Department of Electronics and Telecommunication Engineering

Minutes of Board of Studies Meeting of Electronics and Telecommunication Engineering held on 03.06.2025

The Board of Studies (BoS) meeting of the Electronics & Telecommunication Engineering Department was held on 3rdJune 2025 at 4:00 P.M onwards. Following members have attended the meeting:

1. Dr.P. K Singhal, Professor
2. Dr.Vandana Vikas Thakare, Professor & Head
3. Dr. Karuna Markam, Associate Professor
4. Prof Pooja Sahoo, Assistant Professor
5. Prof D K Parsedia, Assistant Professor
6. Dr. Rahul Dubey, Assistant Professor
7. Dr. Deepak Batham, Assistant Professor
8. Dr. Varun Sharma, Assistant Professor
9. Dr. Shubhi Kansal, Assistant Professor
10. Dr. Himanshu Singh, Assistant Professor
11. Dr. Yogesh Kumar, Assistant Professor

Student Members

1. Suryansh Singh (0901ET221070)
2. RatneshSagar (0901ET221053)

Summary of the BoS Meeting

Courses where revision was carried out*

(Course/subject 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

Courses focusing on employability/entrepreneurship/ skill development*

(Course/subject name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.	Link of relevant documents/minutes
Microwave Engineering	**200754**	Analysis of coaxial, stripline, microstrip lines used in RF PCB design.	Item-4	14	Annexure III
Fundamentals of Nano and Quantum Photonics	**200756**	Quantum transitions, optical cross-section for Semiconductor & photonics R&D	Item-4	14	Annexure III
Fiber Optic Communication Technology	**200762**	Understanding SMF, MMF, attenuation, dispersion for design of fiber networks	Item-4	14	Annexure III
Pattern Recognition and Applications	**200763**	Sequential data processing for Speech recognition, NLP	Item-4	14	Annexure III

New Courses added*

(Course/subject name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.	Link of relevant documents/minutes
5G Communication Lab	**200751**	Network virtualization and SLA management for Telco cloud and 5G private networks.	Item-7	19	**Annexure VI**

Feedback on curriculum received from stakeholders: Analysis& ATR*

Stakeholder	**Student**	**Faculty**	**Alumni**	**Employer**
No. of responses	231	21	16	39
Link of Analysis	https://tinyurl.com/yrnu43bp	https://tinyurl.com/2s45h676	https://tinyurl.com/54m2td5m	https://tinyurl.com/38dambxp
ATR Link		https://tinyurl.com/v2jstyhe	https://tinyurl.com/5amkuhkh	https://tinyurl.com/2p8x8tan
Link showing Excel sheet of Google Form details of stakeholders	https://tinyurl.com/5eskm836	https://tinyurl.com/36uymjam	https://tinyurl.com/5bw53h96	https://tinyurl.com/3nxmkk33

<table>
<tr><th colspan="2">BoS Agenda Items</th></tr>
<tr><td>Item 1</td><td>To confirm the minutes of previous BoS meeting held in the month of December 2024.

The minutes of previous BoS meeting held on 6th Dec 2024 has been finalized and confirmed.</td></tr>
<tr><td>Item 2</td><td>To review and finalize the scheme structure of B. Tech. VII Semester with the provision of Three (02) Departmental Electives (DEs) and one (01) Open Category (OC) Course. (Out of which Open category course is to be run through MITS MOOCS and Two (02) Departmental Electives are to be run through SWAYAM/NPTEL platform with credit transfer. {for the batch admitted in 2022-23}.

Scheme Structure of B.Tech VII Semester with provision of Two Departmental Electives and One Open Category courses has been discussed and finalized. Annexure I</td></tr>
<tr><td>Item 3</td><td>To introduce a two-credit course titled “Professional Skills & Competencies” in the VII semester schemefor the batch admitted in 2022–23.

Two-credit course titled “Professional Skills & Competencies” in the VII semester for the batch admitted in 2022–23 has been introduced. Annexure II</td></tr>
<tr><td>Item 4</td><td>To propose the list of courses which the students can opt from SWAYAM/NPTEL/MOOC based Platforms, to be offered in online mode for Two (02) Departmental Electives (DE) Course, with credit transfer in the B.Tech. VII Semester under the flexible curriculum {for the batch admitted in 2022-23}.

The list of courses which the students can opt from SWAYAM/NPTEL/MOOC based Platforms, to be offered in online mode for Two (02) Departmental Electives (DE) Course, with credit transfer in the B.Tech. VII Semester under the flexible curriculum has been proposed. Annexure III
<table>
<tr><th>S. No</th><th>Category Code</th><th>Course Code</th><th>Name of The course</th></tr>
<tr><td>1</td><td rowspan="3">DE-2</td><td>2200754</td><td>Microwave Engineering</td></tr>
<tr><td>2</td><td>2200755</td><td>Signal Processing for mm Wave Communication for 5G and Beyond</td></tr>
<tr><td>3</td><td>2200756</td><td>Fundamentals of Nano and Quantum Photonics</td></tr>
<tr><td>1</td><td rowspan="3">DE-3</td><td>2200762</td><td>Fiber Optic Communication Technology</td></tr>
<tr><td>2</td><td>2200764</td><td>Simulation of Communication Systems using MATLAB</td></tr>
<tr><td>3</td><td>2200763</td><td>Pattern Recognition and Applications</td></tr>
</table></td></tr>
<tr><td>Item 5</td><td>To propose the list of the courses (as per the format given below) which the students can opt from MITS MOOCs to be offered in blended mode for Open Category(OC)course for students of B.Tech.VII Semester under the flexible curriculum{for the batch admitted in 2022-23}

The list of the courses (as per the format given below) which the students can opt from MITS MOOCs to be offered in blended mode for Open Category (OC)course for students of B.Tech.VII Semester under the flexible curriculum{for the batch admitted in 2022-23}has been proposed.Annexure IV
<table>
<tr><th>S.No</th><th>Name of the Course</th><th>Course Faculty</th><th>Mentor</th></tr>
<tr><td>1</td><td>Embedded System</td><td>Dr.Shubhi Kansal</td><td>Dr.Shubhi Kansal</td></tr>
</table></td></tr>
<tr><td>Item 6</td><td>To propose the list of “Additional Courses” which can be opted for getting an (i) Honours (for students of the host department) and (ii) Minor Specialization (for students of other departments)
These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. VII semester students{for the batch admitted in 2022-23}.
The list of “Additional Courses” which can be opted for getting an (i) Honours (for students of the host department) and (ii) Minor Specialization (for students of other departments)
These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. VII semester students {for the batch admitted in 2022-23} has been proposed. Annexure V
<table>
<tr><td rowspan="4">VII</td><td rowspan="3">Honors</td><td>Communication and Signal Processing</td><td>1. Introduction To Adaptive Signal Processing
2. Stochastic Control & Communication</td></tr>
<tr><td>VLSI Design</td><td>1. VLSI Interconnects
2. Analog VLSI Design
3. VLSI Design flow(RTL to GDS)</td></tr>
<tr><td rowspan="2">Minors</td><td>Control & Sensor Technology</td><td>1. Design of Photovoltaic Systems</td></tr>
<tr><td>Communication and Signal Processing</td><td>1. Microwave Engineering</td></tr>
</table></td></tr>
</table>

Item 7

To review and finalize the Experiment list/ Lab manual for Departmental Laboratory Courses (DLC) to be offered in B. Tech. VII semester {**for the batch admitted in 2022-23}**.

