



Bharatiya Vidya Bhavan's

Sardar Patel Institute of Technology

(Autonomous Institute Affiliated to University of Mumbai)

[Knowledge is Nectar]

Liberal, Pi-Model of Engineering Education @ SPIT

(Department of Electronics and Telecommunication Engineering)

CURRICULUM STRUCTURE FOR UNDERGRADUATE ACADEMIC PROGRAMS IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING AT SPIT W.E.F. A.Y. 2023-24 [2023-2027 BATCH]

Preamble: Government of Maharashtra has directed Autonomous Colleges to revise their curriculum and step into the implementation of National Education Policy (NEP) 2020. We commit ourselves to the effective and fruitful implementation of NEP 2020 in its spirit. The holistic development of learners has always been the priority and center of focus for “Bharatiya Vidya Bhavan”. S.P.I.T. started implementing the philosophy of NEP in the year 2019 itself. We have in fact graduated the first batch of our holistic curriculum in 2023. Now based on our learnings from the implementation and recent recommendations of the Government, we are pleased to offer a 2nd iteration of our holistic curriculum for 2023-27, a Liberal Pi Model of Engineering Education.

This curriculum aims at the development of an **all-rounded** personality. It follows a **holistic** approach to education, ensures strong science, and mathematics foundation and program core, develops expertise in domain vertical through the sequel of electives, ensures significant exposure to additional discipline through a “Multidisciplinary Minor” courses, imparts state of the art practical knowledge through a semester-long industry / research internship, collaborates outside world for the imparting relevant skill courses, challenges good learners through “Honors” evaluation, and systematically develops soft skills, and social, physical, mental, spiritual personality through carefully articulated **Liberal Learning** and **Humanities** sequels. Thus, it offers a unique, liberal “**Pi-Model**” of Engineering Education.

Table 1: Nomenclature of the courses in the curriculum

Groups	Abbreviation	Course Category
Basic Sciences and Engineering Sciences Courses (BSES)	BSESC	Basic Science & Engineering Science Courses
	BSESEC	Basic Science & Engineering Science Elective Courses
Skill Based Courses (SBC)	SEC	Skill Enhancement Course
	CC	Co-curricular Courses
HSSM	HSSMC	Humanities, Social Science and Management Courses
	CP	Community Project
Ability Enhancement Courses (AEC)	IKS	Indian Knowledge System
	UHV	Universal Human Values
Program Related Courses (PRC)	PCC	Program Core Courses
	PEC	Program Elective Courses
	ELC	Experiential Learning Courses
Multi-Cross-Trans disciplinary courses (MCTD)	OEC	Open Elective Courses
	MDM	Multidisciplinary Minor

Indicative List of BSESE Courses:

- Engineering Physics
- Engineering Chemistry
- Biology for Engineers
- Engineering Mechanics
- Engineering Graphics
- Material Science
- Environmental Science
- Thermal & Fluid Engineering

Table 2: Comparison of S.P.I.T. credit structure with the G.R. recommendations

SPIT											
Sem	BSES	SEC	AEC	HSSM	CC(LLC)	PCC	PEC	OE	EXP LEARNING	MDM	Total
I	11	5	2		1						19
II	11	5	2		1				2		21
III	6	2		2	1	12					23
IV	3	2		2	1	12				3	23
V						16			2	4	22
VI		2				8	6		2	3	21
VII							6	3	4	4	17
VIII								3	11		14
Total	31	16	4	4	4	48	12	6	21	14	160
%	19.38	10	2.5	2.5	2.5	30	7.5	3.75	13.125	8.75	100
G.R. (NEP-2020) Recommended											
Total	30	10	8	4	4	44	20	8	22	14	164
%	18.3	6.1	4.88	2.44	2.44	27	12.2	4.88	13.42	8.54	100

