Sardar Patel Institute of Technology

(Autonomous Institute Affiliated to University of Mumbai)
[Knowledge is Nectar]

Liberal, Pi-Model of Engineering Education @ SPIT
(Department of Computer Engineering)

CURRICULUM SCHEME FOR UNDERGRADUATE ACADEMIC PROGRAM (COMPUTER ENGG) AT SPIT

(For 2022-2026 Batch)

Salient Features

- 160-Credit **Liberal** Engineering Education Model.
- A strong **program core of 13 courses** and **6 baskets of program electives** to ensure the breadth and depth in a chosen domain of studies. Program electives are arranged either to grow in a specified vertical or have diversified exposure.
- **Full semester industry internship to interested students.**
- Aggressive model of **"Learning-by-doing". (**Engagement in classroom and laboratory sessions is 50:50)
- Special tracks for **"Minor"** Certification for interested learners, ensuring significant awareness of additional discipline leading to multiple specializations
- **Unique, multi-track model of "Honors" Certification,** for well performers for enhanced depth in the domain of study.
- Special sequel of optional **industry floated "SCOPE"** courses (Skilled Certification for Outcome-based Professional Education) for interested learners, ensuring high technical skills, in the diversified cutting-edge technologies.
- **First-of-its-kind-in-education** blend to Engineering Curriculum. **"ABLL@LLC"®** (Activity Based Liberal Learning about **Life, Literature and Culture**) in **Six** semesters, ensuring **all dimensional holistic growth** of the learner. These eight activity based mini courses are offered as two sequels namely **"SEVA"®**(Social Empowerment through Various Activities", and **"SATVA"®** (Self accomplishment through various Activities).

This curriculum aims at development of an **all-rounded** personality. It follows **holistic** approach of education, ensures strong science, mathematics foundation and program core, develops expertise in domain vertical though sequel of electives, ensures significant exposure of additional discipline through "Minor" program, collaborates outside world for the imparting relevant skills through "SCOPE" 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, offers a unique, liberal **"Pi-Model"** of Engineering Education.

Program Core

At SPIT, every undergraduate program consists of **Twelve Core Courses** referred to as Program **Core**. Several academic models from reputed institutions in the country and outside the country are studied in articulating this Program Core, to make curriculum Globally Competitive. All courses in this Core have laboratory components to augment the learning. Each program core course has an additional optional component of "Contents beyond the curriculum" which is carefully designed to ensure additional 15-20 hours engagement of the learners. The learner thus is nurtured towards the "Self-Learning" and "lifelong learning "which are essential attributes of 21st Century learner.

Program Electives

At SPIT, every program has **Six baskets** of Program Electives, each basket having a minimum 3 courses. This enables learners to grow in a **domain-specialization** or **domain-vertical**. For example, learners can graduate with B.Tech Electronics with a vertical in "Embedded Systems" or "VLSI" or "Signal Processing". Or a learner can graduate with B.Tech Computer Engineering with specialization in "Security" or "ML & AI" or "Computer Networking" or "Data Science". At the same time, a learner can increase her bandwidth by opting for elective courses which are general in nature, not pointing out towards a specific vertical.

Open Electives

Every undergraduate program has three baskets of open electives. This is planned to give exposure to interdisciplinary and cross disciplinary domains. The courses in these baskets are planned both at department and institute level. Students can choose any combination of these courses (not floated by the parent department) to get familiar with other domains of learning. One of these open electives must be chosen from Basic science courses or Engineering Science courses. **This unique approach of offering additional basic science or engineering science elective at senior level aims at appreciating the importance of other domains of learning.**

Humanities and Social Science Electives

National Education policy 2019 has aptly spelled out the necessity of Humanities in Professional Education. It quotes, "A holistic and liberal education as described so beautifully in India's past is indeed what is needed for the education of India in the future to truly lead the country into the 21st century and the fourth industrial revolution. Even engineering schools such as the IITs must move towards a more liberal education integrating arts and humanities". Every program at SPIT has three baskets of humanities. Learners are encouraged to take diversified courses in the field of languages, law, history, economics, management, finance etc.

