



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

CURRICULUM STRUCTURE FOR UNDERGRADUATE ACADEMIC PROGRAMS
Department of Computer Engineering
W.E.F. A.Y. 2026-27 [2026-2030 And 2025-29 BATCH]

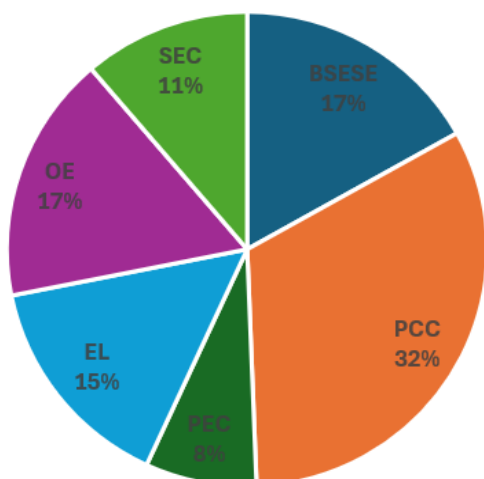
Preamble: SPIT commits itself to the effective and fruitful implementation of NEP 2020 in its spirit. The holistic development of learners has always been the priority and center of focus for “Bharatiya Vidya Bhavan’s”. Therefore, we started implementing the philosophy of NEP in the year 2020 itself, before the formal announcement of NEP in Nov. 20. 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 State Government, we are pleased to offer a 3rd iteration of our holistic curriculum, a Liberal “Pi-Model” of Engineering Education for the batches admitted in 2025 and 2026.

This curriculum emphasizes outcome-based education, **flexibility in learning pathways**, multidisciplinary exposure, design thinking, digital competency, sustainability awareness, and collaborative learning. It integrates strong theoretical foundations with practical applications through laboratory work, **project-based learning**, **self-learning components**, and industry engagement. The program structure promotes **holistic development** by balancing professional engineering competencies with liberal learning, critical thinking, communication skills, creativity, **human values** and a compulsory minor program of besides chosen major.

Passionate learners can also opt for “Honours by Research” through very structured additional research internship during summer breaks. The most salient feature of curriculum is the unique flexibility it offers, particularly for selecting “Multidisciplinary Minor”. This curriculum has 42% choice-based component and 15% learners’ engagement in experiential learning (Learning by doing). Thus, the choice-based component amounts to 57% and a compulsory component to 43%. It ensures that the learners engagement in theory classes is lesser than their engagement in laboratories and experiential learning. While it allows learners to study 8 Mathematics courses throughout the programme, it also permits some other learner to take 6—8 courses from different domain. Thus, it offers a unique, liberal “**Pi-Model**” of Engineering Education.

S.P.I.T. Credit Structure										
Course Category	SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII	Total	%
BSESE	11	11	3	2					27	16.88
PCC			14	15	15	8			52	32.5
PEC						6	6		12	7.5
EL					3	3	6	12	24	15
OE	3	3	3	3	3	3	3	6	27	16.88
SEC	6	6	2	2		2			18	11.25
Total	20	20	22	22	21	22	15	18	160	100