The Experiment list/ Lab manual for Departmental Laboratory Course (DLC) to be offered in B.Tech. VII semester has been finalized and approved by BoS members Annexure VI

S.No	Category	Subject Code	Subject Name
1	DLC	2200705	Creative Problem Solving
2	DLC	2200704	5G Communication Lab

Item 8

To review and finalize the ***scheme structure of B.Tech. V Semester under*** the flexible curriculum {**for the batch admitted in 2023-24}**.

The scheme structure of B.Tech. V Semester under the flexible curriculum (Batch admitted in 2023-24) has been discussed and finalized. Annexure VII

Item 9

To review and finalize the syllabi for all ***Departmental Core (DC) Courses*** of B. Tech. ***V Semester (for batch admitted in 2023-24)*** under the flexible curriculum along with their COs.

The syllabi for all Departmental Core (DC) Courses of B.Tech. V Semester (for batch admitted in 2023-24) under the flexible curriculum along with their COs has been discussed and finalized.Annexure VIII

S.No	Category	Subject Code	Subject Name
1	DC	3200511	Data Science
2		3200512	Mobile Communication & 5G Network
3		3200515	VLSI Design
4		3200519	Electromagnetic Theory
		3200520	Digital Signal Processing

Item 10

To review and recommend the Experiment list/ Lab manual for all the Laboratory Courses to be offered in B. Tech. ***V Semester*** {**for the batch admitted in 2023-24}**.

The Experiment list/ Lab manual for all the Laboratory Courses to be offered in B.Tech.V semester (for batch admitted in 2023-24) has been discussed and finalized.AnnexureIX

S.No	Category	Subject Code	Subject Name
1	DC	2200511	Data Science
2	DC	2200512	VLSI Lab
3	DLC	2200516	Minor Project-I

Item 11

To review and recommend the list of projects which can be assigned under the 'Skill based mini-project' category in various laboratory components based courses to be offered in B.Tech. **V Semester** {**for the batch admitted in 2023-24}**.

The skill based mini projects for various laboratory courses to be offered in V semester has been discussed and finalized. Annexure X

Item 12

To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered in online mode under ***Self-Learning/ Presentation***, in the B.Tech. ***V Semester*** {**for the batch admitted in 2023-24}**.

The list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered *(for batch admitted in 2023-24)* in online mode under *Self-Learning/ Presentation*, in the B.Tech. *V Semester* has been discussed and finalized.Annexure XI

S. No	Semester	Subject Category	Subject Name	Duration (weeks)
1	V	Self Learning	Demystifying Networks	04
2			Basics of Software defined Radios and Practical applications	04
3			Foundation of Cognitive robotics	04

Item 13

To propose the list of "***Additional Courses***" which can be opted for getting an (i) Honours (for students of the host department) and (ii) Minor Specialization (for students of other departments)
These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. ***V semester*** students {**for the batch admitted in 2023-24}**.

	The list of "*Additional Courses*" which can be opted for getting an (i) Honours (for students of the host department) and (ii) Minor Specialization (for students of other departments) offered through SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. *V semester* students {for the batch admitted in 2023-24} has been discussed and finalized. Annexure XII
Item 14	To review the ***CO attainments, to identify gaps and to suggest corrective measures*** for the improvement in the CO attainment levels for all the courses taught during **July-Dec 2024 session**. ***The CO attainments, to identify gaps and to suggest corrective measures* for the improvement in the CO attainment levels for all the courses taught during July-Dec 2024 session has been discussed with BoS members. Annexure XIII**
Item 15	To review ***curricula feedback*** from various stakeholders, its analysis and impact. ***The curricula feedback* from various stakeholders, its analysis and impact has been review and discussed.** Annexure IV
Item 16	Any other matter

(Dr. P.K Singhal) (Dr.VandanaVikasThakare) (Dr. KarunaMarkam)

(Prof Pooja Sahoo) (Prof D. K. Parsedia) (Dr. Rahul Dubey)

(Dr. Deepak Batham) (Dr. Varun Sharma) (Dr. Shubhi Kansal)

(Dr. Himanshu Singh) (Dr. Yogesh Kumar) (Dr. Nidhi Saxena)

(Dr. Khushboo Poonia)

Annexure I

Item 2

To review and finalize the **scheme structure of B. Tech. VII Semester** with the provision of *Three (02) Departmental Electives (DEs) and one (01) Open Category (OC) Course*. **(Out of which Open category course is to be run through MITS MOOCS** and **Two (02) Departmental Electives are to be run through SWAYAM/NPTEL platform** with credit transfer. {**for the batch admitted in 2022-23}**.

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NAAC Accredited with A++ Grade

Scheme of Examination (B.Tech. in Electronics & Telecommunication Engineering)
B.Tech. VII Semester *[For batches admitted in Academic Session 2022-23 onwards]*

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam
				Theory Slot				Practical Slot			MOOCs								
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P			
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem.	Quiz/Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	**22007XX**	DE	*Departmental Elective(DE-2)	-	-	-	-	-	-	-	25	75	100	4	-	-	**4**	Blended	MCQ
2.	**22007XX**	DE	*Departmental Elective(DE-3)	-	-	-	-	-	-	-	25	75	100	4	-	-	**4**	Blended	MCQ
3.		OC	#Open Category (OC-2)	50	10	20	20	-	-	-	-	-	100	3	-	-	**3**	Blended	MCQ
4.	2200704	DLC	5G Communication Lab	-	-	-	-	60	20	20	-	-	100	-	-	6	**3**	Offline	SO
5.	2200705	DLC	Creative Problem Solving	-	-	-	-	25	25	-	-	-	50	-	-	4	**2**	Offline	SO
6.	2200703	DLC	**Professional Skills & Competencies	-	-	-	-	40	60	-	-	-	100	-	-	4	**2**	Offline	SO
7.	2200702	DLC	Summer Internship Project-III (04 weeks) (Evaluation)	-	-	-	-	60	-	-	-	-	60	-	-	4	**2**	Interactive	SO
Total				**50**	**10**	**20**	**20**	**185**	**105**	**20**	**50**	**150**	**610**	**11**	**-**	**18**	**20**		
8.		**MAC**	Universal Human Values & Professional Ethics (UHVPE)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Blended	MCQ
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**															