SCOPE Certification

This unique sequel is designed to systematically develop skills required for an industrial sector. SPIT is partnering with various industries to offer the high-end skills required for a specific

industrial sector. Well performing students can stretch the envelope and add a new dimension to their Professional Personality by earning this certification. There are multiple tracks for SCOPE certification. Each track is offered with partnership with a reputed institution or industry. These tracks are jointly designed by SPIT and partnering industry. Each track has four courses (modules). Each module/course is of 2-3 credits including laboratory components for most of the tracks. These tracks are also open for outside learners, leading to Certificate Program in a chosen domain.

Minor Certification

This additional and optional certification provides an opportunity to learners to develop the learners in the additional domain of interests. It broadens the education and ensures the multi-disciplinary development which is an essential attribute of 21st century engineers. However, this is optional. Well performing students can stretch the envelope and add a new dimension to their Professional Personality. Each track for this minor certification is offered either by SPIT or with partnership with other reputed institutions. Each track has four courses (modules). Each course is of 3 credits and laboratory components if any. These tracks are also open for outside learners, leading to a Certificate Program of 12 credits in a chosen domain.

Honors Certification

While the Minor and SCOPE certifications aim at adding an additional professional dimension to the professional personality of the learners, the Honors certification gives opportunity to well performing learners to drive deep in the chosen field of study. Multiple plans/ways are planned to encourage learners to earn this certification which essentially excite the learners to push an envelope and go extra/deep in the chosen area of the study. Students earn additional stars (*) as shown in Table 1 during their program. If at the time of graduation a student earns total **TWELVE** stars, she is conferred with "Honors" certification.

Table 1: Additional "STAR" Earning leading to "Honors" certification

Activity	Definition of "STAR"	Maximum Limit
Earning top grade in any of the 12 courses which constitute the program core.	Top Grade: Full STAR Next GRADE: Half STAR	8 STARs
Enrolling additional "Honors" Course in fourth year.	Top Grade: 3 STARs Next GRADE: 2 STARs Next GRADE: 1 STAR	6 STARs
Success in the GATE examination	<table><tr><td>Percentile Score</td><td>STARs Earned</td></tr><tr><td>Above 99</td><td>6</td></tr><tr><td>Above 98</td><td>5</td></tr><tr><td>Above 95</td><td>4</td></tr><tr><td>Above 90</td><td>4</td></tr><tr><td>Valid score</td><td>2</td></tr></table>	8 STARs
Research Publication	Journal* :2- 6 STARs SPIT supported Patent : 3 STARs	8 STARs
Completion of PG level on line course from IITs available on NPTEL	<table><tr><td>Percentile Score</td><td>STARs Earned</td></tr><tr><td>Above 95</td><td>3</td></tr><tr><td>Above 90</td><td>2</td></tr><tr><td>Above 80</td><td>1</td></tr></table>	6 STARs
#Winning prestigious technical competitions at National level	<table><tr><td>Rank</td><td>STARs Earned</td></tr><tr><td>1</td><td>4</td></tr><tr><td>2</td><td>3</td></tr><tr><td>3</td><td>2</td></tr></table>	6 STARTs
**Enrolling for optional "Special Honors Paper" in Semester 3, 4, and 5.	Above 70% : 3 STARs Above 60%: 2 STARs Above 50%: 1 STAR	8 STARs

*In identified journals only. No. of STARs to be decided by the Institute Committee.

#In identified events by the institute

**This special paper will cover all core courses in the semester and its difficulty level will be higher than the normal end semester examination paper. The question paper will be of GATE standard.

Activity Based Liberal Learning about Life, Literature and Culture (ABLL@LLC)

"Education will fail ignominiously in its objective if it manufactures only a robot and called him an economic man stressing the adjective economic and forgetting the substantive man. A university cannot afford to ignore the cultural aspects of education whatever studies it specializes in. Science is a means, not an end. Whereas culture is an end in itself. Even though you may ultimately become a scientist, a doctor, or an engineer, you must, while in college, absorb fundamental values which will make you a man of culture..."