Curriculum Credit Framework



Program Courses
(PCC+PEC+EL): 55%

Comparison of SPIT Credit Structure with G.R. recommendations

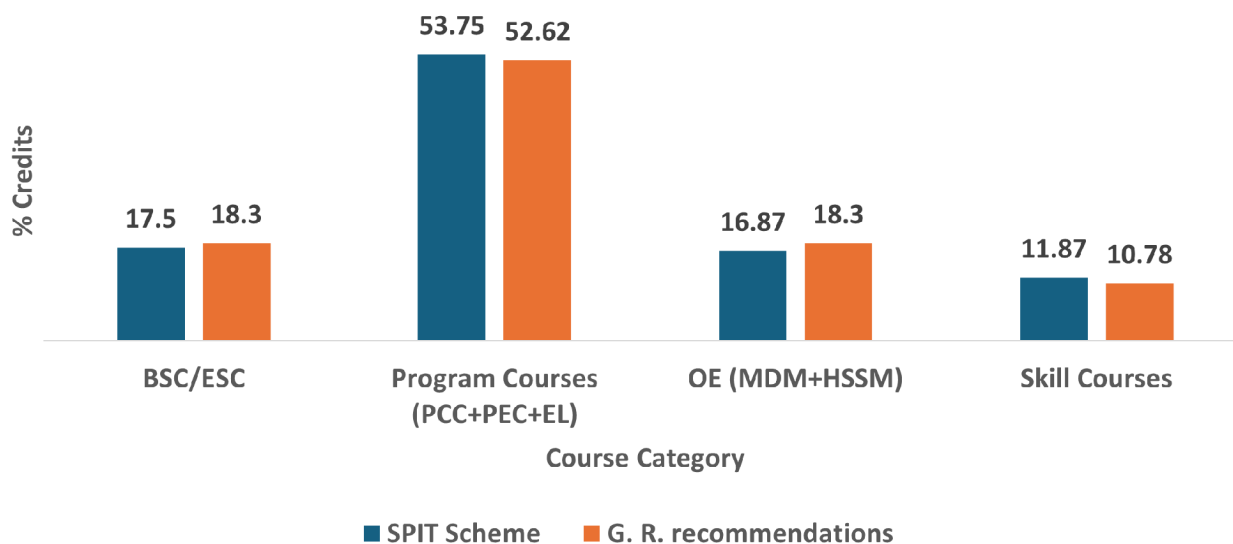


Table 1: Nomenclature of the courses in the curriculum

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
	LLC	Liberal Learning Courses
Humanities	HSSMC	Humanities, Social Science and Management Courses
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

Abbreviations			
L	Lecture Hour	SE	Self-Engagement in Hours
T	Tutorial Hour	TE	Total Engagement in Hours
P	Laboratory Hour	C	Credit Assigned

SEM I										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Basic & Engg. Sciences	BSES	MA101	Engineering Calculus	3	1	0	7	11	4
2	Basic & Engg. Sciences	BSES	EC101/ EC102/ EC103	Digital Systems and Microprocessors/ Basic Electrical Engineering (EXTC) / Basic Electrical & Electronics Engineering (CE&CSE)	3	0	2	6	11	4
3	Basic Sciences & Engg. Sciences Elective	BSESE	AS1XX	Please refer to Table 2	2/3	0	2/0	6/7	10	3
4	Open Elective	HSSM-1	OE1XX	Please refer to Table 3	3	0	0	0	3	3
5	Skill Enhancement Course	SEC	AS113/ AS114	Design Thinking/ Engineering Exploration	0	1	2	0	3	2
6	Skill Enhancement Course	SEC	CECS101	Imperative Programming Lab	0	0	4	4	8	2
7	Skill Enhancement Course	SEC	AS115	Professional Communication	1	0	2	2	5	2
8	Liberal Learning Courses	LLC (Audit)	LLC101/ LLC102 /LLC103	Art of Living/ Leadership for Youth/Harmony with Nature	0	0	1	0	1	NC
Total					12/ 13	2	13/ 11	23/ 24	50	20

SEM II										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Basic & Engg. Sciences	BSES	MA201	Differential Equations and Complex Analysis	3	1	0	7	11	4
2	Basic & Engg. Sciences	BSES	EC201/ EC202/ EC203	Digital Systems and Microprocessors/ Basic Electrical Engineering (EXTC) / Basic Electrical & Electronics Engineering (CE&CSE)	3	0	2	6	11	4
3	Basic Science & Engg. Sciences Elective	BSESE	AS2XX	Please refer to Table 2	2/ 3	0	2/ 0	6/7	10	3
4	Open Elective	HSSM -II	OE2XX	Please refer to Table 3	3	0	0	0	3	3
5	Skill Enhancement Course	SEC	AS213/ AS214	Design Thinking/ Engineering Exploration	0	1	2	0	3	2
6	Skill Enhancement Course	SEC	CECS201/ CECS202	Object Oriented Programming Lab (CE, CSE)/Data Structure Lab (EXTC)	0	0	4	4	8	2
7	Skill Enhancement Course	SEC	AS215	Corporate Communication	1	0	2	2	5	2
8	Liberal Learning Courses	LLC (Audit)	LLC201/ LLC202/L LC203	Art of Living/ Leadership for Youth/Harmony with Nature	0	0	1	0	1	NC
Total					12	2	13	23/ 24	50	20