*** This course must be run through SWAYAM/NPTEL/ MOOC**

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

Mode of Teaching			Mode of Examination				
Offline	**Blended**	**Interactive**	**PP**	**AO**	**MCQ**	**SO**	**Total Credits**
7	11	2	0	0	11	9	**20**
35%	55%	10%	0%	0%	55%	45%	**Credits %**

Department Electives-2 (DE-2) (MOOCS) (22007XX)	Microwave Engineering **(2200754)**	Signal Processing for mm Wave Communication for 5G and Beyond **(2200755)**	Fundamentals of Nano and Quantum Photonics **(2200756)**
Department Electives-3 (DE-3) (MOOCS) (22007XX)	Fiber Optic Communication Technology **(2200762)**	Pattern Recognition and Applications **(2200763)**	Simulation of Communication Systems using MATLAB **(2200764)**
Open Course-2 (OC-2)	Embedded System		
Honors	Introduction To Adaptive Signal Processing	VLSI Interconnects	
Minors	Design of Photovoltaic Systems	Microwave Engineering	

Annexure II

Item 3

To introduce a two-credit course titled "**Professional Skills & Competencies**" in the **VII semester schemefor the batch admitted in 2022–23.**

Professional Skills & Competencies (2200703)
(Activity Based Learning)

COURSE OBJECTIVES

- To equip students with essential professional competencies.
- To develop analytical and technical skills.

Module 1: Communication Skills

Verbal Communication: Public speaking, Group discussions, and Interview handling. Non-verbal Communication: Body language, Gestures, Listening skills. Written Communication: Résumé writing, Email etiquette, Cover letters, Report Writing. Presentation Skills: Visual aids, Audience engagement, Delivery techniques.

English (Verbal Ability): Passage/Sentence Rearrangement, Error Detection and Correction, fill in the Blanks, Reading Comprehension Passages, Sentence Completion, Synonyms and Antonyms, Words Completion, Para jumbles etc.

Activities: Mock interviews and GDs, Email & résumé writing workshops, Peer review and instructor feedback.

Module 2: General Aptitude

Quantitative Aptitude: Number systems, Ratios, Percentages, Averages, Time & Work, Probability. Logical Reasoning: Series, Puzzles, Syllogisms, Direction sense, Blood relations. Data Interpretation: Tables, Pie charts, Graphs.

Activities: Weekly quizzes, Group problem-solving sessions, Timed mock aptitude tests.

Module 3: Basic Coding Skills

Basic Programming Concepts, Syntax and semantics, Input/output handling, Variables, data types, Loops. Functions and recursion.Arrays, strings. Sorting and searching, Pointers (C/C++) / References (Java/Python). Exception handling (Java, Python).

Activities: Technical round based Weekly coding exercises, Mini hands-on projects, Error debugging practice, Mock technical tests.

Module 4: Competitive Coding Skills

Introduction to Data Structures: Linked Lists (Singly, Doubly), Problem solving using linked lists. Stacks, Queues, Trees (Binary, BST, basic traversals), Heaps (Min/Max heap concepts), Graphs (Adjacency list/matrix, BFS, DFS), Sets (HashSet, TreeSet). OOPS concepts: Encapsulation, Abstraction, Inheritance and Polymorphism. Introduction to Databases, ER-model, basics of SQL. Version Control: Git, GitHub.

Activities: Weekly coding contests, Problem solving on competitive coding platforms like Leetcode, Codeforces, Hackerrank etc., Peer-to-peer code review, Mock technical interviews.

Module 5: Discipline Specific Tools*

CSE/ CSD / IT: Git& GitHub, Docker, Postman, MySQL, VS Code, Linux Shell.
Electronics / Electrical: MATLAB, Simulink, Multisim, Proteus, LTspice, Arduino IDE.
Mechanical Engineering: AutoCAD, SolidWorks, ANSYS, MATLAB, Fusion 360.
Civil Engineering: AutoCAD Civil 3D, STAAD Pro, Revit, Primavera, GIS tools.
AI&DS/ AI&ML / IT(AIR): Jupyter Notebook, Pandas, Scikit-learn, TensorFlow, Tableau.
IoT: Arduino IDE, Raspberry Pi, ESP-32, LoRaWAN, ESP-IDF, PlatformIO, LTspice.

Activities: Tool-based lab exercises, Branch-specific mini projects, Short presentations on use-cases of tools in industry.

***Respective departments may include discipline specific tools which are essential for students.*

COURSE OUTCOMES:

After completion of the course students will be able to:

CO1 Demonstrate effective communication strategies in professional scenarios including interviews and group discussions.
CO2 Solve real-world quantitative and logical reasoning problems with time-bound accuracy.
CO3 Implement basic algorithms using standard programming languages.
CO4 Design efficient algorithmic solutions to solve coding problems.
CO5 Apply discipline-specific tools to simulate, model, or develop solutions relevant to core engineering problems.

Course Articulation Matrix:

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

Annexure III

Item -4

To propose the list of courses which the students can opt from SWAYAM/NPTEL/MOOC based Platforms, to be offered in **online mode for Two (02) Departmental Electives** (DE) Course, with credit transfer in the **B.Tech. VII Semester** under the flexible curriculum {**for the batch admitted in 2022-23}**.

S.No	Category Code	Course Code	Name of The course	Duration of the Course in weeks	Course Registration		Name of the Mentor Faculty
					Start Date	End Date	
Electronics/Electronics & Telecommunication Engineering							
1	DE-2	**2200754**	Microwave Engineering	12	**21-07-2025**	**10-10-2025**	Prof. Pooja Sahoo
		2200755	Signal Processing for mm Wave Communication for 5G and Beyond	12	**21-07-2025**	**10-10-2025**	Dr.Yogesh Kumar
2		**2200756**	Fundamentals of Nano and Quantum Photonics	12	**21-07-2025**	**10-10-2025**	Dr.Shubhi Kansal
1	DE-3	**2200762**	Fiber Optic Communication Technology	12	**21-07-2025**	**10-10-2025**	Dr. Deepak Batham
		2200763	Pattern Recognition and Applications	12	**21-07-2025**	**10-10-2025**	Dr. Rahul Dubey
2		**2200764**	Simulation of Communication Systems using MATLAB	12	**21-07-2025**	**10-10-2025**	Dr. Himanshu Singh

Annexure IV

Item -5

To propose the list of the courses (as per the format given below) which the students can opt from **MITS MOOCs** to be offered in blended mode for **Open Category(OC)** course for students of B.Tech. VII Semester under the flexible curriculum {for the batch admitted in 2022-23}.

