6.	14241106	DLC	**Computer Programming Lab**	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	14241107	DLC	**Electrical & Electronics Engineering Lab**	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	14241108	SP	**Semester Proficiency**[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	14241109	PBL	**Micro Project-I**	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	14241110	ESC	**Engineering Physics Lab**	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
11.	NECXXXXX	NEC	**Novel Engaging Course (Activity Based Learning)**	-	-	-	-	50	_	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**380**	**120**	**1000**	**11**	**03**	**10**	**19**	-	-	-
12.	14241111	MAC	**Universal Human Values & Professional Ethics (UHVPE)**	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.		MWS	**Mandatory Workshop on Indian Constitution and Traditional Knowledge at Department Level (Duration: Two Days)**											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.																	
Skill Internship Program (Soft Skill): Minimum 45 hours duration: To be credited in II Semester.																	

[$]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

[#] 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	SLP	PDC	PBL	MAC	MWS
0	0	3	3	0	0	0	2	1	1	0	0	0	1	1	1

Mode of Learning							Mode of Examination						Total Credits
Theory		NEC	Lab				Theory			NEC	Lab		
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	PP	MCQ	OB	SO	AO	SO	
13	0	1	1	0	1	3	6	7	0	1	3	3	39
68.42%	0%	5.26%	5.26%	0%	5.26%	15.78%	31.57%	36.84 %	0%	5.26%	15.78%	15.78%	Credits %

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Scheme of Evaluation

B. Tech. II Semester (EL) *(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional					P				
1.	14241201	DC	Communication Networks	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
2.	14241202	DC	Electronic Circuits	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	14241203	DC	Signals and Systems	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	14241204	DC	Digital Circuits and Systems	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	14241205	BSC	**Linear Algebra and Differential Equation**	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
6.	14241206	DLC	Digital Logic Design Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	14241207	DLC	**Problem Solving through Python Programming**	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	14241208	SP	**Semester Proficiency[$]**	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	14241209	PBL	**Micro Project-II[#]**	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	14241210	ESC	**Engineering Chemistry Lab**	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
11.	14241211	HSMC	**Language Lab**	-	-	-	-	70	30	100	-	-	2	1	Blended	AO	-
12.	NECXXXXX	NEC	**Novel Engaging Course (Activity Based Learning)**	-	-	-	-	50	_	50	-	1	-	1	Interactive	SO	-
13.	SIP1XXXX	SIP	**Skill Internship Program (Soft Skill)**	-	-	-	-	60	_	60	-	-	-	2**	Experiential	SO	-
Total				**100**	**100**	**150**	**150**	**510**	**150**	**1160**	**12**	**04**	**12**	**24**	-	-	-
14.	14241212	MAC	**Sustainability & Environmental Science**	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5Hrs
15.		MWS	**Mandatory Workshop on Indian Knowledge System at Department Level (Duration: Two Days)**											GRADE	Interactive	MCQ	-

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 **OB:** Open Book

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

.** These credits will be transferred from **Skill Internship Program (Soft Skill)**.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
1	1	1	4	0	0	0	2	1	1	1	0	0	1	1	1

Mode of Learning							Mode of Examination						Total Credits
Theory		NEC	Lab				Theory			NEC	Lab		
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	PP	MCQ	OB	SO	AO	SO	
15	0	1	1	1	3	3	6	9	0	1	3	3	46
62.5%	0%	4.16%	4.16%	4.16%	12.5%	12.5%	25%	37.5 %	0%	4.16%	12.5%	12.5%	Credits %

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Scheme of Evaluation

B. Tech. III Semester (EL) *(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	14242101	BSC	Probability and Random Processes	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
2.	14242102	DC	Data Structures	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	14242103	DC	Analog Communication	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	14242104	DC	Analog Integrated Circuits	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
5.	14242105	DC	Data Communication	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
6.	14242106	DLC	Analog Communication Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	14242107	DLC	Analog Integrated Circuits Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	14242108	SP	**Semester Proficiency**[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	14242109	PBL	**Macro Project-I**[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	14242110	SLP	**Self-learning/Presentation**[$$$] **(SWAYAM/NPTEL/MOOC)**	-	-	-	-	40	-	40	-	-	2	1	Mentoring	SO	-
11.	NECXXXXX	NEC	**Novel Engaging Course (Activity Based Learning)**	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**350**	**90**	**940**	**11**	**05**	**10**	**21**	-	-	-
12.	14242311	MAC	**Cyber Security**	20	20	30	30	-	-	100	2	-	-	**GRADE**	Blended	MCQ	1.5Hrs
13.		MWS	**Mandatory Workshop on Internet of Things(IoT) at Department Level (Duration: Two Days)**											**GRADE**	Interactive	MCQ	-
Skill Internship Program(Institute Level) (Qualifier): Minimum 30 hours duration: To be credited in IV Semester																	

[$]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-I will be presented and evaluated through an interdisciplinary project evaluation committee.

[$$$] Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance and presentation.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	1	0	4	0	0	0	2	1	1	0	0	0	1	1	1

Mode of Learning							Mode of Examination						Total Credits
Theory		NEC	Lab				Theory			NEC	Lab		
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	PP	MCQ	OB	SO	AO	SO	
15	0	1	1	0	1	2	6	9	0	1	2	4	42
71.42%	0%	4.76%	4.76%	4.16%	4.76%	9.5%	28.57%	42.85 %	0%	4.16%	9.52%	19.04%	Credits %

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Scheme of Evaluation

B. Tech. IV Semester (EL) *(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	14242201	DC	Linear Control Theory	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
2.	14242202	DC	Microprocessor and Interfacing	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	14242203	DC	Digital Communication	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	14242204	DC	Electromagnetic Fields	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
5.	14242205	DC	VLSI Design	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
6.	14242206	DLC	Microprocessor and Interfacing Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	14242207	DLC	Digital Communication Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	14242208	DLC	VLSI Design Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
9.	14242209	SP	**Semester Proficiency**[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
10.	14242210	PBL	**Macro Project-II**[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
11.	14242211	PC	**Professional Certification**	-	-	-	-	50	-	50	-	-	2	1	Blended	SO	-
12.	NECXXXXX	NEC	**Novel Engaging Course (Activity Based Learning)**	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
13.	SIP3XXXX	SIP	**Skill Internship Program**	-	-	-	-	60	-	60	-	-	-	2**	Experiential	SO	
Total				**100**	**100**	**150**	**150**	**490**	**188**	**1110**	**11**	**05**	**12**	**24**	-	-	-
14.	14242212	MAC	**Project Management, Economics & Financing**	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
15.	14242213	MWS	**Mandatory Workshop on Computer Vision at Department Level (Duration: Two Days)**											GRADE	Interactive	MCQ	-
16.		MWS	**Mandatory Workshop on Life Skills at Department Level (Duration: Two Days)**											GRADE	Interactive	MCQ	-
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 Program.