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SEM III										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Basic & Engg. Sciences	BSES	MA301	Linear Algebra	2	1	0	5	8	3
2	Basic & Engg. Sciences *	FOM-I	MA302	Foundation of Mathematics-I*	2	1	0	5	8	3*
3	Program Core Courses (14)	PCC	CECS301	Discrete Structures and Graph Theory	3	0	0	5	8	3
4		PCC	CECS302	Database Management Systems	3	0	2	4	9	4
5		PCC	CECS303	Computer Organization and Architecture	2	0	2	4	8	3
6		PCC/ PCC (SM)	CECS304/ CECS305	Data Structures	2	0	4	4	10	4
7	Open Elective	OE	OE3XX	Please refer Table 5&6	3	0	0	3	6	3
8	Skill Enhancement Course	SEC	CECS306	Data Science Lab	0	0	4	4	8	2
9	Liberal learning Course	LLC (Audit)	LLC3XX	Please refer Table 4	0	0	1	0	1	N C
Total										22

*Only for Lateral Entry Students and not included in CGPA

Winter Term (For Lateral Entry Students)										
Sr. No	Course Category	Abbreviation	Course Code	Course Name	L	T	P	SE	TE	C
1	Basic & Engg. Sciences	BSES	MA301	Linear Algebra	2	1	0	5	8	3
2	Basic & Engg. Sciences *	FOM-II	MA303	Foundation of Mathematics-II*	2	1	0	5	8	3*

SEM IV										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Basic & Engg. Sciences	BSES	MA402	Probability and Statistics	2	0	0	6	9	2
2	Program Core Courses (15)	PCC	CECS401	Computer Communications and Networks	3	0	2	4	9	4
3		PCC	CECS402	Operating Systems	3	0	2	4	9	4
4		PCC	CECS403	Software Engineering	2	0	2	4	8	3
5		PCC/ PCC (SM)	CECS404/ CECS405	Design and Analysis of Algorithms	2	0	4	6	12	4
6	Open Elective	OE	OE4XX	Please refer to Table 5&6	3	0	0	3	6	3
7	Skill Enhancement Course	SEC	CECS406	Real life problem solving in AI	0	0	4	6	10	2

8	Humanities	HSSM	AS401	Constitution of India	1	0	0	1	2	NC
Total										22

Summer Term for Students opted for Honors through Research

Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Experiential Learning	ELC	CEHR1	Research Stage- I						6

SEM V

Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Program Core Courses (15 credits)	PCC	CECS501	Theory of Computation	3	0	0	5	8	3
2		PCC	CE502	Artificial Intelligence and Machine Learning	3	0	2	4	9	4
3		PCC	CE503	Cryptography and Network Security	3	0	2	4	9	4
4		PCC/ PCC(SM)	CE504/ CE505	Distributed Computing	3	0	2	4	9	4
5	Open Elective	OE	OE5XX	Please refer to Table 5&7	3	0	0	3	6	3
6	Experiential Learning	ELC	CE5PRI	Mini Project I	0	0	0	6	6	3
Total										21

SEM VI

Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Program Core Courses (8 credits)	PCC	CE601	System Programming and Compiler Construction	3	0	2	4	9	4
2		PCC/ PCC (SM)	CE602/ CE603	High Performance Computing	3	0	2	4	9	4
3	Program Elective Courses	PEC	CE6X1	PE-I (Please refer to Table 9)						3
4	Program Elective Courses	PEC	CE6X2	PE-II (Please refer to Table 9)						3
5	Open Elective	OE	OE6XX	Please refer to Table 5&7	3	0	0	3	6	3
6	Experiential Learning	ELC	CE6PRII	Mini Project- II	0	0	0	6	6	3
7	Skill Enhancement Course	SEC	CE604	Computing System and Application Development Lab	0	1	2	3	6	2
Total										22

Summer Term for Students opted for Honors through Research										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Experiential Learning	ELC	CEHR2	Research Stage- II						6

SEM VII: Option A										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Open elective	OE	OE7XX	Please refer Table 8						3
2	Program Elective Courses	PEC	CE7X1	PE-III (Please refer to Table 9)						3
3	Program Elective Courses	PEC	CE7X2	PE-IV (Please refer to Table 9)						3
4	Experiential Learning	ELC	CE7PR	Main Project	0	0	8			6
Total										15

