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. 2024-25 [2024-2028 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 Leaning 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	**22**
V						18			1	4	**23**
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

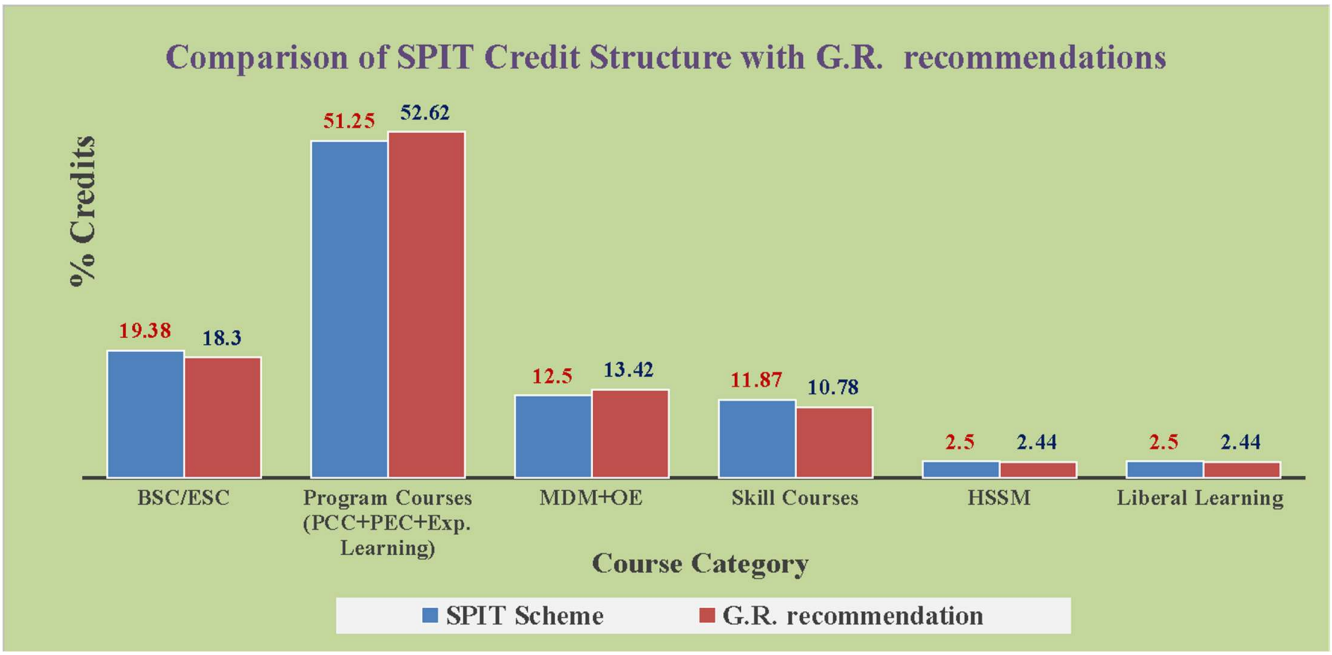

Figure 2: Pie-chart of vertical-wise allocation of credits

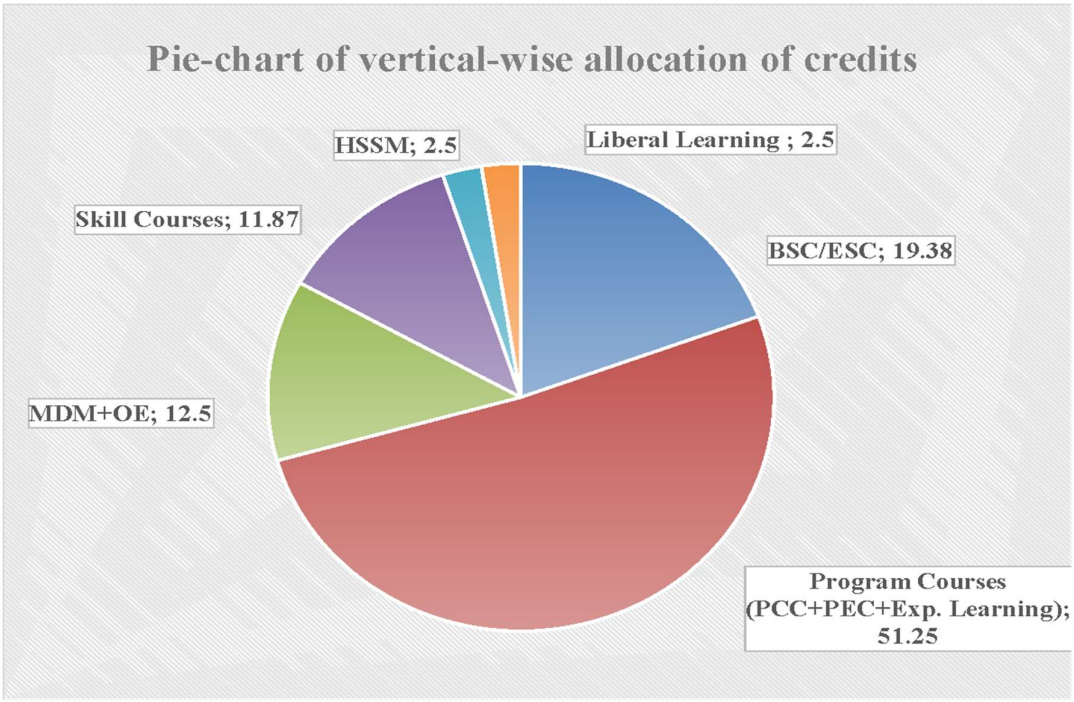

Table 3: Semester-wise allocation of credits to different verticals

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	EC102	Basic Electrical Engineering	3	0	2	5	10	4
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
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	Linear Algebra	2	0	2	5	9	3
2	Basic & Engg. Sciences *	MT	MA202	Fundamentals of Mathematics-I*	2	1	0	0	3	3
3	Skill Enhancement Course #	SEC	AS201	Professional Communication Skills	1	0	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	7	
			AS109	Environmental Science/	3	0	0	3	6	
			AS110	Energy Science/	3	0	0	3	6	
			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	PCC	EC201	Electromagnetic Wave Engineering	3	0	2	5	7	4
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	Co-curricular Courses	CC (LLC)	LLC03	LLCXX	0	1/0	0/2	2	3	1
				Total	**15**	**1**	**12**	**30**	**57+**	**23**

**Only for Lateral Entry Students*
 # No MSE and ESE exam

SEM IV										
Sr. No	**Course Category**	**Abbreviation**	**Course Code**	**Course Name**	**L**	**T**	**P**	**O**	**E**	**C**
1	Basic & Engg. Sciences	BSES	MA203	Probability and Stochastic Process	3	0	0	6	9	3
2	Basic & Engg. Sciences *	MM	MA204	Fundamentals of Mathematics-II*	2	1	0	0	3	3
3	Skill Enhancement Course #	SEC	AS202	Hardware Description Language programming	1	0	2	2	5	2
4	Humanities	HSSM-II	HS2XX	**Course II**	2	0	0	3	5	2
5	Program Core Courses	PCC	EC205	Analog and Digital Communication	3	0	2	4	9	4
6		PCC	EC206	Computer Organization & Architecture	3	0	0	4	7	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**	**0**	**6**	**27**	**49 +**	**22**

 # No MSE and ESE exam

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	Linear Algebra	2	0	2	5	9	3