PC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
1	0	0	5	0	0	0	3	1	1	1	0	0	1	1	2

Mode of Learning							Mode of Examination						Total Credits
Theory		NEC	Lab				Theory			NEC	Lab		
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	PP	MCQ	OB	SO	AO	SO	
15	0	1	1	0	3	3	6	9	0	1	3	5	42
62.5%	0%	4.16%	4.16%	0%	4.16%	9.5%	25%	37.5 %	0%	4.16%	12.5%	20.83%	Credits %

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Scheme of Evaluation

B. Tech. V Semester (EL) *(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional											
1.	14243101	DC	Digital Signal Processing	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
2.	14243102	DC	Embedded Systems	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
3.	14243103	DC	**Data Science**	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	142431XX	DE	**Departmental Elective* (DE-1)**	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
5.	14243104	SPC	**Specialization Course (SPC-1)**	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
6.	14243105	DLC	Digital Signal Processing Lab	-	-	-	-	70	30	-	-	100	-	-	2	1	Experimental	AO	-
7.	14243106	DLC	**Data Science Lab**	-	-	-	-	70	30	-	-	100	-	-	2	1	Experimental	AO	-
8.	14243107	SP	**Semester Proficiency$**	-	-	-	-	50	-	-	-	50	-	-	2	1	Face to Face	SO	-
9.	14243108	PBL	**Cornerstone Project**	-	-	-	-	70	30	-	-	100	-	-	4	2	Experiential	SO	-
Total				80	**80**	**120**	**120**	**260**	**90**	**25**	**75**	**850**	**11**	**04**	**10**	**20**	-	-	-
10.	14243109	MAC	**Supply Chain Management**	20	20	30	30	-	-			100	2	-	-	GRADE	Blended	MCQ	1.5Hrs
11.		MWS	**Mandatory Workshop on Blockchain at Department Level (Duration: Two Days)**													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																			

$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

SMC	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

Mode of Learning							Mode of Examination						Total Credits
Theory		NEC	Lab				Theory			NEC	Lab		
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	PP	MCQ	OB	SO	AO	SO	
12	3	0	1	0	2	2	6	9	0	0	2	3	40
60%	15%	0%	5%	0%	10%	10%	30%	45 %	0%	4.16%	10%	15%	Credits %

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Scheme of Evaluation

B. Tech. VI Semester (EL) *(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional											
1.	14243201	DC	Mobile Communication and 5G Networks	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
2.	14243202	DC	**Artificial Intelligence & Machine Learning**	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	142432XX	DE	**Departmental Elective* (DE-2)**	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
4.	142432XX	OC	**Open Category Course (OC-1)**	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
5.	14243203	SPC	**Specialization Course (SPC-2)**	20	20	30	30	-	-	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
6.	14243204	DLC	Embedded System Lab	-	-	-	-	70	30	-	-	100	-	-	2	1	Experimental	AO	-
7.	14243205	DLC	**Artificial Intelligence & Machine Learning Lab**	-	-	-	-	70	30	-	-	100	-	-	2	1	Experimental	AO	-
8.	14243206	SP	**Semester Proficiency$**	-	-	-	-	50	-	-	-	50	-	-	2	1	Face to Face	SO	-
9.	14243207	PBL	**Capstone Project**	-	-	-	-	70	30	-	-	100	-	-	4	2	Experiential	SO	-
Total				**80**	**80**	**120**	**120**	**260**	**90**	**25**	**75**	**850**	**12**	**03**	**10**	**20**	-	-	-
10.	14243208	MAC	**Disaster Management**	20	20	30	30	-	-	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
11.		MWS	**Mandatory Workshop on Intellectual Property Rights at Department Level (Duration: Two Days)**													GRADE	Interactive	MCQ	-

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

Summer Semester of six-eight week duration will be conducted for makeup of V & VI 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	MAC	MWS
0	0	0	2	1	1	1	2	0	1	0	0	0	1	1	1

Mode of Learning							Mode of Examination						Total Credits
Theory		NEC	Lab				Theory			NEC	Lab		
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	PP	MCQ	OB	SO	AO	SO	
12	3	0	1	0	2	2	6	9	0	0	2	3	40
60%	15%	0%	5%	0%	10%	10%	30%	45 %	0%	4.16%	10%	15%	Credits %

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Scheme of Evaluation

B. Tech. VII Semester (EL) *(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional											
1.	142441XX	DE	Departmental Elective (DE-3)	20	20	30	30	-	-	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
2.	142441XX	DE	Departmental Elective* (DE-4)	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
3.	142441XX	OC	Open Category Course (OC-2)	20	20	30	30	-	-	25	75	100	2	1	-	3	Face to Face	PP	2 Hrs
4.	14244101	SPC	Specialization Course# (SPC-3)	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	14244102	SEP	Skill Enhancement Program/Research Internship/ On Job Training	-	-	-	-		50	-	-	50	-	-	2	1**	Face to Face	SO	-
6.	14244103	DLC	Creative Problem Solving	-	-	-	-		50	-	-	50	-	-	2	1	Experiential	AO	-
Total				**60**	**60**	**90**	**90**	**120**	**100**	**50**	**150**	**500**	**10**	**02**	**04**	**14**	-	-	-
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.

** These credits will be transferred from Skill Enhancement Program/Research Internship/On Job Training

#Course run through MITS-DU MOOCs

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

Mode of Learning							Mode of Examination						Total Credits
Theory		NEC	Lab				Theory			NEC	Lab		
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	PP	MCQ	OB	SO	AO	SO	
12	3	0	1	0	1	0	6	6	0	0	1	1	31
85.17%	21.42%	0%	7.14%	0%	7.14%	0%	42.85%	42.85 %	0%	0%	7.14%	7.14%	Credits %

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Department of Electronics Engineering

Scheme of Evaluation

B. Tech. VIII Semester (EL) *(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment													
1.	142442XX	DE	Departmental Elective* (DE-5)	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
2.	142442XX	OC	Open Category Course* (OC-3)	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
3.	14244201	PBL	Industry Internship/Research Internship/ Innovation & Start-up	-	-	-	-	280	120	-	-	400	-	-	20	10	Experiential	SO	-
4.	14244202	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	NEC	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		NEC	Lab					Theory			NEC	Lab		
Face to Face	Online	Interactive	Face to Face	Blended	Experiential	Experimental	Interactive	PP	MCQ	OB	SO	AO	SO	
0	6	0	0	0	10	0	2	0	6	0	0	0	12	36
0%	33.33%	0%	0%	0%	55.55%	0%	11.11%	0%	33.33 %	0%	0%	0%	7.14%	Credits %

Annexure II

Item 2	To review & finalize the syllabi for all courses of B. Tech I Semester (for batch admitted in 2024-25) under the flexible curriculum along with their COs.

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Syllabus (EL)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241101	DC	Instrumentation & Sensors	20	20	30	30	-	-	100	3	-	-	3

Instrumentation & Sensors (14241101)

Course Objective:

- To understand the significance of measurement techniques, errors in measurement, and statistical analysis process, sensors, classification, operating principles, and their practical use to design smart electronic systems.

Unit 1: Measurement Systems: Introduction, Significance of measurement, block diagram of measurement system, methods of measurements, elements and their functions of measurement systems, applications, characteristics of measurement systems-static and dynamic, Static characteristics- accuracy, precision, sensitivity, reproducibility, drift, static error, dead zone, linearity, resolution, hysteresis, loading effects, Dynamic characteristics- Speed of response, measuring lag, fidelity, dynamic error, calibration.