Figure 1: Comparison of S.P.I.T. credit structure with the G.R. recommendations

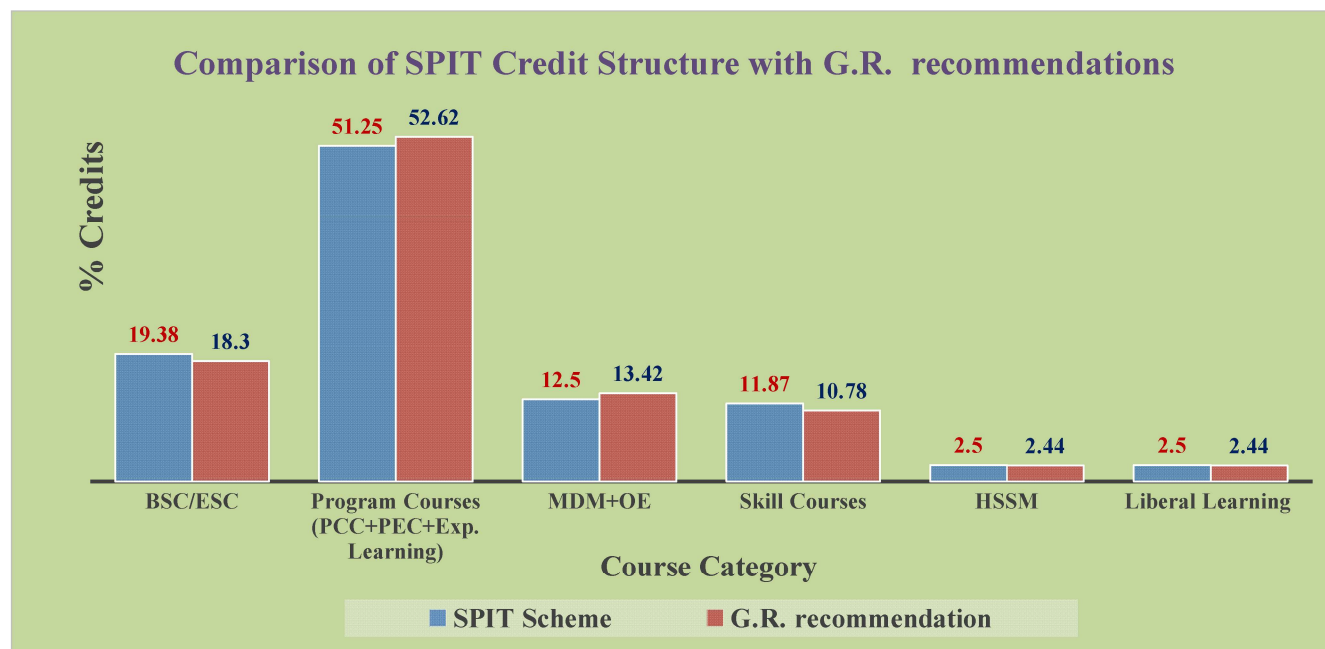


Figure 2: Pie-chart of vertical-wise allocation of credits

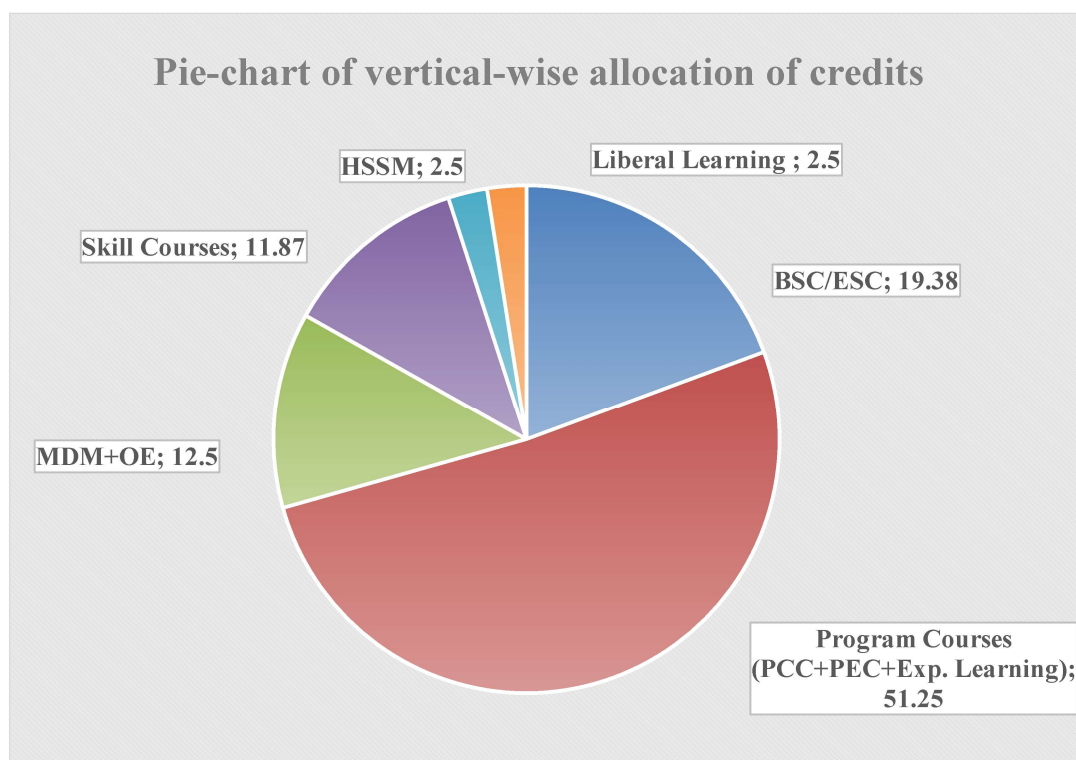


Table 3: Semester-wise allocation of credits to different verticals

SEM I											
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	O	E	C	
1	Basic & Engg. Sciences	BSES	MA101	Mathematics I (ECL)	3	1	0	8	12	4	
2	Basic & Engg. Sciences	BSES	EC101	Digital Systems /	3	0	2	6	11	4	
			EC102	Basic Electrical Engineering	3	0	2	5	10		
3	Basic & Engg. Sciences Elective	BSESE		Course I						3	
			AS101	Engineering Physics/	2	0	2	4	8		
			AS102	Engineering Chemistry/	2	0	2	3	7		
			AS103	Biology for Engineers/	3	0	0	3	6		
			AS104	Engineering Mechanics/	2	0	2	4	8		
			AS105	Engineering Graphics/	0	1	2+2	2	7		
			AS108	Material Science/	3	0	0	4	8		
			AS109	Environmental Science/	3	0	0	3	6		
			AS110	Energy Science/	3	0	0	3	7		
			AS111	Thermal & Fluid Engineering/	3	0	0	3	6		
4	Skill Enhancement Course	SEC	AS106	Tech Shop/	0	1	2	2	5	2	
			AS107	Soft Skill I	0	1	2	2	5		
5	Skill Enhancement Course	SEC	CE101	Programming Lab I	0	1	2+2	4	9	3	
6	Ability Enhancement Course	AEC	AEC01	IKS /	1	1	0	1	3	2	
			AEC02	UHV	1	1	0	1	3		