S. No	Name of the Course	Course Faculty	Mentor
1	Embedded System	Dr. Shubhi Kansal	Dr. Shubhi Kansal

Annexure V

Item 6

To propose the list of "***Additional Courses***" which can be opted for getting an (i) ***Honours (for students of the host department)*** and (ii) ***Minor Specialization (for students of other departments)***

These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. ***VII semester students*****{for the batch admitted in 2022-23}**.

VII	Honors	Communication and Signal Processing	1. Introduction To Adaptive Signal Processing 2. Stochastic Control & Communication
		VLSI Design	1. VLSI Interconnects 2. Analog VLSI Design 3. VLSI Design flow (RTL to GDS)
	Minors	Control & Sensor Technology	1. Design of Photovoltaic Systems
		Communication and Signal Processing	1. Microwave Engineering

Category	**Semester**	**Name of the course**	**Duration of the Course in weeks**	**Course Registration**		**Name of the Mentor Faculty**
				Start Date	**End Date**	
Electronics/Electronics & Telecommunication Engineering (VII Semester)						
Honors	VII	Introduction To Adaptive Signal Processing	08	**18-08-2025**	**10-10-2025**	Dr. Himanshu Singh
	VII	Stochastic Control & Communication	12	**21-07-2025**	**10-10-2025**	Dr. Rahul Dubey
	VII	VLSI Interconnects	08	**21-07-2025**	**12-09-2025**	Dr. Yogesh Kumar
	VII	Analog VLSI Design	12	**21-07-2025**	**10-10-2025**	Dr. Shubhi Kansal
	VII	VLSI Design flow(RTL to GDS)	12	**21-07-2025**	**10-10-2025**	Dr. Varun Sharma
Minors	VII	Design of Photovoltaic Systems	12	**21-07-2025**	**10-10-2025**	Prof. Pooja Sahoo
	VII	Microwave Engineering	12	**21-07-2025**	**10-10-2025**	Prof. D. K. Parsediya

Annexure VI

Item 7

To review and finalize the Experiment list/ Lab manual for Departmental Laboratory Courses (DLC) to be offered in B. Tech. VII semester {**for the batch admitted in 2022-23}**.

S.No	Category	Subject Code	Subject Name
1	DLC	2200705	Creative Problem Solving
2	DLC	2200704	5GCommunication Lab

B.Tech. VII Semester (Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Mark	Lab work & Sessional Marks	Skill based mini project		L	T	P	
2200705	DLC	Creative Problem Solving	25	25	-	50	-	-	6	3

Creative Problem Solving (2200705)

Lab Objective:

The lab comprises two modules each of which students need to finish passing this course. These 02 modules are named as

1. Communication Systems
2. Antenna Design

Tools Required:

Network Simulator, QualNet, CST Design Studio

List of Experiments

Communication Module:

1. Program in NS(network simulator)/QualNet to implement different topology
2. Program in NS(network simulator)/QualNet for connecting multiple routers and nodes and building a hybrid topology
3. Program in NS(network simulator)/QualNet to implement FTP using TCP bulk transfer
4. Program in NS(network simulator)/QualNet for connecting multiple routers and nodes and building a hybrid topology and then calculating network performance
5. To analyse network traces using Wireshark software.

Antenna Module

1. Study and overview of CST simulation tool.
2. Design and Simulation of Microstrip Antenna Using CST Tool.
3. Design and Simulation of Microstrip Transmission Line Using CST Tool.
4. Design and Simulation of Waveguide Using CST Tool.
5. Design and Simulation of Half Wave Dipole Antenna Using CST Tool.

Course Outcomes:

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

CO1. **Write** a program in Network Simulator for various topologies.
CO2. **Design** a network using NS2 or QualNet.
CO3. **Design** an antenna of given specification.

B.Tech. VII Semester (Electronics Engineering/Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
2200704	DLC	5G Communication Lab	60	20	20	100	-	-	6	3

5GCommunication Lab (2200704)

Course Objective: This course aims to equip students with the knowledge and hands-on skills to configure and deploy 5G Core, IMS, and gNodeB systems.

List of Experiments

1. Configure and bring up the 5G Core, IMS, and gNodeB. Register a commercial UE to the 5G network.
2. Capture and analyze NGAP packets between gNodeB and Core Network during UE attachment.
3. Measure the downlink and uplink throughput performance using iPerf3.
4. Configure APN settings on the UE for internet and IMS services.
5. Evaluate MIMO 2T2R under various conditions.
6. Configure and register IMS subscribers, then establish VoNR calls.
7. Use VS Code and GNU Debugger to debug gNodeB software and analyze execution flow.
8. Monitor and analyze key radio parameters such as RSRP, SINR, and PCI using NetMonster or similar signal monitoring apps.

Course outcome

CO1. Demonstrate the setup of 5G Core and gNodeB.
CO2. Analyze signaling protocols using Wireshark to interpret message exchanges, authentication processes, and session setup.
CO3. Compute network KPIs such as throughput, latency, and signal quality.
CO4. Analyze 5G network components to identify and debug errors.

Annexure VII

Item 8

To review and finalize the ***scheme structure of B.Tech. V Semester under*** the flexible curriculum {**for the batch admitted in 2023-24}**.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
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NAAC Accredited with A++ Grade

Scheme of Examination (For the Batch Admitted in the Year 2023-2024)

B.Tech. (Electronics and Telecommunication Engineering) V Semester *[For batches admitted in Academic Session 2023-24 onwards]*

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot									
				End Sem.		Mid Sem. Exam.	Quiz/ Assignment	End Sem	Lab Work & Sessional	Skill Based Mini Project		L	T	P			
				End Term Evaluation	$Proficiency in subject /course												
1.	3200511	DC	Data Science	50	10	20	20	40	30	30	200	3	-	2	4	Blended	MCQ
2.	3200512	DC	Mobile Communication & 5G Network	50	10	20	20	-	-	-	100	3	1	-	4	Blended	PP
3.	3200515	DC	VLSI Design	50	10	20	20	40	30	30	200	3	-	2	4	Blended	PP
4.	3200519	DC	Electromagnetic Theory	50	10	20	20	-	-	-	100	3	1	-	4	Blended	PP
5.	3200520	DC	Digital Signal Processing	50	10	20	20	-	-	-	100	3	1	-	4	Blended	PP
6.	3200516	DLC	Minor Project-I	-	-	-	-	60	40	-	100	-	-	4	2	Offline	SO
7.	3200517	DLC	Self-learning/ Presentation#	-	-	-	-	-	40	-	40	-	-	2	1	Online +Mentoring	SO
8.		CLC	Novel Engaging Course	-	-	-	-	50	0	-	50	-	-	2	1	Interactive	SO
9.	3200518	DLC	Soft Skill Internship (Institute Level Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
Total				**250**	**50**	**100**	**100**	**250**	**140**	**60**	**950**	**15**	**3**	**16**	**26**		
Additional Courses for obtaining Honors/Minor Specialization by desirous students							**Permitted to opt for maximum two additional courses for the award of Honors or Minor specialization**										
#compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation																	
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	Grade	Blended	MCQ

Honors	1. Principles and Techniques of Modern Radar Systems 2. Stochastic Control & Communication	1. Digital VLSI Testing 2. Analog VLSI Design	1. Nano-Technology, Science and Application 2. Microelectronics: Devices to Circuits
Minors	Control System	Fundamentals of Wireless Communication	

Annexure VIII

Item 9

To review and finalize the syllabi for all ***Departmental Core (DC) Courses*** of B. Tech. ***V Semester (for batch admitted in 2023-24)*** under the flexible curriculum along with their COs.