Unit 2: Errors in Measurement and their Statistical Analysis: Types of Error- Gross, Systematic (Instrumental, Environmental, Observational error), and random error, Statistical treatment of data-measurement tests, histogram, arithmetic mean, dispersion measurement, range, deviation, average deviation, standard deviation, variance, Noise, signal to noise ratio.

Unit 3: Thermal Sensors: Introduction, Sensor Classifications, Sensors Parameters, Selection criterion of Sensors, General requirements for interfacing, Temperature sensors, Thermo resistive sensors- Resistance Temperature Detectors, Thermistor, Thermoelectric sensors- Thermocouple, Electric Sensors- Capacitive position, proximity, and displacement sensors, LVDT.

Unit 4: Force and Pressure Sensors: Introduction**,** Force sensor- Strain gauge**,** Semiconductor strain gauge**,** Strain gauge accelerometers, Pressure sensors- Mechanical pressure sensors, Piezoresistive pressure sensor, Capacitive pressure sensor.

Unit 5: Humidity and Moisture Sensors: Humidity and moisture sensors- Resistive humidity sensor, capacitive moisture sensors, Thermal conduction moisture sensors, Light dependent resistor (LDR).

Text Book:

1. A.K. Sawhney: "A Course in Electrical and Electronic Measurements and Instrumentation", 18th Edition, Dhanpat Rai Publications, 2001.
2. Nathan Ida, "Sensors, Actuators and Their Interfaces, A multidisciplinary introduction", 2nd Edition, IET Publication.

Reference Books:

1. Subhash Chanda Mukhopadhyay, "Intelligent Sensing, Instrumentation and Measurements," Springer Publication.
2. Sanjay N. Talbar, Akhilesh R. Upadhyay, Instrumentation and Measurement, Dhanpat Rai Publishing Company. Third Edition 2004.
3. Process Control Instrumentation Technology, Curtis D. Johnson, PHI
4. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi, Volker Zeimann, CRC Press.

Course Outcomes (COs):

After completion of this course students will be able to:

CO1. Examine the measurement systems, significance, and their characteristics.
CO2. Evaluate the errors in measurement systems.
CO3: Analyse the selection criteria and parameters for various sensors.
CO4: Describe the working of force, pressure, humidity and moisture sensors.
CO5: Differentiate sensors based on their applications.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241103	DC	Electronics Devices	20	20	30	30	-	-	100	2	1	-	3

Electronics Devices (14241103)

Course Objective: To understand of the fundamental principles and operational characteristics of electronic devices, and apply this knowledge in practical electronic applications and further advanced studies in electronics.

Unit I: Semiconductor Physics: Elemental & Compound Semiconductor Materials, Bonding Forces and Energy Bands in Intrinsic and Extrinsic Silicon, Charge Carrier in Semiconductors, Carrier Concentration, Extrinsic Semiconductor, Hall Effect, Mechanism of Current Flow, Drift Current, Diffusion Current, Einstein Relation, Continuity Equation.

Unit II: Semiconductors Diodes: P-N Junction properties, Diode Characteristics, Equilibrium condition, biased junction, Steady state condition, P-N Junction breakdown mechanism, Capacitance of junction barrier, Diode circuit parameters, Basic circuits of Rectifier, Clippers and Clampers.

Unit III: Types of Diodes: Basic operation and characteristics of; Zener diode, Zener diode as a voltage regulator, Tunnel diode, Varactor diode, Schottky diode, Light emitting diode, Photo-diode.

Unit IV: Transistors (BJT & FET): **Bipolar Junction Transistors;** Construction, basic operation, current components and equations, CB, CE and CC configuration, input and output characteristics, Early effect, Region of operations: active, cut-off and saturation region. **Field effect transistors;** Construction and characteristics of JFET, working principle of JFET.MOSFET construction and characteristics, MOSFET enhancement and depletion mode.

Unit V: Power Electronics Devices: Basic principle and working of SCR, IGBT, Uni-junction Transistor (UJT) and Thyristors. UJT: Principle of operation, characteristics.

Text Books:

1. Electronics Devices and Circuits: Boylested & Nashelsky, 11th Edition, Pearson Education India
2. Electronic devices and circuits: S. Salivahanan, 2nd Edition, Tata McGraw-Hill Education, 2011.

3. Microelectronic Circuits: Theory and Application: Sedra & Smith, 7th Edition, Oxford University Press.

Reference Books:

1. Micro Electronics: Millman, & Grabel, 2nd Edition, McGraw Hill Education
2. Integrated Electronics: Millman &Halkias, McGraw Hill Education.

Course Outcomes

After the completion of this course students will be able to:

- **CO1.** **Explain** the semiconductor materials with their importance.
- **CO2.** **Design** the circuits using diodes.
- **CO3.** **Analyze** the construction, operation, and characteristics of various diodes.
- **CO4.** **Compare** the characteristics of Bipolar Junction Transistors (BJT) and Field Effect Transistors (FET).
- **CO5.** **Explain** the working and characteristics of power electronics devices.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241104	DC	Network Theory	20	20	30	30	-	-	100	2	1	-	3

Network Theory (14241104)

Course objective: To understand basic electric circuits, study of network theorems, transient analysis, analysis of two port networks.

Unit-I Introduction – Basics of Circuit Elements**,** Characteristics of Independent & Dependent Sources, KCL & KVL for circuits with dependent & independent sources, Dot convention for coupled inductor and their characteristics, co-efficient of coupling.

Unit-II Network theorems: Superposition theorem, Thevenin theorem, Norton theorem, Millman theorem, Reciprocity theorem and Maximum Power Transfer theorem for various types of dependent and independent power source networks.

Unit-III Laplace Transform & Passive Filters: The Laplace transform, Properties of Laplace transform, Initial and final value theorem. Waveform synthesis & Laplace Transform of various waveform function, Low pass, high pass, band pass and band elimination filters,

Unit-IV Transient analysis: Transients in RL, RC and RLC circuits, initial conditions, time constants, Steady state analysis, Node and mesh analysis of RL, RC and RLC networks with sinusoidal sources.

Unit-V Two Port Network: Concept of Ports, Calculation of network functions for one port and two port, Two port parameters – Z, Y, hybrid and chain Parameters, Relationship between two port network parameters, T and π networks, Characteristics impedance & propagation constant.

Text Books:

1. Network Analysis: M.E. Van Valkenberg, 3rd Edition, Prentice Hall of India.
2. Network and Systems: D. Roy Chaudhary,2nd Edition**,** New Academic Science Ltd.

Reference Books:

1. Introduction to Modern Network Synthesis: M.E. Van Valkenberg, Prentice Hall of India.
2. Network Analysis & Synthesis: F. Kuo, 2nd Edition, Wiley & Sons.
3. Network Analysis & Synthesis: Ravish R Singh, 1st Edition, McGraw Hill Education.

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Course Outcomes

After the completion of this course students will be able to:

CO1. **Analyze** the circuits using Kirchoff‟s laws.
CO2. **Apply** Network theorems for the simplification of circuits.
CO3. **Apply** the Laplace transform to linear circuits and systems.
CO4. **Evaluate** transient response and steady state response.
CO5. **Determine** ABCD, Z,Y and h parameters of an electrical circuit.