Kulpati Dr. K. M. Munshi

How aptly our visionary founder has given direction to the education. His wisdom towards education inspires, encourages us to experiment in the field of education, to make it as relevant and helpful to the society as possible. Mahatma Gandhi once quoted, *"By education I mean an all-round drawing out of the best in man; body, mind and spirit."*

Recently announced National Policy on Education-2019, reconfirms this and profoundly stresses the need of liberalizing the higher education including professional education. It quotes, *"Higher education must develop good, well-rounded and creative individuals, with intellectual curiosity, spirit of service and a strong ethical compass".* Moving towards a more liberal undergraduate education is one of the most important features of this policy. It narrates, *"The needs of the 21st century require that liberal broad-based multidisciplinary education become the basis for all higher education. This will help develop well-rounded individuals that possess critical 21st century capacities in fields across arts, humanities, sciences, social sciences, and professional, technical, and vocational crafts, an ethic of social engagement, and rigorous specialization in a chosen field or fields. Such a liberal education would be, in the long run, the approach across all undergraduate programs, including those in professional, technical, and vocational disciplines. Imaginative and flexible curricular structures will enable creative combinations of disciplines for students to study, thus demolishing currently prevalent rigid boundaries and creating new possibilities for lifelong learning. The notion of 'knowledge of many arts'- i.e. what is called 'liberal arts' in modern times – must be brought back to Indian education, as it is exactly the kind of education that will be required for the 21st century."*

We at Bhavan's SPIT, make sincere attempt to blend engineering education appropriately with arts, humanities, crafts, ethic of personal and social engagement to ensure holistic development of the learner. We have carefully designed liberal learning courses covering Life, Literature, and Culture (LLC @ LLC) for all the semesters of the program. Learner concurrently studies these courses. These courses broadly fall under two groups, namely "SEVA (Social Empowerment through Various Activities)" and "SATVA (Self Accomplishment through Various Activities)". Each of these groups, has four modules as indicated in Table 2 and Table 3. Further each module has multiple courses of 1 or 2 credits (An engagement of 35-40 hours is expected to earn one credit). Every learner at SPIT is expected to take 1 such course on LLC every semester. We strongly believe that these EIGHT liberal learning modules will help us to appropriately blend the professional education as envisaged by the National Policy Makers.

SUGGESTED LIST OF COURSES (INDICATIVE ONLY)

Open Electives I and II

OEXXX	IoT and I^{2}oT
OEXXX	Cloud Computing
OEXXX	Augmented and Virtual Reality
OEXXX	3D Printing
OEXXX	Industrial Automation
OEXXX	Artificial Intelligence and Machine learning
OEXXX	Cyber Security & Digital Forensics
OEXXX	Block Chain Technology
OEXXX	E-Mobility
OEXXX	Smart Grid
	courses floated as **Open elective** by the **Departments**
OEXXX	Consumer Electronics
OEXXX	Robotic & Machine Vision
OEXXX	Data Structures and Algorithms
OEXXX	Information and Network Security
OEXXX	Human Machine Interaction
OEXXX	Software Engineering
OEXXX	Database Management Systems
OEXXX	Internet Technology
OEXXX	Data Analytics
	Any other 12 weeks Course approved by the Dean Academics and Principal

Open Elective III-Basic Science Electives

OEMA1	Advanced Statistics
OEAS1	Biology for Engineers-Part II
OEAS2	Climate and Earth Science
OEMA2	Engineering Optimization
OEAS3	Environment and Sustainability
OEAS4	Semiconductor Optoelectronics
OEMA3	Numerical Methods for Engineers
OEXXX	Any other Course approved by the Dean Academics and Principal

Open Elective III-Engineering Science Electives

OEXXX	Thermal & Fluid Engineering
OEXXX	Manufacturing Processes
OEXXX	Electric Drives
OEXXX	Engineering Materials
OEXXX	Data Structures
OEXXX	Algorithms
OEXXX	Sensors and Actuators
OEXXX	Communication Engineering
OEXXX	Any other Course approved by the Dean Academics and Principal

Open Elective IV: Humanities and Management Related

OEHXX	Management Principles
OEHXX	Research Methodology
OEHXX	IPR and Patents
OEHXX	Law for Engineers
OEHXX	Organizational Behavior
OEHXX	Leadership, Innovation and Entrepreneurship
OEHXX	Project Management
OEHXX	Finance for Engineers
OEHXX	Any course approved by Dean Academics and Principal