S.No	Category	Subject Code	Subject Name
1	DC	3200511	Data Science
2		3200512	Mobile Communication & 5G Network
3		3200515	VLSI Design
4		3200519	Electromagnetic Theory
		3200520	Digital Signal Processing

B.Tech. V Semester (Electronics and Telecommunication)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3200511	DC	Data Science	50	10	20	20	40	30	30	200	3	-	2	4

Data Science (3200511)

Course Objective: To equip students with the necessary skills and knowledge to effectively analyze and interpret data using Python, enabling them to make data-driven decisions and contribute to the field of data science.

Unit 1: Need for data science, benefits and uses, facets of data, data science process, Introduction of basics python tool, Setting working Directory, Creating and saving a script file, File execution, removing variables from environment, clearing environment, Commenting script files, Variable creation, Data types and associated operations, Arithmetic and logical operators.

Unit 2: Control structures, loop, Functions, data structures: Lists, Arrays, Tuples, Dictionary, Sets, NumPy library, Data Collection: Getting to know your data, Types of Data, Data collection strategies, Data Pre-processing, Feature engineering, Exploratory Data Analytics.

Unit 3: Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, inferential statistics: hypothesis testing, probability: probability theory, conditional probability, Pandas library, dataframe and dataframe related operations, Reading files.

Unit 4: Data Cleaning and Preparation, Handling Missing Data, Data Transformations using pandas and sklearn library, Removing Duplicates, Replacing Values, Detecting Outliers. Data visualization on different dataset using matplotlib and seaborn libraries, Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot.

Unit 5: Supervised learning: Regression, classification, Linear regression, logistic regression, decision tree, tree creation with entropy and information gain, ID3 algorithm, random forest, naïve bayes theorem, K-nearest neighbor and ensemble methods for solving real world problems, Unsupervised learning: Clustering, Reinforcement learning.

BOOKS AND REFERENCES

1. Mastering python for data science, Samir Madhavan
2. Introduction to linear algebra - by Gilbert Strang
3. Applied statistics and probability for engineers – by Douglas Montgomery
4. Pattern Recognition and Machine Learning, Christopher M. Bishop

COURSE OUTCOMES:

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

- **CO1.** **Analyze** data science basics and apply python for data manipulation
- **CO2.** **Apply** data structure for preprocessing and analysis of data
- **CO3.** **Build** exploratory data analysis for Data Science methods.
- **CO4.** **Apply** data visualization techniques to solve real world problems.
- **CO5.** **Apply** Data Science techniques for solving real world problems.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. V Semester (Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3200512	DC	Mobile Communication & 5G Networks	50	10	20	20	-	-	-	100	3	1	-	4

Mobile Communication & 5G Networks (3200512)

Course Objective: The objective of the course is to provide an understanding of wireless communication system, its evolution, standards, and comparison of recent technologies and overview of 5G technology.

Unit I: Introduction to cellular mobile systems: Basic Cellular System, Cellular communication infrastructure: Cells, Clusters, Cell Splitting, Frequency reuse concept, Cellular system components, Operations of cellular systems, Handoff/Handover, Channel assignment, Fixed and dynamic, Cellular interferences: Co-Channel and adjacent channel and sectorization.

Unit II: Channel Models: Properties of mobile radio channels – Intersymbol interference – Multipath and fading effects – Interleaving and diversity – Multiple access schemes (TDMA, FDMA, CDMA, SDMA,OFDMA) – Interuser interference – Traffic issues and cell capacity.

Unit III: Modulations techniques for mobile communication: Pulse shaping, Linear and non-linear Modulation techniques, constant envelop modulation, QPSK, MSK, GMSK. Spread spectrum modulation techniques - Direct sequence and Frequency Hopping Spread Spectrum and their applications.

Unit IV: Introduction to modern cellular standards: 2G Architecture such as GSM and CDMA based – 2.5G – GPRS: GPRS and its features –3G standard details such as UMTS – Introduction to LTE, Basic concept of massive MIMO.

Unit V: Overview of 5G Broadband Wireless Communications: 5G potential and applications; Usage scenarios: enhanced mobile broadband (eMBB), ultra reliable low latency communications (URLLC), massive machine type communications (MMTC), D2D communications, V2X communications; Spectrum for 5G and sharing.

Text Books:

1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
2. 4G, LTE-Advanced Pro and The Road to 5G Third Edition, Elsevier publication

Reference Books:

1. V.K.Garg, J.E.Wilkes, "Principle and Application of GSM", Pearson Education, 5th edition, 2008.
2. T.S. Rappaport ,"Wireless Communications: Principles and Practice", second edition, Prentice Hall publication, 2002.

Course Outcomes:

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

CO1. **Describe** mobile communication system.
CO2. **Compare** multiple access techniques for signal transmission.
CO3. **Explain** modulation techniques for mobile communication system.
CO4. **Analyze** modern cellular standards.
CO5. **Discuss** 5G technology in mobile communication.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. V Semester (Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	TheorySlot				PracticalSlot			TotalMarks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3200515	DC	VLSI Design	50	10	20	20	40	30	30	200	3	-	2	4

VLSI Design (3200515)

Course objectives: To understand the fundamental properties of digital CMOS logic circuits using basic MOSFET equations and to develop skills for various logic circuits using CMOS design.

Unit I :MOS Transistor: The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structure and Operation of MOS Transistor (MOSFET), MOSFET Current-Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitances.

Unit II: MOS Inverters Static Characteristics: Introduction, Voltage Transfer Characteristic (VTC), Noise Immunity and Noise margins, Resistive-Load Inverter, Inverters with n-Type MOSFET Load and CMOS Inverter, DC Characteristics of CMOS Inverter, Calculation of VIL, VIH, VOL, VOH and Vth, Design of CMOS Inverters, Supply Voltage Scaling in CMOS Inverters, Power and Area considerations.