Course Articulation Matrix

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

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241102	ESC	Computer Programming	20	20	30	30	-	-	100	2	-	-	2

Computer Programming (14241102)

Course Objectives: Equip students with the skills to design and implement programming solutions in C++ using fundamental algorithms, approaches, and documentation techniques.

Unit I: Introduction to Programming: Types of computer programming languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to C++ Programming: Data Types, Constants, Keywords, variables, input/output, Operators & Expressions, Precedence of operators.

Unit II: Control Statements and Decision Making: Conditional statements: if, if-else, nested if, Switch statement with break and default, Loops: while, do-while, for, nested for, Loop control: break, continue, return, Decision making using logical operators, Real-world examples and applications of control structures.

Unit III: C++ Functions: Function Declaration and Definition, Function syntax, Parameter types and names, Return types and values, Function Types, Function Scope and Lifetime, Function Templates, Recursion, Recursive function definition.

Unit III: Strings and Arrays: C-style strings (character arrays), C++ string class, Declaring and initializing strings, String operations: concatenation, comparison, String manipulation functions: strlen(), strcpy(), strcat(). One-dimensional and multi-dimensional arrays, Array declaration and indexing, Array-based operations: sorting, searching**.**

Unit IV: C++ Pointers: Basics of Pointers & Addresses, reference variable, Pointer to Pointer, Pointer to Array, Array of Pointers, Pointer to Strings. Dynamic memory allocation using new and delete operators.

Unit V: Object Oriented Programming: Features of OOPS, Comparison of Procedural Oriented Programming with Object Oriented Programming, Abstract Data Types, Specification of Class, Visibility Modes, Defining Member Functions, Scope Resolution Operator, Creating of Objects, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Inline Function, Friend Function.

Text Books:

1.C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
2.Programming with C++, D Ravichandran, T.M.H.
3.Computing Concepts with C++ Essentials, Horstmann, John Wiley.

Reference Books:

1. The Complete Reference in C++, Herbert Schildt, TMH.
2. Object-Oriented Programming in C++, E Balagurusamy.
3. Fundamentals of Programming C++, Richard L. Halterman.

COURSE OUTCOMES:

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

CO1: Design algorithms and flowchart for a given problem.
CO2: Implement the concepts of procedural programming with control statement.
CO3: Develop optimized recursive functions and function templates to solve challenging computational tasks.
CO4: Implement the pointer concept for effective C++ programming.
CO5: Design object-oriented programs that effectively model real-world scenarios with encapsulation and abstraction.

Course Articulation Matrix

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

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241105	ESC	Basic Electrical and Electronics Engineering	20	20	30	30	-	-	100	3	-	-	3

Basic Electrical & Electronics Engineering (14241105)

Course Objectives: Equip students with foundational knowledge of DC/AC circuits, magnetic circuits, transformers, electrical machines, and electronic circuits in electrical engineering.

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:Basic definitions, AC excitation in magnetic circuits, self-inductance and mutual inductance, Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F. Flux, MMF and their relation, analysis of magnetic circuits.

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.

Text Books:

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

Reference Books

1. Principles of Electrical Engineering- Vincdent Del Toro- Prentice Hall.
2. Basic Electrical Engineering -A,E. Fitzgerald, Higginbotham and Grabel -TMH
3. Integrated Electronics- Millmann & Halkias

Course Outcomes

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

CO 1. **Solve** dc &ac circuits by applying fundamental laws & theorems
CO 2. **Compare** the behavior of electrical and magnetic circuits for given input
CO 3. **Explain** the working principle, construction, applications of rotating electrical machines
CO 4. **Explain** the working principle, constructional details, losses & applications of single phase transformer.
CO 5. **Select** the logic gates for various applications in digital electronic circuits.
CO 6. **Explain** characteristics of Diode and Transistor.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

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Annexure III

Item 3	To review and finalize the Experiment list/ Lab manual for all the Laboratory Courses and Micro Project-I to be offered in B.Tech. I semester along with their COs.

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241109	DLC	Micro Project-I#					70	30	100	-	-	2	1

Micro Project-I# (14241109)

Course Objectives: To Fabricate Electronic Circuits on PCB.

List of Microprojects

1. Design a half and full wave rectifier circuits.
2. Design hardware model for Simple Rain Water Alarm System.
3. Design hardware model for Flashing Lamps Using 555 Timer.
4. Design hardware model for DC Power Supply.
5. Design hardware model for Simple Light Sensitivity Metronome Using Transistors.
6. Design hardware model for Simple Temperature Monitor.
7. Design hardware model for Invisible Burglar Alarm.
8. Design hardware model for Automatic Door Bell Ringer.
9. Design hardware model for Electronic Fuse.
10. Design hardware model for Geyser timer circuit
11. Design hardware model for Water Sensor Alarm.
12. Design a circuit for BJT as a Touch Switch.
13. Design a circuit for Water Level Indicator.
14. Design a circuit for LED Blinker Circuit.
15. Design a circuit for Automatic Night Light.
16. Design a circuit for Fire Alarm Detector.
17. Design a circuit for Automatic Smoke Detector.
18. Design a circuit for Laser-based Security System.
19. Design a circuit for Auto Water Pump Switcher.
20. Design a circuit for wireless Power Transfer System.
21. Design a Clap Circuit for Controlling Home Automation (light & fan).

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Course Outcomes

CO1: **Analyze** the electronic components, measuring instruments, and tools.
CO2. **Design** and simulate the schematic, layout using CAD software.
CO3. **Design** and fabricate PCBs for various electronic circuits individually and in a team.
CO4. **Troubleshoot** the fabricated circuit individually and in a team.
CO5. **Implementation** of electronic mini project that benefits society.

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241107	DLC	Electrical and Electronics Lab					70	30	100	-	-	2	1

Electrical and Electronics Lab (14241107)

Course Objective: Develop skills in designing and testing electrical and electronic circuits.

List of Experiment

1. To determine the volt –ampere characteristics of diode in forward bias & reverse bias condition.
2. Verification of Kirchhoff's Current Law & Kirchhoff's Voltage Law.
3. Verification of Superposition Theorem.
4. To determine resistance & inductance of a choke coil.
5. To determine active & reactive power in a single phase A.C circuit.
6. To determine voltage ratio & current ratio of a single phase transformer.
7. To determine the polarity of a single phase transformer.
8. To perform open circuit & short circuit test on a single phase transformer.
9. Measurement of various Electrical Quantities using multimeter.
10. Study of construction details of D.C machine.

Course Outcomes:

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

1. Verify circuit theorems.
2. Perform tests on transformer for determination of losses, efficiency & polarity.
3. Demonstrate the constructional features of electrical machines
4. Acquire teamwork skills for working effectively in groups
5. Prepare an organized technical report on experiments conducted in the laboratory.

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ Lab work & Sessional	Major Evaluation		L	T	P	
14241106	DLC	Computer Programming Lab					70	30	100	-	-	2	1

Computer Programming Lab (14241106)

Course Objectives: Develop skills in modular programming by writing reusable functions and dividing the code into logical modules.