2	Basic & Engg. Sciences	BSES	MA203	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	2	4	6	1
2	Program Core Courses	PCC	EC301	Computer Communication Networks	3	0	2	5	10	4
3		PCC	EC302	Control Systems	3	0	0	5	8	3
4		PCC	EC303	Digital Signal Processing	3	0	2	6	11	4
5		PCC	EC304	Microcontrollers	3	0	2	5	10	4
6		PCC	EC305	Mobile Wireless Communication	2	0	2	4	8	3
7	Multidisciplinary Minor	MDM	MDEC2X	MDM-II	To be defined by others					4
				Total	**14**	**0**	**10**	**29**	**50+**	**23**

- **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	PCC	EC306	Radiating Systems	3	0	2	5	10	4
2		PCC	EC307	Power Electronics	3	0	2	5	10	4
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	2	4	8	3
6	Program Elective Courses	PEC	EC3X2	PE-II	2	0	2	4	8	3
7	Skill Enhancement Course #	SEC	AS301	Internet of Things Laboratory	1	0	2	2	5	2
				Total	**10**	**1**	**14**	**19**	**42+**	**21**

 # No MSE and ESE exam

- **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	2	4	8	3
3	Program Elective Courses	PEC	EC3X4	PE-IV	2	0	2	4	8	3
4	Open Elective	OE	OE1	OE-I	2	0	2	4	8	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	2	4	8	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.

Track	PE-I (Sem VI)	PE-II (Sem VI)	PE-III (Sem VII)	PE-IV (Sem VII)
Communication	**EC311** Optical Fiber Communication	**EC312:** Error Coding and Cryptography	**EC413:** Microwave Communication	**EC414:** Space Communication on Technologies
	EC321: Cyber Security and Digital Forensic	**EC322**: Wireless Networks	**EC423:** Network Virtualization	**EC424:** Telecom Network Management
Embedded	**EC331:** Embedded Systems	**EC332:** Real Time Operating System	**EC433:** IoT Protocols	**EC434:** IoT Applications and Analytics
Signal Processing	**EC341:** Advanced Signal Processing	**EC342:** Speech and Audio Processing	**EC443:** Image and Video Processing	**EC444:** DSP based System Design
VLSI	**EC351:** Digital CMOS VLSI Design	**EC352:** Semiconductor Technologies	**EC453:** Analog CMOS VLSI Design	**EC454:** ASIC Verification