Humanities and Social Sciences Electives

Special Tracks

	HSSE-I		**HSSE-II**		**HSSE-III**
HSE11	Law for Engineers-I	HSE12	Law for Engineers-II	HSE13	Law for Engineers-III
HSE21	Finance for Engineers-I	HSE22	Finance for Engineers-II	HSE23	Finance for Engineers-III
HSE31	Psychology-I	HSE32	Psychology-II	HSE33	Psychology-III
HSE41	Economics-I	HSE42	Economics-II	HSE43	Economics-III
HSE51	Ancient India	HSE52	Medieval India	HSE53	Modern India
HSE6X1	Language X-I	HSE6X2	Language X-II	HSE6X3	Language X-III

Common Pool for HSSE-I, II and III (May be studied on MOOC's)

HSEC01	Film Appreciation	HSEC02	Universal Values
HSEC03	Game Theory	HSEC04	Human Behavior
HSEC05	Ecology and Society	HSEC06	Energy Economics and Policies
HSEC07	Drama Appreciation	HSEC08	Political Ideologies
HSEC09	Justice	HSECXX	Any other Approved Course
HSEXX	Any course from HSSE-I		

ABLL@LLC

- **Students are required to earn 6 credits through 8 semesters.**
- **If student is not able attendance/performance requirements, he/she will be dropped from the course and will have to enroll in additional course in the next semester.**
- **A student can enroll in maximum 2 courses in a semester.**

Table 2: List (indicative) of 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	Mentorship to Juniors (for Final Year Students)
LLC22	Kannada Language
LLC23	Telugu Language
LLC24	Tamil Language
LLCXX	Any other Course approved by Dean Academics and Research

Indicative SCOPE Certification

Minor/SCOPE Certification

Minor/SCOPE Track	Partner Institute if any.	Module	C
Computer Engineering	SPIT	Data Structures and Algorithms	MN11
		Database Management Systems	MN12
		Machine Learning	MN13
		Internet Technology	MN14
Industrial IoT	SPIT	Application Specific System Design	MN21
		Embedded "C" Programming & Real-time Software Development	MN22
		Software Design for Discrete time Control Algorithms	MN23
		Industrial Internet of Things (IIoT) System design and Applications	MN24
Management	S.P. Jain Institute of Management and Research [SPJIMR]	Finance and cost Management	MN31
		Supply Chain Management, operations and project Management	MN32
		IT for Business, HR and Organization	MN33
		Marketing	MN34
User Experience (UX) Design	ImaginXP, Pune	UX Design & Digitalization	SC11
		Empathy & Its Tools	SC12
		User Research & Its Application	SC13
		Design Thinking & Its Applications	SC14

CURRICULUM SCHEME FOR UNDERGRADUATE ACADEMIC PROGRAM AT SPIT

2022-ITERATION: B.Tech. (Computer Engineering)

Nomenclature of the Courses

BSC	Basic Science Course	**PC**	Program Core
BSE	Basic Science Elective	**PE**	Program Elective
ESC	Engineering Science Course	**MLC**	Mandatory Learning Course
ESE	Engineering Science Elective	**SCOPE**	Skill Certification for Outcomebased Professional Education
SBC	Skilled Based Course	**OE**	Open Elective
ABLL@LLC	Activity Based Liberal Learning about Life, Literatureand Culture	**HSSE**	Humanities and Social ScienceElective

Abbreviations

L	Lecture Hour	O	Other Work (Self Study)
T	Tutorial Hour	E	Total Engagement in Hours
P	Laboratory Hour	C	Credit Assigned

Engagement and Credit Scheme

Sem I									
No.	**Type**	**Code**	**Course**	**L**	**T**	**P**	**O**	**E**	**C**
1	BSC	MA101	Engineering Calculus	3	1	0	8	12	4
2	BSC	AS102	Engineering Chemistry	2	0	2	3	07	3
3	BSC	AS103	Biology for Engineers	2	0	0	3	05	2
4	ESC	AS105	Engineering Mechanics	2	0	2	4	08	3
5	ESC	CS101	Problem solving using Imperative Programming	2	0	4	6	12	4
6	ESC	EC101	Digital Systems and Microprocessors	3	0	2	5	10	4
7	SBC	AS107	Communication Skills	1	0	2	2	05	2
			TOTAL	**15**	**1**	**10**	**29**	**55**	**22**