List of Experiments

1. WAP to perform addition, subtraction, multiplication and division of integer and floating values.
2. WAP to perform swapping between two user entered values without using third variable.
3. WAP to take temperature from the user in Fahrenheit, then convert and display the temperature in Celsius and Kelvin.
4. WAP to calculate and display Simple Interest where the principle, rate and time are given by the user.
5. WAP to calculate and print the values of sinθ, cosθ and tanθ using math.h library.
6. WAP to implement Pythagoras Theorem. 7. WAP to display whether a user entered number is even or odd.
7. WAP to check and display whether a user entered number is divisible by 30 or not (using nested if).
8. WAP to find and display the greatest number among the three numbers entered by the user.
9. WAP to check and print whether a user entered number is negative, positive or zero.
10. WAP to print whether a user entered character is vowel or consonant using switch-case.
11. WAP to print mathematical table of a user entered number (example, 5*1=5) (for loop).
12. WAP to find factorial of a user entered number using while loop.
13. WAP to print all the numbers between 1 to 100 whose sum of the is even (do-while loop).
14. WAP to find factorial of a user entered number using recursion.
15. WAP to print the maximum and minimum element of a user entered 1D array and sort the array elements in ascending and descending order.
16. WAP to search an element and print its position in a user entered 2D array.
17. WAP to take enrollment number, name, 5 subject marks form students and calculate and print percentage along with their respective enrollment numbers using structure.

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Course Outcomes

After completing the lab, students will be able to:

CO1 Demonstrate the computer programming concepts data types, sizes, variable name, declaration and statements using C++.

CO2 Implement the programming of string and arrays using C++.

CO3 Implement the use of functions in C++.

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Annexure IV

Item 4	To discuss and recommend the scheme structure for the Batch admitted in 2024-25 academic session & syllabi of I 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)

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Scheme of Evaluation

M. Tech. I Semester *(Communication Control and Networking)* *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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1	60241101	DC	Computational Techniques	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hour
2	60241102	DC	Computer Communication Networks	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hour
3	60241103	DC	Communication System Design and Applications	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hour
4	602411XX	DE	Departmental Elective (DE-1)	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hour
5	60241104	SC	Specialization Course (SC-1)	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hour
6	60241105	DLC	Project Lab-I[#](Wireless Adhoc Network Lab)	-	-	-	-	70	30	100	-	-	4	2	Experiential	SO	-
7	60241106	DLC	Seminar/Presentation[$]	-	-	-	-	70	30	100	-	-	4	2	Blended	SO	-
8	60241107	NEC	Classified Novel Engaging Course (Activity Based Learning)	-	-	-	-	-	50	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**140**	**110**	**750**	**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/Presentationthrough SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

DE-1

S. No.	Course Code	Course Name
1.	60241108	Communication Protocols
2.	60241109	RADAR Signal Processing
3.	60241110	Adaptive Control System

SC-1 (RF Engineering Track)	Millimeter and Terahertz Communication(60241104)

Mode of Learning						Mode of Examination				Total Credits
Theory			Lab			Theory			Lab	
Face to Face	Online	Blended	Experiential	Interactive	Experimental	PP	MCQ	OB	SO	
15	0	2	2	1	0	15	0	0	5	20
75%	0%	10%	10%	5%	0%	75%	0%	0%	15%	Credits %

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Scheme of Evaluation

M. Tech. II Semester *(Communication Control and Networking)*

(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment													
1	60241201	DC	Information Theory and Coding	20	20	30	30	-	-	-	-	100	3	-	-	3	Face to Face	PP	2 Hour
2	60241202	DC	Computer Aided Control System	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hour
3	60241203	DC	Digital Filter Design and Algorithms	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hour
4	602412XX	DE	Departmental Elective*(DE-2)	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
5	60241204	SC	Specialization Course (SC-2)	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hour
6	60241205	DLC	Project Lab-II#(Embedded System LAB)	-	-	-	-	70	30	-	-	100	-	-	4	2	Experiential	SO	-
7	60241206	DLC	Seminar/Presentation$	-	-	-	-	70	30	-	-	100	-	-	4	2	Mentoring	SO	-
8	NECXXXXX	NEC	Classified Novel Engaging Course (Activity Based Learning)	-	-	-	-	-	50	-	-	50	-	1	-	1	Interactive	SO	-
Total				**80**	**80**	**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/Presentationthrough 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.	60241207	Linear Dynamics System
2.	60241208	Spread Spectrum Communications and Jamming
3.	60241209	Signal processing techniques and its applications

SC-2 (RF Engineering Track)	Broadband Wireless Technology

Mode of Learning							Mode of Examination				Total Credits
Theory		Lab					Theory			Lab	
Face to Face	Online	Blended	Experiential	Interactive	Mentoring	Experimental	PP	MCQ	OB	SO	
12	3	0	2	1	2	0	12	3	0	5	20
60%	15%	0%	10%	5%	10%	0%	60%	15%	0%	25%	Credits %

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Scheme of Evaluation

M. Tech. III Semester *(Communication Control and Networking)* *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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1	60242101	DLC	**Preliminary Dissertation** *(Literature Review/ Problem Foundation/ Synopsis/survey paper, etc.)*	-	-	-	-	175	75	250	-	-	28	**14**	Interactive	SO	-
Total				-	-	-	-	**175**	**75**	**250**	-	-	**28**	**14**	-	-	-

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Scheme of Evaluation

M. Tech. IV Semester *(Communication Control and Networking)*

(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 Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	60242201	DLC	Dissertation	-	-	-	-	350	150	500	-	-	32	**16**	Interactive	SO	-
Total				-	-	-	-	**350**	**150**	**500**	-	-	**32**	**16**	-	-	-

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ lab work & Sessional	Major Evaluation		L	T	P	
60241102	DC	Computer Communication Networks	20	20	30	30	-	-	100	2	1	-	3

COMPUTER COMMUNICATION NETWORKS (60241102)

Course Objectives: To develop an understanding of computer networking basics and different components of computer networks, various protocols, modern technologies and their applications.

Unit I

Computer Networks and its Standards: Computer Network, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability and Security, Network Standards.

Unit II

Network Models: Protocol Layering: Scenarios, Principles, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, OSI VersusTCP/IP.

Unit III

Data-Link Layer: Introduction: Nodes and Links, Services, Categories of link, Sublayers, Link Layer addressing: Types of addresses, ARP, Data Link Control (DLC) services: Framing, Flow and Error Control, Data Link Layer Protocols: Simple Protocol, Stop and Wait protocol.

Unit IV

Media Access Control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. Controlled Access: Reservation, Polling, Token Passing.

Unit V

Wireless LANs: Introduction: Architectural Comparison, Characteristics, IEEE 802.11: Architecture, MAC Sublayer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Layers, Connecting Devices: Hubs, Switches.

Text Books:

1. James F. Kurose, Keith W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, Fifth Edition, Pearson Education,2009.
2. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers,2010.
3. Computer Networks by Andrew S. Tanenbaum (Fifth Edition), Pearson Education.

Reference Books:

1. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher,2011.
2. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw Hill,2011.