SEM VII: Option B (Research/ Industry Internship)										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Open elective	OE**	OENP ^{\$}	Indian Knowledge and Values Systems						3
2	Open elective	OE**	OENP ^{\$}							3
3	Experiential Learning	ELC	INT7R/INT7I	Research /Industry Internship	0	0	8			12
Total										18

SEM VII: Option C (Only for Honors by Research)										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Open elective	OE**	OENP ^{\$}	Indian Knowledge and Values Systems						3
2	Open elective	OE**	OENP ^{\$}							3
3	Experiential Learning	ELC	CEHR3	Research - III	0	0	8			12
Total										18

** To be completed from MOOCS, ^{\$}Course code offered by NPTEL

SEM VIII: Option A										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Open Elective	OE**	OENP ^{\$}	Indian Knowledge and Values Systems						3
2	Open Elective	OE**	OENP ^{\$}							3
3	Experiential Learning	ELC	INT8R/INT8I	Research / Industry Internship						12
Total										18

SEM VIII: Option B										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Program Elective Courses	PEC	CE8X1	PE-III (Please refer to Table 9)						3
2	Program Elective Courses	PEC	CE8X2	PE-IV (Please refer to Table 9)						3
3	Open elective	OE	OE8XX	Please refer Table 8						3
4	Experiential Learning	ELC	CE8PR	Main Project						6
Total										15

SEM VIII: Option C (Only for Honors by Research)										
Sr. No	Course Category	Abbr.	Course Code	Course Name	L	T	P	SE	TE	C
1	Program Elective Courses	PEC	CE8X1	PE-III (Please refer to Table 9)						3
2	Program Elective Courses	PEC	CE8X2	PE-IV (Please refer to Table 9)						3
3	Open elective	OE	OE8XX	Please refer Table 8						3
4	Experiential Learning	ELC	CE8PR	Main Project						6
5	Experiential Learning	ELC	CEHR4	Research- IV						6
Total										21

** To be completed from MOOCS, §Course code offered by NPTEL

Table 2: Basic Sciences & Engg. Sciences Elective Courses (BSESEC)

Sr. No.	Course Code	Course Name
1	AS101/AS201	Engineering Physics
2	AS102/AS202	Industrial Chemistry
3	AS103/AS203	Engineering Mechanics
4	AS104/AS204	Computer Aided Engineering Drawing
5	AS105/AS205	Materials for EEE
6	AS106/AS206	Biology for Engineers
7	AS107/AS207	Computational Electromagnetics
8	AS108/AS208	Signals & Systems (for CSE/CE)
9	AS109/AS209	Analysis of Algorithms (for ECE)
10	AS110/AS210	Thermal and Fluid Engineering
11	AS111/AS211	Industrial Measurement

Table 3: Humanities, Social Science and Management Courses (HSSMC)

Indicative List of HSSMC		
Course Code	Course Title	Prerequisite if any
OE101/OE201	Introduction of Microeconomics	
OE102/OE202	Foundations of Law for Engineers	
OE103/OE203	Psychology of Human behavior	
OE104/OE204	Sanskrit Parichay	
OE105/OE205	Basic German	
OE106/OE206	Basic Japanese	
OE107/OE207	Basic French	
OE108/OE208	Foundations of Indian History	
OE109/OE209	Foundations of Political Science	
OE110/OE210	Foundations of Philosophy	
OE111/OE211	Advanced of Microeconomics	OE101/OE201
OE112/OE212	Advanced Law for Engineers	OE102/OE201
OE113/OE213	Industrial and organizational Psychology	OE103/OE203
OE114/OE214	Sanskrit Pragat	OE104/OE204
OE115/OE215	Advanced German	OE105/OE205
OE116/OE216	Advanced Japanese	OE106/OE206
OE117/OE217	Intermediate French	OE107/OE207
OE118/OE218	Advanced Indian History	OE108/OE208
OE119/OE219	Advanced Political Science	OE109/OE209
OE120/OE220	Advanced Philosophy	OE110/OE210