7	Cocurricular Courses	CC (LLC)	LLC01	LLCXX	0	1/0	0/2	2	3	1	
	Total				12	5	10	26	49+	19	

SEM II										
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	O	E	C
1	Basic & Engg. Sciences	BSES	MA102	Mathematics II (DECA)	3	1	0	8	12	4
2	Basic & Engg. Sciences	BSES	EC101	Digital Systems /	3	0	2	6	11	4
			EC102	Basic Electrical Engineering	3	0	2	5	10	
3	Basic & Engg. Sciences Elective	BSESE		Course II						3
			AS101	Engineering Physics/	2	0	2	4	8	
			AS102	Engineering Chemistry/	2	0	2	3	7	
			AS103	Biology for Engineers/	3	0	0	3	6	
			AS104	Engineering Mechanics/	2	0	2	4	8	
			AS105	Engineering Graphics/	0	1	2+2	2	7	
			AS108	Material Science/	3	0	0	4	8	
			AS109	Environmental Science/	3	0	0	3	6	
			AS110	Energy Science/	3	0	0	3	7	
			AS111	Thermal & Fluid Engineering/	3	0	0	3	6	
4	Skill Enhancement Course	SEC	AS106	Tech Shop/	0	1	2	2	5	2
			AS107	Soft Skill I	0	1	2	2	5	
5	Skill Enhancement Course	SEC	CE102	Programming Lab II	1	0	2+2	4	9	3
6	Ability Enhancement Course	AEC	AEC01	IKS /	1	1	0	1	3	2
			AEC02	UHV	1	1	0	1	3	
7	Cocurricular Courses	CC (LLC)	LLC02	LLCXX	0	1/0	0/2	2	3	1
		Total			12	5	10	26	49+	19

1	Experiential Learning	CP (in Summer)	PRJ01	Community Project	0	0	4	4	8	2
2	HSSE	COI	AS202	Constitution of India (2Hrs/Week)	1	0	0	1	2	NC