Indicative list of Multidisciplinary Minors

S.No.	MDM (No.)	Courses Code	Name of the courses	Offered to	Offered by. (Organization)	Conducted Online/ Offline
1	**Industrial IoT (MDM-01)**	M011	Fundamental of Internet of Things	CE & CSE	SPIT	Offline
		M012	Embedded "C" and Micro Python for IoT			
		M013	IOT Communication and Network Layer Protocols			
		M014	IoT Applications and Security			
2	**Signal Processing and Communication (MDM-02)**	M021	Digital Signal Processing	CE & CSE	SPIT	Offline
		M022	Principles of Communication Systems			
		M023	Digital Image Processing			
		M024	Wireless Communication			
3	**VLSI (MDM-04)**	M041	Hardware Description Language Programming	CE & CSE	SPIT	Offline
		M042	Digital CMOS VLSI Design			
		M043	VLSI Physical Design			
		M044	ASIC Verification			
4	**Computer Engineering (MDM-05)**	M051	Database Management Systems	EXTC	SPIT	Offline
		M052	Data Structures and Algorithms			
		M053	Cloud Computing			
		M054	Internet and Web Technology + DevOps (Project)			
5	**Artificial Intelligence and Machine Learning (MDM-06)**	M061	Fundamentals of NNFL (NN, Fuzzy)	EXTC	SPIT	Offline
		M062	Artificial Intelligence Machine Learning (AI, ML)			
		M063	Natural Language Processing			
		M064	Image Processing and Pattern Recognition +Project			
6	**Data Science (MDM-07)**	M071	Fundamentals of Data Science	EXTC	SPIT	Offline
		M072	Data Analytics and Visualization			
		M073	Decision Making and Business Intelligence			
		M074	Social Media Analytics			
7	**Interface and Experience Design (MDM-08)**	M081	UI/UX Fundamentals	EXTC	SPIT	Offline
		M082	Design Thinking and Innovations			
		M083	Human Computer Interaction			
		M084	Total Experience Design			
8	**AI (For Non CS Students) (MDM-09)**	M091	Foundations in AI and ML	EXTC	Vizuara Technologies Pvt Ltd	Online
		M092	Machine Learning and Deep Learning Mastery			
		M093	NLP and CV Mastery, Capstone Project			
		M094	Large Language Models Theory and			

			Deployment, Capstone Project			
9	**Entrepreneurship & Innovation (MDM- 10)**	M101	Entrepreneurship And Innovation	All the Branches	Six Ladders	Offline
		M102	Entrepreneurship and Socio Cultural Environment of Businesses in India			
		M103	Entrepreneurial Finance & Management			
		M104	Innovation: Learning By Doing			
10	**Financial & Strategic Management (MDM-11)**	M111	Economics and Strategic Management	All the Branches	Six Ladders	Offline
		M112	Introduction to Financial Analysis			
		M113	Introduction to Finance			
		M114	Industry Project (FNSM)			
11	**AI in Digital Marketing (MDM-12)**	M121	Digital Marketing	All the Branches	Six Ladders	Offline
		M122	Advanced Digital Marketing Techniques			
		M123	Introduction to AI for Digital Marketing			
		M124	Industry Project (AIDM)			
12	**UI/UX Design Programme (MDM-13)**	M131	Foundations of UI/UX Design	All the Branches	Pearl Academy Pvt. Ltd	Online
		M132	Intermediate UI/UX Design			
		M133	Advanced UI/UX Design and Specializations			
		M134	Advanced Research and Emerging Practices in			
13	**Time triggered reliable engineering systems (MDM-14)**	M141	Programming ARM : The bare metal way	CE & CSE	Skills Universe Technologies	Offline
		M142	Foundations of Time Triggered architectures			
		M143	Advanced Time-Triggered Systems Design			
		M144	Engineering Reliable Time Triggered Systems			
13	**Management (MDM-15)**	M151	Fundamentals of Accounting & Finance	All the Branches	SPJIMR Management	Offline
		M152	Supply Chain Management			
		M153	IT for Business			
		M154	Marketing Management			
14	**Barclays Minor in Banking Technology (MDM-16)**	M161	BFSI, Data Management & Analytics	All the Branches	Barclays	Online
		M162	Enterprise Risk Management & Applied cyber security			
		M163	Agile Methodology			
		M164	Academic-Industry collab Project			
15	**Corporate Finance & Investment Banking (MDM -17)**	M171_P	Data Preparation using MS Excel	All the Branches	IIT Patna	Online
		M172_P	Corporate Finance & Investment Banking Fundamentals			
		M173_P	Detailed Investment Banking Operations Activities			
		M174_	Performing Diversification in Portfolios			

		P	and Investments			
16	**Business Analytics (MDM-18)**	M181_P	Python for Data Science	All the Branches	IIT Patna	Online
		M182_P	SQL for Business Analytics			
		M183_P	Stats & Machine Learning			
		M184_P	Data Visualization Tools: Power BI, Excel, Intro to Excel			

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.

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HoD EXTC	**Dean Academics & Research**	**Principal**