Sem II									
No.	**Type**	**Code**	**Course**	**L**	**T**	**P**	**O**	**E**	**C**
1	BSC	MA102	Differential Equations and Complex Analysis	3	1	0	8	12	4
2	BSC	AS101	Engineering Physics	2	1	2	5	10	4
3	ESC	AS104	Engineering Graphics	1	0	2	2	05	2
4	ESC	ET101	Basic Electrical Engineering	3	0	2	6	11	4
5	ESC	CS102	Problem Solving using OOP	2	0	4	6	12	4
6	SBC	AS106	Skill Shop	0	0	2	0	02	1
7	ABL	LLCXX	LLC-I	0	0	0	2	02	1
			TOTAL	**11**	**2**	**12**	**26**	**51**	**20**

Sem III

No.	Type	Code	Course	L	T	P	O	E	C
1	BSC	MA203	Probability and Statistics	3	0	0	5	08	3
1	BSC*	MA202	Foundation of Mathematics-I*	2	1	0	6	09	3
2	PC	CS201	Discrete Structures and Graph Theory	3	0	0	4	07	3
3	PC	CS202	Data Structures	3	0	2	5	10	4
4	PC	CS203	Computer Architecture and Organization	3	0	2	4	09	4
5	PC	CS204	Database Management Systems	3	0	2	5	10	4
6	ABL	LLCXX	LLC-II	0	0	0	3	03	1
7	HSSE	HSEX1	HSS-I	2	0	0	3	05	2
			TOTAL	**17**	**0**	**6**	**29**	**52**	21

Only for Lateral Entry Students

Sem IV

No.	Type	Code	Course	L	T	P	O	E	C
1	BSC	MA201	Linear Algebra	2	0	2	5	09	3
1	BSC*	MA204	Foundation of Mathematics-II	2	1	0	6	09	3
2	PC	CS205	Design and Analysis of Algorithms	3	0	2	5	10	4
3	PC	CS206	Operating Systems	3	0	2	5	10	4
4	PC	CS207	Computer Communications and Networks	3	0	2	5	10	4
5	SBC	CS208	Mini Project-I	0	0	0	4	04	2
6	ABL	LLCXX	LLC-III	0	0	0	3	01	1
7	HSSE	HSEX2	HSS-II	2	0	0	3	05	2
8	SBC	AS201	Professional Communication Skills	1	0	2	2	05	2
9	S/M	SCX1/MNX1	SCOPE-I/Minor-I						3
			TOTAL	**14**	**0**	**10**	**32**	**56**	22

Only for Lateral Entry Students

Second Summer for HSC students

No.	Type	Code	Course	L	T	P	O	E	C
1	MLC	AS202	Constitution of India				06	06	NC

Second Summer (For Lateral Entry Students)

No.	Type	Code	Course	L	T	P	O	E	C
1	BSC	MA201	Linear Algebra	2	0	2	5	09	3
1	BSC	MA203	Probability and Statistics	3	0	0	5	08	3
2	MLC	AS202	Constitution of India				06	06	NC

Sem V

No.	Type	Code	Course	L	T	P	O	E	C
1	PC	CS301	Theory of Computation	3	0	0	6	9	3
2	PC	CS302	Software Engineering	3	0	2	5	10	4
3	PC	CS303	Artificial Intelligence and Machine Learning	3	0	2	5	10	4
4	PC	CS304	Distributed Computing	3	0	2	5	10	4
5	SBC	CS305	Cloud and Internet Technology Lab	1	0	2	5	08	2
6	HSSE	HSEX3	HSS-III	2	0	0	3	05	2
7	ABL	LLCXX	LLC-IV	0	0	0	3	3	1
8	S/M	SCX2/MNX2	SCOPE-II/Minor-II						3
			TOTAL	15	0	8	29	52	20

Sem VI (Cat 1- For Students who have **NOT** preferred semester long internship)

No	Type	Code	Course	L	T	P	O	E	C
1	OE	OEXXX	Open Elective-I	2	0	2	4	8	3
2	PC	CS306	System Programming and Compiler Construction	3	0	2	5	10	4
3	PC	CS307	Fundamental of Signal and Image Processing	3	0	2	5	10	4
4	PE	CS3X1	PE-I	2	0	2	4	8	3
5	PE	CS3X2	PE-II	2	0	2	4	8	3
6	SBC	CS308	Main Project Stage-I	0	0	0	8	08	3
7	ABL	LLCXX	LLC-V	0	0	0	3	3	1
8	S/M	SCX3/MNX3	SCOPE-III/Minor-III						3
			TOTAL	6		4	18	28	21