SEM III										
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	O	E	C
1	Basic & Engg. Sciences	BSES	MA201	Program Specific Maths-I – Linear Algebra	2	0	2	5	9	3
2	Basic & Engg. Sciences *	FOM-I	MA202	Foundation of Mathematics-I*	2	1	0	0	3	3
3	Skill Enhancement Course	SEC	AS201	Soft Skill II-- Professional Communication Skills	0	1	2	2	5	2
4	Basic & Engg. Sciences Elective	BSESE		Course III						3
			AS101	Engineering Physics/	2	0	2	4	8	
			AS102	Engineering Chemistry/	2	0	2	3	7	
			AS103	Biology for Engineers/	3	0	0	3	6	
			AS104	Engineering Mechanics/	2	0	2	4	8	
			AS105	Engineering Graphics/	0	1	2+2	2	7	
			AS108	Material Science/	3	0	0	4	8	
			AS109	Environmental Science/	3	0	0	3	6	
			AS110	Energy Science/	3	0	0	3	7	
			AS111	Thermal & Fluid Engineering/	3	0	0	3	6	
5	Humanities	HSSM-I	HS2XX	Course I	2	0	0	3	5	2
6	Program Core Courses (12)	PCC	EC201	Electromagnetic Wave Engineering	2	0	2	5	9	3
7		PCC	EC202	Electronic Devices and Circuits	3	0	2	4	9	4
8		PCC	EC203	Signal, Network and System	3	0	2	4	9	4
9		PCC	EC204	Hardware Description Language programming	0	0	2	2	4	1
10	Co-curricular Courses	CC (LLC)	LLC03	LLCXX	0	1/0	0/2	2	3	1
			Total		14	1	14	27	57+	23

**Only for Lateral Entry Students*

SEM IV										
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	O	E	C
1	Basic & Engg. Sciences	BSES	MA203	Program Specific Maths-II ---Probability and Stochastic Process	3	0	0	6	9	3
2	Basic & Engg. Sciences *	FOM-II	MA204	Foundation of Mathematics-II*	2	1	0	0	3	3
3	Skill Enhancement Course	SEC	AS202	Programming lab III---Computational numerical methods	0	1	2	4	8	2
4	Humanities	HSSM-II	HS2XX	Course II	2	0	0	3	5	2
5	Program Core Courses (11)	PCC	EC205	Analog and Digital Communication	3	0	2	4	7	4
6		PCC	EC206	Computer Organization & Architecture	3	0	0	4	9	3
7		PCC	EC207	Mixed Signal Integrated Circuit	3	0	2	4	9	4
8	Cocurricular Courses	CC (LLC)	LLC04	LLCXX	0	1/0	0/2	2	3	1
9	Multidisciplinary Minor	MDM	MDEC1X	MDM-I	To be defined by others					3
Total					15	1	4	26	49+	22

Summer term (For Lateral Entry Students)										
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	O	E	C
1	Basic & Engg. Sciences	BSES	MA201	Program Specific Maths-I – Linear Algebra	2	0	2	5	9	3
2	Basic & Engg. Sciences	BSES	MA203	Program Specific Maths-II ---Probability and Stochastic Process	3	0	0	6	9	3

- Students are expected to start working for the Mini Project I during the summer.
- Research internship of minimum 2 months for the “Honors by Research” for 6 credits- HR21 (Not for DSY)
- For Enrollment to Honors by research, Minimum CGPA must be 8.25

SEM V										
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	O	E	C
1	Experiential Learning	ELC	PR1	Mini Project I	0	0	4	4	8	2
2	Program Core Courses (18 credits)	PCC	EC301	Control Systems	3	0	1	5	8	4
3		PCC	EC302	Computer Communication Networks	3	0	0	5	8	3
4		PCC	EC303	Digital Signal Processing	3	0	1	6	9	4
5		PCC	EC304/	Digital CMOS VLSI Design /	2	0	1	5	8	3
			EC305	Fundamental of Power Electronics	2	0	1	5	8	
6		PCC	EC306	Embedded Systems	3	0	1	5	9	4
7	Multidisciplinary Minor	MDM	MDEC2X	MDM-II	To be defined by others					4
Total					14	0	8	30	50+	24

- Research internship of minimum 1 month for the “Honors by Research” for 3 credits HR31 (Not for DSY)
- For Enrollment to Honors by research, Minimum CGPA must be 8.25