Table 4: Liberal Learning Courses (LLC) Basket

Indicative List of LLC courses			
Course Code	Course Title	Course Code	Course Title
LLC301	Basics of Fire Safety	LLC311	Yoga I
LLC302	Film Appreciation	LLC312	Introduction to Bhagavad Geeta
LLC303	First Aid	LLC313	Dance – Kathak
LLC304	Fundamentals of Photography	LLC314	Dance – Bollywood
LLC305	Integrated Personality Development I	LLC315	Innovation and Entrepreneurship
LLC306	Mentoring (Volunteering) to school Children (Abhyudaya)	LLC316	Rangoli
LLC307	Read a book	LLC317	Understanding Theatres
LLC308	Wall Painting	LLC318	Interpersonal Effectiveness and Team Building
LLC309	Working with NGO	LLC319	Yoga II
LLC310	Yes Plus AOL Advanced	LLC320	Martial Art

Table 5: Open Electives Basket

Indicative List of Open Elective Courses						
Sr. No.	Track	Courses Code	Name of the courses	Offered to	Offered by	Mode of Session Delivery
1	Industrial IoT	OE311	Fundamental of Internet of Things	CE & CSE	SPIT	Offline
		OE411	Embedded “C” and Micro Python for IoT			
		OE511	IOT Communication and Network Layer Protocols			
		OE611	IoT Applications and Security			
2	Signal Processing and Communication	OE312	Digital Signal Processing	CE & CSE	SPIT	Offline
		OE412	Principles of Communication & Systems			
		OE512	Digital Image Processing			
		OE612	Wireless Communication and Networks			
3	Computer Engineering	OE313	Database Management Systems	EXTC	SPIT	Offline
		OE413	Data Structures and Algorithms			
		OE513	Cloud Computing			
		OE613	Internet and Web Technology + DevOps (Project)			
4	Interface and Experience Design	OE314	Foundations of Interface and Experience Design	All the Branches	SPIT	Offline
		OE414	User Experience Design, Research and Evaluation			
		OE514	AR/VR Design			
		OE614	Immersive Experience Design (Capstone Project)			
5	Artificial Intelligence and Machine Learning	OE315	Fundamentals of NNFL [NN, Fuzzy]	EXTC	SPIT	Offline
		OE415	Machine Learning			
		OE515	Deep Learning			
		OE615	Generative AI and application			

6	Financial & Strategic Management	OE316	Economics and Strategic Management	All the Branches	Six Ladders	Offline
		OE416	Introduction to Financial Analysis			
		OE516	Introduction to Finance			
		OE616	Industry Project (FNSM)			
7	Management	OE317	Fundamentals of Accounting & Finance	All the Branches	SPJIMR Management	Offline
		OE417	Supply Chain Management			
		OE517	IT for Business			
		OE617	Marketing Management			
8	Barclays Minor in Banking Technology	OE318	BFSI, Data Management & Analytics	All the Branches	SPIT in association with Barclays	Online
		OE418	Enterprise Risk Management & Applied Cyber security			
		OE518	Agile Methodology			
		OE618	Academic-Industry collab Project			
9	Entrepreneurship & Innovation	OE319	Fundamentals of Entrepreneurship	All the Branches	SP-TBI & Six Ladders	Offline
		OE419	Entrepreneurial Finance and Management			
		OE519	Building Business Model			
		OE619	Ideate and Launch Your Startup			
10	Minor English Literature	OE320	Literature & Human Understanding	All the Branches	S.P.I.T.	Offline
		OE420	Literature, Technology & Society			
		OE520	Literature, Leadership & Public Life			
		OE620	Communication, Story-Telling & Creative Expression			
11	Minor Mathematics	OE321	Integral Transforms	All the Branches	S.P.I.T.	Offline
		OE421	Numerical Methods & Scientific Computing			
		OE521	Optimization Techniques			
		OE621	Modern Algebra			
12	Minor in Physics	OE322	Classical Mechanics-I	All the Branches	S.P.I.T.	Offline
		OE422	Quantum Mechanics-I			
		OE522	Thermal and Statistical Physics			
		OE622	Solid State Physics			
13	Systems Engineering and Design	OE323	Fundamentals of Systems Engineering and Design Thinking	All the Branches	S.P.I.T.	Offline
		OE423	System Modeling, Architecture and MBSE			
		OE523	Verification, Validation, Reliability and Risk Engineering			
		OE623	Enterprise, Cloud and Cyber-Physical Systems Engineering			