Course Outcomes:

After the completion of the course, student will able to:

CO1. Analyze various Computer Networks
CO2. Describe Network model and their Architectures.
CO3. Describe Data link layer and itsprotocols.
CO4. Illustrate Media Access ControlSystems.
CO5. Analyze Wireless LAN architecture and its Connecting devices

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ lab work & Sessional	Major Evaluation		L	T	P	
60241103	DC	Communication System Design and Applications	20	20	30	30	-	-	100	2	1	-	3

COMMUNICATION SYSTEM DESIGN AND APPLICATIONS (60241103)

Course Objectives: To understand and analyze the concepts of digital modulation techniques and communication through band limited linear filter channels.

Unit I

Random Variables and Random Process: Random Variables, Discrete and Continuous random variable, PDF, CDF, properties of PDF and CDF, Joint CDF, Cauchy PDF, Rayleigh PDF, Centre limit theorem, Random process, Stationary and Non stationary random processes, Wide Sense Stationary process, Ergodic process, Gaussian process.

Unit II

Digital Transmission Techniques: Geometric Representation of Signal Waveforms, Gram-Schmidt Orthogonalization procedure, BPSK ,BFSK, QPSK, DPSK, , Matched-Filter receiver, Correlation Receiver.

Unit III

Communication Through Band Limited Linear Filter Channels: Baseband binary data transmission system,The Power Spectrum of the Baseband Signal, Optimum Receiver for Channels with ISI and AWGN Linear Equalization, Minimum Mean Square Error Equalizer, Adaptive Equalizer, Decision Feedback Equalization.

Unit IV

Spread Spectrum Signals for Digital Communication: Principle of Spread spectrum, Pseudo noise sequence, direct sequence spread spectrum signals, Frequency hopped spread spectrum signals, Synchronization.

Unit V

Multicarrier Communication: Generation and detection of OFDM, Cyclic prefix, Importance of Orthogonality, Difference between FDM and OFDM, advantages and disadvantages, applications.

Text Books:

1. John G. Proakis and Masoud Salehi, Digital Communications, Tata McGraw-Hill, 5th Edition, 2014.
2. Simon Haykin, Digital Communications, John Wiley India Pvt., Ltd,2008.

Reference Books:

1. Richard Van Nee & Ramjee Prasad, 'OFDM for Multimedia Communications' Artech House Publication,2001
2. Bernard Sklar, Digital communication, Pearson education,2009.

Course Outcomes:

After the completion of the course, student will able to:

CO1. Analyze random variables and random processes.
CO2. Explain base band transmission and reception schemes.
CO3. Illustrate communication through band limited linear filter channels.
CO4. Discuss spread spectrum signals and its synchronization.
CO5. Describe the generation and the processing of OFDM signals.

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continous Evaluation/ Labwork & Sessional	Major Evaluation		L	T	P	
60241108	DE	Communication Protocols	20	20	30	30	-	-	100	3	-	-	3

COMMUNICATION PROTOCOLS (60241108)

Course Objectives: The students will be able to understand the wireless network fundamentals, including WLAN and MAN standards, and will be equipped to design and implement advanced wireless technologies, addressing challenges in ad-hoc and mobile networks.

Unit I

Overview of Wireless Communication: Cellular Communication, Different generations and standards in Cellular Communication Systems. Wireless Network Architecture: Logical Architecture OSI Network Model, Network Layer Technologies, Data Link Layer Technologies, Physical Layer Technologies, Physical Architecture: Wireless Network Topologies, Wireless Devices.

Unit II

Wireless LAN Standards: 802.11 WLAN Standards, 802.11 MAC Layer Standard,
802.11 PHY Layer, Implementing Wireless LANs: Evaluating Wireless LAN Requirements, Planning and Designing the WirelessLAN.

Unit III

Wireless MAN Standards: Bluetooth (IEEE 802.15.1), Wireless USB, ZigBee (IEEE 802.15.4), IrDA, Near Field Communication. Wireless MAN Standards: IEEE 802.16 Wireless MAN Standard (WiMAX). Implementing Wireless MAN: Technical Planning.

Unit IV

Ad-hoc Wireless Networks: Design Challenges in Ad-hoc wireless networks, concept of cross layer design, security in wireless networks, Energy constrained networks, MANET and WSN, Wireless Mobile Network Layer Protocol (Mobile IP, IPv6, Dynamic Host Configuration Protocol), Mobile Transport Layer Protocol (Traditional TCP, Classical TCP improvements).

Unit V

Recent Wireless Technologies: multicarrier modulation, OFDM, MIMO system, diversity multiplexing trade-off, MIMO-OFDM system, Smart-antenna, Beamforming and MIMO, Cognitive radio, Software defined radio, Communication relays, Spectrum sharing.

Text Books:

1. Andrea Goldsmith, "Wireless Communications", Cambridge University Press,2005.
2. Steve Rackley, "Wireless Networking Technologies: From Principles to Successful Implementation", Newness Publication,2007.
3. Sanjay Kumar, "Wireless Communication the Fundamental and Advanced Concepts" River Publishers, Denmark, 2015 (Indianreprint).

Reference Books:

1. Vijay K Garg, "Wireless Communications and Networks", Morgan Kaufmann Publishers an Imprint of Elsevier, USA 2009 (Indianreprint)
2. J. Schiller, "Mobile Communication", Pearson Education,2012.
3. Iti Saha Misra, "Wireless Communication and Networks: 3G and Beyond", McGraw Hill Education (India) Private Ltd, New Delhi,2013.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1. Explain the evolution and architecture of wireless communication systems.
CO2. Implement wireless LAN for corresponding protocols.
CO3. Analyse wireless MAN standards like Bluetooth and WiMAX
CO4. Understand ad-hoc network and mobile network technology.
CO5. Develop secure, efficient solutions for ad-hoc wireless networks.

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ lab work & Sessional	Major Evaluation		L	T	P	
60241109	DE	Radar Signal Processing	20	20	30	30	-	-	100	3	-	-	3

RADAR SIGNAL PROCESSING (60241109)

Course Objectives: To understand and analyze the concepts of Radar signal processing which includes Radar signals and Networks, Pulse Compression, Range Resolution, Detection and Measurements.

Unit I

Radar Signals and Networks: Real Radar Signals, Complex Radar Signals, Analytic Radar Signals, Duration Frequency and Bandwidth of signal, Transmission of signal through Networks, Match Filter for Non white Noise, Match filter for white noise, Ambiguity Function.

Unit II

Pulse Compression with Radar Signals: Liner FM Pulse, Mismatch Filter for Sidelobe Control, Signal Design for Low Sidelobes, Example Signal Designs, Other Pulse Compression Waveforms, Pulse Compression by Costas FM, Pulse Compression by Binary Coding.

Unit III

Radar Resolution: Range Resolution, Doppler Frequency Resolution, Simultaneous Rang and Doppler Resolution, Resolution and RMS Uncertainty, Overall Radar and Angle Resolution.

Unit IV

Radar Detection: Bayes's Concepts, Detection Criteria for Several Target Models, Detection of Known Target, Detection of Steady Target with Random Initial Phase, Detection of Steady Target with N Pulse having Random Phases, Detection of Targets with Pulse-to-Pulse Fluctuation, Binary Detection, Detection in Clutter.