SEM VI										
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	O	E	C
1	Program Core Courses (7credits)	PCC	EC307	Fundamentals of Antenna	3	0	1	5	8	4
2		PCC	EC308	Mobile Wireless Communication	2	0	1	4	7	3
3	Multidisciplinary Minor	MDM	MDEC3X	MDM-III	To be defined by others					3
4	Experiential Learning	ELC	PR3-I	Main Project Stage I	0	0	4	4	8	2
5	Program Elective Courses	PEC	EC3X1	PE-I	2	0	1	4	7	3
6	Program Elective Courses	PEC	EC3X2	PE-II	2	0	1	4	7	3
7	Skill Enhancement Course	SEC	AS301	Special Lab (domain specific)---Internet of Things Laboratory	0	1	2	2	5	2
Total					9	1	10	19	42+	20

- Research internship of minimum 2 month for the “Honors by Research” for 6 credits HR32 (Not for DSY)
- For Enrollment to Honors by research, Minimum CGPA must be 8.25

SEM VII										
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	O	E	C
1	Multidisciplinary Minor	MDM	MDEC4X	MDM-IV	To be defined others					4
2	Program Elective Courses	PEC	EC3X3	PE-III	2	0	1	4	7	3
3	Program Elective Courses	PEC	EC3X4	PE-IV	2	0	1	4	7	3
4	Open Elective	OE	OE1	OE-I	2	0	1	4	7	3
5	Experiential Learning	ELC	PR3-II	Main Project Stage II	0	0	8	4	12	4
Total					6	0	11	16	33+	17

- Research internship of minimum 1 month for the “Honors by Research” for 3 credits HR41 (Not for DSY)
- For Enrollment to Honors by research, Minimum CGPA must be 8.25

SEM VIII										
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	O	E	C
1	Open Elective	OE	OE2	OE-II**	2	0	1	4	7	3
2	Experiential Learning	ELC	INTR/INTI/PR3-III	Research/ Industry Internship/Main Project Stage III/ ***	0	0	24	12	36	11
Total					2	0	25	16	43	14

** To be completed from MOOCs

*** Students neither taking research or industry internship nor willing to extend their project work can earn additional 11 credits from Swayam Platform or NPTEL or registering courses from any peer institution of higher learning., besides open elective/program elective courses offered by the institute.

Indicative List of Humanities courses (HSSM-I):

Course Code	Course Title	Course Code	Course Title
HS211	Law for Engineers-I	HS212	Law for Engineers-II
HS221	Psychology -I	HS222	Psychology –II
HS231	Finance for Engineers-I	HS232	Finance for Engineers-II
HS241	Economics-I	HS242	Economics-II
HS251	French-I	HS252	French-II
HS261	German-I	HS262	German-II
HS271	Japanese-I	HS272	Japanese-II
HSNP	NPTEL (HSS/Management)	HSNP	NPTEL (HSS/Management)

Indicative List of Cocurricular courses (LLC)

Course Code	Course Title
LLC01	Dance (Kathak)
LLC02	Dance (Bharatnatyam)
LLC02	Fundamentals of Photography
LLC03	Art of Short Film Making / Cinematography
LLC04	Film Appreciation
LLC05	Basics of Music Composition
LLC06	Basics of Keyboard playing
LLC07	Physical Fitness
LLC08	Self Defense for Women
LLC09	Pran-Vidya (Combo of Yoga and Pranayam)
LLC10	Jeevan Vidya (Work Life Balance)
LLC11	Integrated Personality Development-I
LLC12	Indian Knowledge System-I
LLC13	Design Thinking
LLC14	Innovation and Creativity
LLC15	Principle Centered Leadership
LLC16	Social Psychology
LLC17	Mentoring of School Children at SPIT (Abhudaya)
LLC18	Basics of Fire Safety
LLC19	Study of one of the Identified Books
LLC20	Teaching Assistantship
LLC21	Trekking
LLC22	Kannada Language
LLC23	Telugu Language
LLC24	Tamil Language
LLCXX	Any other Course approved by Dean Academics and Research

PROGRAM ELECTIVE COURSES

4 Electives are sufficient to specialize in a particular domain.

PE-I	PE-II	PE-III	PE-IV
EC311 Optical Fiber Communication	EC312: Error Correction & Coding	EC413: Microwave Communication	EC414: Space Communication on Technologies
EC321: Cyber Security and Digital Forensic	EC322: Software Defined networks	EC423: Network Virtualization	EC424: Telecomm Network Operation and Management
EC331: Embedded System Design and Development	EC332: Real Time Operating System	EC433: Advanced Wireless Networks	EC434: Wireless Sensor Networks
EC341: Speech and Audio Processing	EC342: Image and Video Processing	EC443: Communication Protocol for IoT	EC444: IoT Applications and Analytics
EC351: Natural Language Processing	EC352: Biomedical Signal Processing	EC453: DSP System Design	EC454: Multimedia System Design
EC361: Semiconductor Technologies	EC362: Analog CMOS VLSI Design	EC463: Mixed CMOS VLSI Design	EC464: ASIC Verification
EC371: Control of Power Electronics Converters	EC372: Electric Motor Drive Systems	EC473: Embedded & Digital Control of PE Systems	EC474: Selected topic in Power Electronics & Drives