Unit III: MOS Inverters Dynamic Characteristics: Switching Characteristics and Interconnect Effects, Switching Characteristics of CMOS Inverter- Delay-Time Definitions, CMOS Propagation Delay, Calculation of Delay times, Power Dissipation-Switching, Short-Circuit and Leakage Components of Energy and Power, Power-Delay Product.

Unit IV: CMOS Logic Structures and Layout Design: Combinational MOS logic circuits- CMOS Logic circuits (NAND,NOR and Complex Logic Gates, Multiplexers etc.), CMOS Transmission Gates (Pass Gates). CMOS n-Well Process, layout design rules, layout design of CMOS Inverter, designing of stick diagram.

Unit V: Semiconductor Memories and Low-Power CMOS Logic Circuits: Semiconductor memories: non- volatile and volatile memory devices, flash memories, SRAM cell design, 1T DRAM cell design, dynamic CMOS logic circuits, domino logic CMOS circuits.

Text Books

1. Sung-Mo Kang & Yusuf Leblebici, "CMOS Digital Integrated Circuits – Analysis and Design", 3rd Edition, Tata McGraw-Hill, NewDelhi,2003.
2. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, "Digital Integrated Circuits: a design perspective", 2nd Edition, Pearson Education, 2003.

Reference Books

1. David A. Hodges, Horace G. Jackson, Resve A. Saleh, "Analysis and Design of Digital Integrated Circuits: In Deep Submicron Technology", McGraw, 2003.
2. David A. Johns and Ken Martin, "Analog Integrated Circuit Design" John Wiley and Sons Inc., 1997. Neil Weste and David Harris,"CMOS VLSI Design:A Circuits and Systems Perspective",4th Edition, Addison-Wesley, 2010.

Course Outcomes:

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

CO1. **Analyze** operating modes of CMOS transistors
CO2. **Compute** static characteristic parameters of CMOS inverters.
CO3. **Evaluate** the propagation delay and power dissipation of CMOS inverter.
CO4. **Design** CMOS logic circuit and layout.
CO5. **Compare** Semiconductor memories.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. V Semester (Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3200519	DC	Electromagnetic Theory	50	10	20	20	-	-	-	100	3	1	_	4

Electromagnetic Theory (3200519)

Course objectives: To develop an understanding of fundamental concepts of electromagnetic fields with an emphasis on wave propagation and to create ability to relate basic electromagnetic concepts to the performance of devices, circuits, and systems.

UnitI Electrostatics: Coulomb‘s Law, Electricfieldintensity, Electricfluxandflux density, Gausslaw,Boundary relations, Concept of divergence, Curl, Scalar and vector potential, Divergence theorem, Stokes theorem, Electric field in dielectric and conductor, Continuity equation, Poisson‘sandLaplace‘s equations.

Unit II Magnetostatics: Lorentz force, Magnetic field intensity(H), Biot Savart‘s Law, Ampere‘s Circuit Law, H due to straight conductors, Circular loop, Infinite sheet of current, Magnetic flux density (B) –in free space and conductor, Magnetic materials – Magnetization.

Unit III Electrodynamic Fields: Magnetic field in multiple media – Boundary conditions, Scalar and vector potential, Poisson‘s equation, Magnetic force,force between current carrying wires, Magnetic circuits– Faraday‘s law, Displacement current– Maxwell‘s equations (differential and integral form) –for steady, time varying and time harmonic fields.

Unit IV Electromagnetic Wave Equation: General wave equation, Uniform plane wave in free space, Perfect dielectric, Lossy dielectric and conducting medium, Skin depth, Poynting vector and Poynting theorem.

Unit V Polarization and Reflection of Wave: Wave Polarization –linear, elliptic, circular, Reflection of uniform plane waves, Normal incidence and Oblique incidence, Brewster angle, Total internal reflection.

Text Books:

1. Elements of Engineering Electromagnetic Third Edition-N. N. Rao- Prentice Hall, India.
2. Elements of Electromagnetic, Second Edition- Matthew N.O.Sadiku- Saunderscoll Publishing.

Reference Books:

1. Fields &Waves in Communication Electronics-S. Ramo, J.R.Whinnery & T.Van Duzer-John Wiley & Sons.
2. Electromagnetic-J.D.Kraus-McGraw Hill.
3. ElectromagneticWaves & Radiating Systems-E.C. Jordan & K.G.Balmain- Prentice Hall.

CourseOutcomes:

After successful completion of the course,students will be able to:
CO1.Analyze the concepts of electrostatic fields in practical applications.
CO2. Analyze magnetic fields generated by steady currents and the influence of magnetic materials.
CO3. Apply the maxwell equations to solve problems of time varying fields.
CO4. Analyze electromagnetic wave propagation in different media.
CO5.Analyze polarization and reflection of electromagnetic waves in a practical field.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

B.Tech. V Semester (Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Marks	Lab work & Sessional Marks	Skill based mini project		L	T	P	
3200520	DC	Digital Signal Processing	50	10	20	20	-	-	-	100	3	1	-	4

Digital Signal Processing (3200520)

Course Objectives: Understanding of the fundamental concepts of digital signal processing, designing of digital filters, and brief knowledge about the Multirate digital signal processing.

Unit I Review of Transform Domain Techniques: Review of discrete time signals and systems, Properties and applications of discrete time Fourier transform, Review of Z transform, Analysis of minimum phase, maximum phase and inverse system.

Unit II Discrete Fourier Transform (DFT): Introduction and properties of DFT, Computation of circular convolution using DFT, Decimation in time FFT algorithm, Decimation of frequency FFT algorithm with radix-2, and radix-4.

Unit III Digital Filters (Part-I): Characteristics of practical frequency selective filters, various signal flow graph structure of IIR filters. **IIR Filter design:** Overview of Butterworth, Chebyshev and Elliptic approximations, Design of discrete time IIR filters using Impulse invariant, and Bilinear transformation methods,

Unit IV Digital Filters (Part-II): Introduction and Signal flow graph structure of FIR Filter.

FIR Filter design: Symmetric, and Asymmetric FIR filters, Design of linear phase FIR filters using windows, and Frequency sampling method.

Unit V Multirate Digital Signal Processing: Introduction, Decimation and Interpolation, Sampling rate conversion by a Rational factor.

Implementation of Sampling rate Conversion: Sampling rate conversion with Cascaded integrator, Comb filters,Polyphase structures for decimation, and interpolation filters, Application of multirate signal processing.

Text Books:

1. John. G. Proakis, "Digital Signal Processing", 4th Edition, Pearson Education.
2. Oppenheim and Schafer, "Digital Signal Processing", 2nd Edition, PHI Learning.