Table 6: Open Elective Basket

Indicative List of Open Electives			
Course Code	Course Title (SEM III)	Course Code	Course Title (SEM IV)
OE3XX	MDM P1-A	OE4XX	MDM P1-B
OE3XX	MDM P2-A	OE4XX	MDM P2-B
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OE3XX	MDM Pn-A	OE4XX	MDM Pn-B

Table 7: Open Elective Baskets

Indicative List of Open Elective			
Course Code	Course Title (SEM V)	Course Code	Course Title (SEM VI)
OE5XX	MDM P1-C	OE6XX	MDM P1-D
OE5XX	MDM P2-C	OE6XX	MDM P2-D
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OE5XX	MDM Pn-C	OE6XX	MDM Pn-D

Table 8: Open Elective Baskets

Indicative List of Open Elective			
Course Code	Course Title (SEM VII and VIII)	Course Code	Course Title (SEM VII and VIII)
OE701/OE801	Quantum Materials	OE711/OE811	Quantum Computing
OE702/OE802	Nanomaterials and Engineering	OE712/OE812	Herbal Science & Technology
OE703/OE803	Nuclear Science	OE713/OE813	Introduction to Digital Health
OE704/OE804	Battery Technologies and Management Systems	OE714/OE814	Quantum Chemistry and Computation
OE705/OE805	Optimization Techniques for Engineers	OE715/OE815	Finance Management
OE706/OE806	Numerical Methods & Scientific Computing	OE716/OE816	Mechatronic systems
OE707/OE807	Advance Linear Algebra	OE717/OE817	PLC and Automation
OE708/OE808	Drone Technology	OE718/OE818	Entrepreneurship and IPR
OE709/OE809	Introduction to Research Methodology	OE719/OE819	Economics for Engineers
OE710/OE810	Project Management	OE720/OE820	Bioinformatics
Any course approved by Dean Academics			

Table 9: Programme Elective Courses

Indicative List of Programme Elective Courses						
Domain	PE-I (Sem VI)	PE-II (Sem VI)	PE-III (Sem VII)	PE-IV (Sem VII)	PE-III (Sem VIII)	PE-IV (Sem VIII)
Artificial Intelligence	CE611: Deep Learning	CE612: Generative-AI	CE713: Explainable and responsible AI	CE714: Agentic AI	CE813: Explainable and responsible AI	CE814: Agentic AI
Data Science	CE621: Data Mining	CE622: Natural Language Processing	CE723: Decision Making and Business Intelligence	CE724: Big Data Analytics	CE823: Decision Making and Business Intelligence	CE824: Big Data Analytics
Algorithms	CE631: Applied Algorithms	CE632: Quantum Computing	CE733: Computational Geometry	CE734: Quantum Machine Learning	CE833: Computational Geometry	CE834: Quantum Machine Learning
Security	CE641: Cyber Security and Ethical Hacking	CE642: Block chain	CE743: Digital Forensics	CE744: Information and System Security	CE843: Digital Forensics	CE844: Information and System Security
Hardware Systems	CE651: Embedded Systems	CE652: IOT and edge Computing	CE753: Robotics and Automation	CE754: Embedded AI and TinyML	CE853: Robotics and Automation	CE854: Embedded AI and TinyML
Computer vision	CE661: Digital Signal and Image Processing	CE662: AI-based Vision Systems	CE763: AR VR development	CE764: Visual Computing and Pattern Intelligence	CE863: AR VR development	CE864: Visual Computing and Pattern Intelligence
High Performance Computing	CE671: Cloud Computing and Technologies	CE672: Quantum Computing	CE773: Edge Computing	CE774: Wireless ad-hoc and sensor network	CE873: Edge Computing	CE874: Wireless ad-hoc and sensor network

Notes

- 1 Learners who earn a minimum 160 credits will be awarded “**B. Tech in Engg. /Tech. with Multidisciplinary Minor**” degree.
- 2 Learners who earn 18 additional credits through additional “Research Stages” during summer 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.
- 3 Learners will be allowed to earn **B. Tech. in Engg. /Tech. degree with MDM, and earn additional Honors Certification, if they secure top grade in any 10 Program core courses and score 80 percentile 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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