Indicative list of Multidisciplinary Minors

MDM Sequels for EXTC

- Computer Engineering
- AIML
- Data Science
- Interface and Experience Design
- IT Infrastructure
- Mathematics and Statistics
- Finance
- Economics

Course Category of Multidisciplinary Minor	MDM-I (Semester IV)	MDM-II (Semester V)	MDM-III (Semester VI)	MDM-IV (Semester VII)
Computer Engineering	MDCE11: Database Management Systems	MDCE12: Data Structures and Algorithms	MDCE13: Cloud Computing	MDCE14: Internet and Web Technology + DevOps (Project)
Artificial Intelligence and Machine Learning	MDCE21: Fundamentals of NNFL (NN, Fuzzy)	MDCE22: Artificial Intelligence Machine Learning (AI, ML, Deep Learning)	MDCE23: Natural Language Processing	MDCE24: Image Processing and Pattern Recognition + Project
Data Science	MDCS31: Fundamentals of Data Science	MDCS32: Data Analytics and Visualization	MDCS33: Decision Making and Business Intelligence	MDCS34: Social Media Analytics
Interface and Experience Design	MDCS41: UI/UX Fundamentals	MDCS42: Design Thinking and Innovations	MDCS43: Human Computer Interaction	MDCS44: Total Experience Design
IT Infrastructure	MDCE51: Data Centre Technology (HPC)	MDCE52: Cloud and DevOps	MDCE53: SDN and Network Flow Virtualization	MDCE54: Network Management + Project

MDM Sequels for CE/CSE

- Industrial IoT
- Digital Signal Processing
- Electronics Communication
- VLSI
- Mathematics and Statistics
- Finance
- Economics

Course Category of Multidisciplinary Minor	MDM-I (Semester IV)	MDM-II (Semester V)	MDM-III (Semester VI)	MDM-IV (Semester VII)
Industrial IoT	MDEC11: Fundamental of Internet of Things	MDEC12: Embedded “C” and Micro Python for IoT	MDEC13: IOT Communication and Network Layer Protocols	MDEC14: IoT Applications and Security
Digital Signal Processing	MDEC21: Digital Signal Processing	MDEC22: Digital Image Processing	MDEC23: Multimedia Signal Processing	MDEC24: Digital Signal Processor System Design
Electronics Communication	MDEC31: Linear Electronics Circuit	MDEC32: Principles of Communication & Systems	MDEC33: Data Compression and Encryption	MDEC34: Wireless Communication and Networks
VLSI	MDEC41: Hardware Description Language programming	MDEC42: Digital CMOS VLSI Design	MDEC43: VLSI Physical Design	MDEC44: ASIC Verification

Notes:

1. Learners who earn a minimum of total 160 credits will be awarded “**B. Tech in Engg. /Tech. with Multidisciplinary Minor**” degree.
2. Learners who earn 18 additional credits through 6-month (2+1+2+1) Research Internships during summer and winter breaks, as mentioned in the scheme, are eligible for the degree: “**B. Tech in Engg. /Tech. with Multidisciplinary Minor**” and **Honors by Research**”, subject to earning CGPA of 8.25 throughout all semesters.
3. Learners will be allowed to earn **B. Tech. in Engg. /Tech. degree with MDM and Honors Certification, if they earn top grade in any 8 Program core courses and earn 80 percentiles in Gate exam.**
4. **Learner can earn the certificates based on his/her exit from the program as follows:**
 - a. After a one-year (40 credits to be earned) and 8-week summer workshop: Certificate in Engineering.
 - b. After two-years (80 credits to be earned) and 8-week summer workshop: Diploma in Engineering.
 - c. After three-years (120 credits to be earned) and 8-week summer workshop: B. Sc. Engineering.

Dr. Reena Sonkusare
HoD EXTC

Dr. Y. S. Rao
Dean Academics & Research

Dr. B. N. Chaudhari
Principal