Reference Books:

1. Johnny R. Johnson, "Introduction to Digital Signal Processing", 1st Edition, PHI Learning.
2. Rabiner and Gold, "Theory and Application of Digital Signal Processing",3rd Edition, PHI Learning.
3. Ingle and Proakis, "Digital Signal Processing- A MATLAB based Approach", 3rd Edition, Thompson, Cengage Learning.

Course Outcomes:

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

CO1. **Analyze** discrete-time systems using transform methods.
CO2. **Compute** DFT using FFT algorithms.
CO3. **Design** IIR Filters.
CO4. **Design** FIR Filters.
CO5. **Apply** multi-rate signal processing techniques to design the systems.

Course Articulation Matrix

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

1 - Slightly; 2 - Moderately; 3 – Substantially

Annexure IX

Item 10

To review and recommend the Experiment list/ Lab manual for all the Laboratory Courses to be offered in B. Tech. ***V Semester*** {**for the batch admitted in 2023-24}**.

S.No	Category	Subject Code	Subject Name
1	DC	3200511	Data Science
2	DC	3200512	VLSI Lab
3	DLC	3200516	Minor Project-I

B.Tech. V Semester (Electronics & Telecommunication Engineering)

Subject Name: Data Science

L	T	P	C
-	-	2	1

Subject Code: 3200511

Course Objective: To equip students with the necessary skills and knowledge to effectively analyze and interpret data using Python, enabling them to make data-driven decisions and contribute to the field of data science.

LIST OF EXPERIMENTS

1. Write a Python Program to perform various arithmetic operations (+, -, * / …) and display the results.
2. Create a List using Python program and perform following operations:
   (a) Reverse the items of the list
   (b) Find consonants and vowels in the list
   (c) Change a particular character/number in the list
3. Write a Python Program to create a Matrix (using Numpy Library) and perform multiplication of two matrices.
4. Write a Python Program to create a Matrix (using Numpy Library) and perform Transpose of a matrix.
5. Write a Python Program to create a Matrix (using Numpy Library) perform inverse of a matrix.
6. Write a Python Program using Pandas Library to perform arithmetic operations on two Pandas Series.
7. Write a Python Program using Pandas Library to join the two given data frame salong rows and assign all data.
8. Write a Python program to generate a Line Plot for random data points using MatPlotLiB Library, also customize line style, color, markers and labels.
9. Write a Python program to generate a Bar Plot for random data points using MatPlotLiB Library, also customize line style, color, markers and labels.
10. Write a Python program to create multiple subplots (for standard functions like sine, cosine…) and display it in a single figure, also customize titles, layouts and axes of subplots.

Course Outcomes:

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

CO1. Write a program in Python.
CO2. Analyze and evaluate datasets using Python for data science tasks.

B.Tech. V Semester (Electronics & Telecommunication Engineering)

VLSI Design Lab (3200512)

Course Objectives

To learn the fundamental principles of CMOS VLSI circuit design using SYMICA EDA CAD tool.

List of Experiments:

Digital CMOS logic circuit design using SYMICA CAD tool:

1. Write and simulate basic CMOS logic Gates: AND, OR, NOT.
2. Write and simulate CMOS logic universal gates: NAND and NOR.
3. Write and simulate CMOS logic 2:1 MUX.
4. Write and simulate CMOS logic 2 x 4 Decoder.
5. Write and simulate CMOS logic Half-Adder and Full Adder.
6. Write and simulate CMOS logic RS, JK and D flip-flops.

Gate level design using SYMICA CAD tool:

1. Write and simulate a Verilog program for the following combinational designs: a) 2 to 4 decoder
   b) 8 to 1 multiplexer
   c) 4 bit binary to gray converter
2. Write and simulate a Verilog code to describe the functions of a full adder using three modeling styles.
3. Write and simulate a model for 32 bit ALU.

Course Outcomes

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

CO1. **Demonstrate** a clear understanding in hardware design language Verilog and SPICE.

CO2. Model a combinational circuit using hardware description language Verilog and SPICE Netlist.

CO3. Model a sequential circuit using hardware description language Verilog and SPICE Netlist.

CO4. **Model** a computational circuit using hardware description language verilog and SPICE Netlist.

CO5. Simulate and validate the functionality of the CMOS VLSI circuits using CAD tools.

B.Tech. V Semester (Electronics & Telecommunication Engineering)

Departmental Lab Course

L	T	P	C
-	-	2	1

Subject Name: Minor Project-I
Subject Code: 3200516

Course objective

This course gives the basic introduction of electronics hardware system and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such system by making use of the various tools and instruments available in the electronics workshop.

List of Exercise/ Experiments

1. Familiarization/Identification of electronics component with specification (Functionally, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electronic-Mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.]
2. Drawing of electronic circuit diagrams using symbols, Interpret data sheets of discrete components and IC's, Estimation and costing.
3. Familiarization/application of testing instruments and commonly used tools. (Multimeter, function generator, power supply, CRO etc.) (soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station etc.)
4. Testing of electronic component (Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter.)
5. Inter-connecting methods and soldering practices.[Bread board, Wrapping, Crimping, Soldering – types-selections of materials and safety precautions, Soldering practice in connectors and general purpose PCB, Crimping.]
6. Printed circuit board (PCB) [Types, Single sided, Double sided, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]

Course Outcomes

After successful completion of the workshop, students will be able to:

CO1. **Identify** electronics components and their testing.
CO2. **Operate** measuring instruments (such as multi-meter) and electronics equipments likes CRO, dual-power tracking power supply &function generator.
CO3. **Design** the electronics circuits on bread-board.
CO4. **Perform** soldering and de-soldering of the circuit components properly.
CO5. **Troubleshoot** a not working electronic circuit and to rectify it.

Annexure X

Item 11

To review and recommend the list of projects which can be assigned under the 'Skill based mini-project' category in various laboratory components based courses to be offered in B.Tech. **V Semester** {**for the batch admitted in 2023-24}**.