Unit V

Radar Range Measurement: Parameter Estimation, Cramer-Rao Bound, Limiting Accuracies of Radar Measurements, Range from Delay Measurements, Filter Mismatch and Fine-Line Measurements.

Text Books:

1. Peyton Z. Peebles Jr, "Radar Principles", John Wiley,2004.
2. Mark. A. Richards, "Fundamentals of Radar Signal Processing", TMH,2005.

Reference Books:

1. Fred E. Nathanson, "Radar Design Principles: Signal Processing and the Environment", 2nd ed., PHI,1999.
2. Mark. A. Richards, "Fundamentals of Radar Signal Processing", TMH,2005.
3. R. Nitzberg, "Radar Signal Processing and Adaptive Systems", Artech House, 1999.
4. M.I. Skolnik, "Introduction to Radar Systems", 3rd ed., TMH,2001.

Course Outcomes:

After the completion of the course, student will able to:

CO1. Analyze the Radar Signals and Networks**.**
CO2. Describe the Pulse Compression in Radar Signals Processing.
CO3. Apply the concept **of** Radar Resolution.
CO4. Analyse the Radar target detection Process.
CO5. Explain the Radar Range Measurement and Limiting Accuracies of Radar.

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ lab work & Sessional	Major Evaluation		L	T	P	
60241110	DE	Adaptive Control System	20	20	30	30	-	-	100	3	-	-	3

ADAPTIVE CONTROL SYSTEM (60241110)

Course Objectives: To understand and apply adaptive controls in practical and industrial control systems.

Unit I

State Space Analysis: Concepts of State, State variables, State Model of Linear Systems, State Space Representation using Physical Variables, State Space Representation using Phase Variables, Decomposition of Transfer Function, Diagonalization.

Unit II

Solution of State Equation: State Transition Matrix and State Transition Equation, Computation of the State Transition Matrix, Transfer Function from the State Model, Stability, Controllability and Observability of Linear Systems.

Unit III

Adaptive Control: Linear Feedback, Effects of Process Variations, Adaptive Schemes- Gain Scheduling, Model Reference Adaptive Systems, Self Tuning Regulators, Dual Control, Applications of Adaptive Control.

Unit IV

Real Time Parameter Estimation: Least Squares and Regression Models, Estimating Parameters in Dynamical Systems, Experimental conditions, Simulation of Recursive Estimation, Prior information.

Unit V

Z-Plane Analysis of Discrete Time Control Systems: Impulse Sampling and Data Hold, Reconstructing Original Signal from Sampled Signals, Mapping Between S Plane and Z Plane, Concept of Pulse Transfer Function, Stability Analysis of Closed-Loop Systems in the Z-Plane, Jury Stability Test.

Text Books:

1. Katsuhiko Ogata, "Modern Control Engineering" 5th Edition, Prentice Hall,2010
2. M. Gopal, "Modern Control System Theory" Revised 2nd Edition New Age International Publishers,2005
3. Karl J. Astron and Bjorn Wittenmark, " Adaptive Control" 2nd Edition, Dover Publications,2008
4. Katsuhiko Ogata " Discrete Time Control Systems" 2nd Edition Pearson Education,2002

Reference Books:

1. H. K. Khalil, "Nonlinear Systems", Pearson India,2019
2. Gang Tao, "Adaptive Control Design and Analysis" Wiley,2003
3. G. Feng and R. Lozano, "Adaptive Control Systems" Oxford University Press, 1999.

Course Outcomes:

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

CO1. Apply the State Space Techniques in Control Systems.
CO2. Examine a system for its stability, controllability, and observability.
CO3. Demonstrate the behaviour of Adaptive Control System.
CO4. Describe the real time parameter estimation methods for adaptive control systems.
CO5. Analyse discrete control systems in z-domain.

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ lab work & Sessional	Major Evaluation		L	T	P	
60241104	SC-1	MIMO Wireless Communication	20	20	30	30	-	-	100	3	-	-	3

MIMO WIRELESS COMMUNICATION (60241104)

Course Objectives: To provide a comprehensive coverage of coding techniques for multiple-input, multiple-output (MIMO) communication systems

Unit I Fading Channels and Diversity Techniques: Wireless channels, Error/Outage probability over fading channels, Diversity techniques, Channel coding as a means of time diversity, Multiple antennas in wireless communications.

Unit II Capacity and Information Rates of MIMO Channels : Capacity and Information rates of noisy, AWGN and fading channels, Capacity of MIMO channels, Capacity of non-coherent MIMO channels, Constrained signaling for MIMO communications, Matlab exercise.

Unit III Space-Time Block and Trellis Codes : Transmit diversity with two antennas: The Alamouti scheme, Orthogonal and Quasi-orthogonal space-time block codes, Linear dispersion codes, Generic space-time trellis codes, Basic space-time code design principles, Representation of space-time trellis codes for PSK constellation, Performance analysis for space-time trellis codes, Comparison of space-time block and trellis codes, Matlab exercise.

Unit IV Concatenated Codes and Iterative Decoding : Development of concatenated codes, Concatenated codes for AWGN and MIMO channels, Turbo coded modulation for MIMO channels, Concatenated space-time block coding. Matlab exercise.

UnitV Space-Time Coding for Frequency Selective Fading Channels : MIMO frequency-selective channels, Capacity and Information rates of MIMO FS fading channels, Space-time coding and Channel detection for MIMO FS channels, MIMO OFDM systems. Matlab exercise.

Text Books:

1. Tolga M. Duman and Ali Ghrayeb, “Coding for MIMO Communication systems”, John Wiley & Sons, West Sussex, England, 2007.
2. A.B. Gershman and N.D. Sidiropoulus, “Space-time processing for MIMO communications”, Wiley, Hoboken, NJ, USA, 2005.

Reference Books:

1. E.G. Larsson and P. Stoica, "Space-time block coding for Wireless ommunications", Cambridge University Press, 2003
2. M. Janakiraman, "Space-time codes and MIMO systems", Artech House, 2004.
3. H. Jafarkhani, "Space-time coding: Theory & Practice", Cambridge University Press, 2005.

Course Outcomes:

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

CO1. Analyze Wireless Channels and Mitigate Fading Effects
CO2. Evaluate Capacity and Information Rates in MIMO Channels.
CO3. Develop the Space-Time Coding Techniques.
CO4. Implement and Optimize Concatenated Coding and Iterative Decoding.
CO5. Apply Space-Time Coding in Frequency-Selective Fading Channels.

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Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/ lab work & Sessional	Major Evaluation		L	T	P	
60241105	DLC	Project Lab-I					70	30	100	-	-	4	2

PROJECT LAB-I (60241105)

Wireless Adhoc Networks Lab

Tools Required:

Network Simulator and QualNet

LIST OF EXPERIMENTS:

1. Create a sample wireless topology using Simulation Tool.
2. Create a mobile Ad-hoc networks using Simulation Tool.
3. Implement an Ad-hoc On-demand Distance Vector protocol using Simulation Tool.
4. Implement a Transmission Control Protocol using Simulation Tool.
5. Implement an User Datagram Protocol using Simulation Tool.
6. Simulate a three-node point-to-point network with a duplex link between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
7. Performance evaluation of AODV, DSR, DSDV etc. Routing protocols using Simulation tool.

Course Outcomes:

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

CO1. **Design** a network using NS2 or QualNet.

CO2. Evaluate performance of Routing Protocols.

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Annexure V

Item 5	To review and finalize the syllabus/module of Classified Novel Engaging Course to be offered in I semester of PG programme.

CNEC Module

Name of Faculty Mentor	Dr. **Varun Mishra**
Novel Engaging Course Title	**Modeling of Semiconductor Devices using MATLAB**
Objectives of Course	To gain knowledge and skills related to analytical modeling of semiconductor devices.
Content	• Introduction: Basic of PN-junction diode, MOSFET, and novel semiconductor device like Tunnel FET. • Analytical modeling: Derivations of current expression for diode, MOSFET, and Tunnel FET. • Implementation in MATLAB: Basic equations representations and derived current expression of semiconductor devices.
Contact Hours	30
Mode of Delivery	Hybrid
Outcomes of Course	After completion of this course, the students will be able to: 1. Analyze MOS-based devices. 2. Develop analytical/compact models for MOS devices. Implementation of analytical models using MATLAB.
External Mentors / Collaborations	NA

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CNEC Module

Name of Faculty Mentor	**Dr. Mukesh Kumar Mishra**
Novel Engaging Course Title	**Stochastic Geometry Modeling for Wireless Networks**
Objectives of Course	This course introduces stochastic geometry as a powerful mathematical tool for modeling and analyzing the spatial configurations of wireless networks. It covers the principles, techniques, and applications of stochastic geometry in the context of wireless communication systems.
Content	Introduction to Stochastic Geometry, Poisson Point Processes (PPP), Definition and properties of PPP, Applications of PPP in wireless networks, Modeling interference using PPP, SINR modeling using stochastic geometry, Analysis of outage probability and coverage, Techniques for SINR improvement.
Contact Hours	30
Mode of Delivery	Hybrid
Outcomes of Course	Understand the basic principles of stochastic geometry and its application in modeling wireless networks. Apply tools of stochastic geometry to solve practical problems of wireless communication. Develop skills to critically review and contribute to the existing literature of stochastic geometry and wireless networks.
External Mentors /Collaborations	NA

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Annexure VI

Item6	To review and finalize the scheme structure for the Batch admitted in 2024-25 academic session syllabus of Research Methodology and Ethics for Ph.D. Programme under the Madhav Institute of Technology & Science-Deemed University (MITS-DU).

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General Scheme Structure for Doctor of Philosophy

(Batch admitted in Academic Session 2024-25 onwards)

Scheme of Evaluation
Doctor of Philosophy

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.	Duration of Exam.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1	25100001	MC	Research Methodology and Ethics[#]	20	20	30	30	-	-	100	3	1	-	4	Face to Face	PP	2 Hrs
2.		DC	**Course-1 (Traditional)**	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
3.		MOOC	Course-2 (NPTEL)[*]	20	20	30	30	-	-	100	2	1	-	3	Online	MCQ	2 Hrs
4.		DLC	Departmental Lab	-	-	-	-	70	30	100	-	-	4	2	Experimental	AO	-
5.			Open Seminar	-	-	-	-	70	30	100	-	-	2		Interactive	SO	-
Total Minimum 12 Credits for the student admitted after PG and Minimum of 24 credits for the students admitted directly after B.Tech. degree																	

[#] Research Methodology and Ethics: Mandatory course for all

[*] Course(s) can be offered through NPTEL

This scheme of evaluation shall continue for next semester till the minimum requirement of credits are earned by the student within the maximum permissible time

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RESEARCH METHODOLOGY

OBJECTIVE:

1. To distinguish between the scientific method and common sense knowledge while lying the foundation for research.
2. To identify and apply appropriate research methodology in order to plan, conduct and evaluate basic research.
3. To explore the statistical methods and tools in research.
4. To understand the philosophy of research and ethics, research integrity and publication ethics.
5. To understand indexing and citation databases, open access publication, research metrics.

Introduction to Research Methodology: Meaning of Research, Objectives of Research, Motivations in Research, types of Research, Research Approaches, Significance of Research, Research Methods v/s Methodology, Scientific Methods, Research Process, Criteria of Good Research. Define the Research Problem: Concept and need of Research problem, Identification of Research problem, defining and delimiting Research problem.

Research Design: Problem Definition, variables, research design concepts, Literature survey and review, Research design process, Errors In research. Data Collection and Representation: Primary Data Secondary Data, Data Presentation. Processing and Analysis of Data:

Data Collection: Collections of Primary Data, Collection of Data through questionnaire and Schedules, other Observation Interview Methods, Collection of Secondary Data, Selection of appropriate method for data collection, Case Study, Focus Group Discussion, Techniques of developing research tools, viz. Questionnaire and rating scales etc. Reliability and validity of Research tools.

Descriptive Statistics: Measurement Scales, Sources of error in measurement. Measures of central Tendency (Mean, medium, Mode), Measures of dispersion (range, mean deviation, standard deviation), Moments, Moments generating Function, Graphical representation of Data, Measures of Asymmetry (Skewness), Kurtosis, Correlation and Regression, Curve fitting.

Sampling Methods and Distributions: Sampling Methods, Sampling Distribution of mean, Sampling Distributions of Variance. Testing of Hypotheses-I : Basic Concepts Concerning Testing of Hypotheses, Procedure for Hypothesis Testing, Flow Diagram for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Type I and Type II errors. Important Parametric Tests, Limitations of the Tests of Hypothesis, Chi-square Test, Non Parametric Tests. Analysis of Variance components (ANOVA) for fixed effect model; Total, treatment and error of squares, Degrees of freedom, Confidence interval, some special distribution.

Report Writing: Pre writing considerations,, Thesis writing, Formats of report writing, Formats of publications in Research journals. Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentation.

Philosophy and Theory of Ethics:

Nature, scope and Meaning of Ethics. Role of judgment in ethics, Ethics with respect to science and research - Intellectual honesty and research integrity – Scientific, Conduct and Plagiarism. Redundant Publications: duplicate and overlapping publications.

Publication ethics: definition: introduction and importance - Best practices / standards setting initiatives and guidelines. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types - Violation of publication ethics, authorship and contributor ship - Identification of publication misconduct, complaints and appeals, Vanity Publications.

Reference Books:

1. C.R. Kothari: Research Methodology Methods and Techniques (Second Revised Edition), New Age. International Publication.
2. R.Panneerselvam , Research Methodology, PHI
3. Ranjit Kumar, Research methodology: a step-by-step guide for beginners, SAGE Publication. Ltd.
4. Montgomery, Douglas C :Design and Analysis of Experiments, Wiley India, Fifth edition.
5. Montgomery, Douglas C. and Runger, George C.: Applied Statistics & Probability for Engineers (Wiley India), Third edition.
6. Krishimswamy, K. N. Sivakumar, Appalyer and Mathirattian M.: Research Methodology; Integration of Principles, Methods and Techniques (Pearson Education, New Delhi).