Data Science (3200511)
Skill Based Mini Project

1. Download the IRIS dataset from kaggel and read detail/information, draw boxplot for any column, find mean for all column
2. Download the IRIS dataset from kaggel and read detail/information, draw scatter plot for any column, find median for all column
3. Download the diabetes dataset from kaggel and read detail/information, draw boxplot for any column, find mean for all column
4. Download the diabetes dataset from kaggel and read detail/information, draw scatter for any column, find median for all column
5. Download the ODI men's cricket match data from kaggel and read detail/information, draw boxplot for any column, find mean for all column
6. Download the ODI men's cricket match data from kaggel and read detail/information, draw scatter for any column, find median for all column
7. Load the Toyota dataset from kaggle/Internet, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
8. Load the Diabetes data analysis dataset from Kaggle, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
9. Load the IRIS dataset from Kaggle, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
10. Load the given TITANIC dataset from Kaggle, find the correlation between any two columns values and do the plotting pair-wise using SEABORN Library.
11. Download the IRIS dataset from kaggel and read detail/information, draw boxplot for any column, find mean for all column
12. Download the IRIS dataset from kaggel and read detail/information, draw scatter plot for any column, find median for all column
13. Download the diabetes dataset from kaggel and read detail/information, draw boxplot for any column, find mean for all column
14. Download the diabetes dataset from kaggel and read detail/information, draw scatter for any column, find median for all column
15. Download the ODI men's cricket match data from kaggel and read detail/information, draw boxplot for any column, find mean for all column
16. Download the ODI men's cricket match data from kaggel and read detail/information, draw scatter for any column, find median for all column
17. Load the Toyota dataset from kaggle/Internet, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
18. Load the Diabetes data analysis dataset from Kaggle, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
19. Load the IRIS dataset from Kaggle, find the correlation between numerical variables and do the plotting pair-wise using SEABORN Library.
20. Load the given TITANIC dataset from Kaggle, find the correlation between any two columns values and do the plotting pair-wise using SEABORN Library.

VLSI Design Lab (3200512)

Skill Based Mini Project

1. Design and Verify the 180 nm CMOS based NAND gate on LTSpice.
2. Design and Verify the 180 nm CMOS based NOR gate on LTSpice.
3. Design and Verify the 180 nm CMOS based Half-adder on LTSpice.
4. Design and Verify the 180 nm CMOS based 1-bit Shift Register on LTSpice.
5. Design and Verify the 180 nm CMOS based XOR gate on LTSpice.
6. Design and Verify the 180 nm CMOS based EXNOR gate on LTSpice.
7. Design and Verify the 180 nm CMOS based Full-adder on LTSpice.
8. Design and Verify the 180 nm CMOS based 2-bit Shift Register on LTSpice.
9. Design and Verify the 180 nm CMOS based OR gate on LTSpice.
10. Design and Verify the 180 nm CMOS based AND gate on LTSpice.
11. Design and Verify the 180 nm CMOS based half-substractor on LTSpice.
12. Design and Verify the 180 nm CMOS based 1 bit comparator on LTSpice.
13. Design and Verify the 180 nm CMOS based Inverter on LTSpice and measure the delay at 100 MHz Frequency.
14. Design and Verify the 180 nm CMOS based Inverter on LTSpice and measure the total power dissipation at 100 MHz Frequency.
15. Design and Verify the 180 nm CMOS based full-substractor on LTSpice.
16. Design and Verify the 180 nm CMOS based 2 bit comparator on LTSpice.
17. Design and Verify the 180 nm CMOS based domino logic 2- input NAND gate on LTSpice.
18. Design and Verify the 180 nm CMOS based domino logic 2- input NOR gate on LTSpice.
19. Design and Verify the 180 nm CMOS based domino logic 4- input NAND gate on LTSpice.
20. Design and Verify the 180 nm CMOS based domino logic 2- input NOR gate on LTSpice.

Annexure XI

Item-12

To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered in online mode under ***Self-Learning/ Presentation***, in the B.Tech. ***V Semester*** {**for the batch admitted in 2023-24}**.

S. No	Semester	Subject Category	Subject Name	Duration (weeks)
1	V	Self Learning	Demystifying Networks	04
2			Basics of Software defined Radios and Practical applications	04
3			Foundation of Cognitive robotics	04

Category	Semester	Name of The course	Duration of the Course in weeks	Course Registration		Name of the Mentor Faculty
				Start Date	End Date	
Electronics & Telecommunication Engineering (V Semester)						
Self Learning	V	Demystifying Networking	4	**21-07-2025**	**15-08-2025**	Dr. Deepak Batham
	V	Basics of Software defined Radios and practical applications	4	**21-07-2025**	**15-08-2025**	Dr. Shubhi Kansal
	V	Foundations of Cognitive robotics	4	**21-07-2025**	**15-08-2025**	Dr. Varun Sharma

Annexure XII

Item 13

To propose the list of "***Additional Courses***" which can be opted for getting an (i) Honours (for students of the host department) and (ii) Minor Specialization (for students of other departments)
These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. ***V semester*** students {**for the batch admitted in 2023-24}**.

Category	Semester	Name of the course	Duration of the Course in weeks	Course Registration		Name of the Mentor Faculty
				Start Date	End Date	
Electronics/Electronics & Telecommunication Engineering (V Semester)						
Honors	V	Principles and Techniques of Modern Radar Systems	12	**21-07-2025**	**10-10-2025**	Prof. Deep Kishore
	V	Stochastic Control and Communication	12	**21-07-2025**	**10-10-2025**	Dr. Rahul Dubey
	V	Analog VLSI Tesing	12	**21-07-2025**	**10-10-2025**	Dr. Varun Sharma
	V	Nano-Technology, Science and Application	08	**21-07-2025**	**12-09-2025**	Dr. Yogesh Kumar
	V	Microelectronics: Devices to Circuits	12	**21-07-2025**	**10-10-2025**	Dr. Varun Sharma
Minors	V	Control System	12	**21-07-2025**	**10-10-2025**	Dr. Deepak Batham
	V	Fundamental of Wireless Communications	8	**21-07-2025**	**12-09-2025**	Prof. Pooja Sahoo

Annexure XIII

Item 14

To review the ***CO attainments, to identify gaps and to suggest corrective measures*** for the improvement in the CO attainment levels for all the courses taught during **July-Dec 2024 session**.

https://docs.google.com/document/d/1p75FRIRW4qrLbP7sLHnDLti_0pEig-ij/edit?usp=sharing&ouid=101619927645802630196&rtpof=true&sd=true

Annexure XIV

Item 15

To review ***curricula feedback*** from various stakeholders, its analysis and impact.

Alumni Feedback

https://docs.google.com/document/d/1qlYsvVcEhXkOgZcbp_IerIvea-T7_jlR/edit?usp=sharing&ouid=114993933979291533856&rtpof=true&sd=true

Curriculum Gap Analysis

https://docs.google.com/document/d/1eLBjm7mqMgnxMyUNWvEuc7Irkh2Kqia_/edit?usp=sharing&ouid=101619927645802630196&rtpof=true&sd=true

Employer Feedback

https://docs.google.com/document/d/1-xKD_ECH_Rt-e1KH8qfTsNC9dHMDmjdL/edit?usp=sharing&ouid=101619927645802630196&rtpof=true&sd=true

Student Curriculum Feedback

https://docs.google.com/document/d/18vDWC58YbN_U2595Kpg4vnYZf2vE1wgI/edit?usp=sharing&ouid=101619927645802630196&rtpof=true&sd=true