Sem VI (Cat 2-For Students who have preferred semester long internship)

No	Type	Code	Course	L	T	P	O	E	C
1	PE*	CS3X1	PE-I	2	0	2	4	8	3
2	PE*	CS3X2	PE-II	2	0	2	4	8	3
4	SBC	CS310/ CS309	Research Internship	0	0	0	40	40	15
5	S/M*	SCXX/MNXX	SCOPE-III/Minor-III						3
			*To be completed online mode or allied courses from MOOCs						21

			Sem VII						
No	Type	Code	Course	L	T	P	O	E	C
1	PC	CS401	Cryptography and System Security	2	0	2	4	8	3
1	OE	OEXXX	OE-II	2	0	2	4	8	3
2	OE	OEXXX	OE-III*	2	0	2	4	8	3
3	PE	CS4X3	PE-III	2	0	2	4	8	3
4	PE	CS4X4	PE-IV	2	0	2	4	8	3
5	SBC	CS402	Main Project Stage-I/ Main-Project Stage-II	0	0	0	6	6	3
6	ABL	LLCXX	LLC-VI	0	0	0	4	4	1
7	S/M/H	SCX4/MNX4 /HOXX	SCOPE-IV/Minor-IV/Honors-I						3
			TOTAL						19

*OE-III must be from Basic Science Elective or Engineering Science Elective

			Sem VIII (Option A: Cat1/Cat2)						
No	Type	Code	Course	L	T	P	O	E	C
1	PC	CS403	High Performance Computing	2	0	2	4	8	3
2	OE *	OEHXX	OE-IV	2	0	2	4	8	3
3	PE	CS4X5	PE-V	2	0	2	4	8	3
4	PE	CS4X6	PE-VI	2	0	2	4	8	3
5	SBC	CS404	Main Project Stage-II	0	0	0	6	6	3
6	H	HOXX	Honors-II						3
			*May be taken from MOOCs, Essentially Humanities, Management related						
			TOTAL						15

			Sem VIII (Option B: Only for Cat1 students)						
No	Type	Code	Course	L	T	P	O	E	C
1	SBC	CS405	Industry Internship/ Major Project	0	0	0	36	36	15
3	H	HOXX	Honors-II						3
			*May be taken from MOOCs, Essentially Humanities, Management related						
			TOTAL					40	15

The 'Major Project' in the "Option B" must be completed from an institute of national interest. If a student wishes to complete a Major Project under the mentorship of SPIT faculty, approval from the Dean Academics and Research is required.

Table 2 - PROGRAM ELECTIVES

Semester	Sem-VI		Sem-VII		Sem-VIII	
Program Elective/Thread	**Program Elective-I**	**Program Elective-II**	**Program Elective- III**	**Program Elective- IV**	**Program Elective- V**	**Program Elective- VI**
Artificial Intelligence and Machine Learning	1T11: Soft Computing	1T12: Machine Learning	1T13: Deep Learning	1T14: Artificial Intelligence for Industrial Application	1T11,1T12, 1T21,1T22, 1T31, 1T32, 1X,1Y, 2T11,2T12, 2T21,2T22 2T31,2T32 2X, 2Y	1T11,1T12, 1T21,1T22, 1T31, 1T32, 1X,1Y, 2T11,2T12, 2T21,2T22 2T31,2T32 2X, 2Y
Data Science	1T21: Natural Language Processing	1T22: Big Data Analytics and Visualization	1T23: Foundation of Data Science	1T24: Data Driven Internet of Things		
Network and Security	1T31: Ethical Hacking	1T32: Information and System Security	1T33: Cloud Architecture	1T34: Digital Forensics and Cyber Security		
GENERAL	1T11,1T12, 1T21,1T22, 1T31, 1T32, **1X**,1Y, 2T11,2T12, 2T21,2T22 2T31,2T32 2X, 2Y	1T11,1T12, 1T21,1T22, 1T31, 1T32, **1X**,1Y, 2T11,2T12, 2T21,2T22 2T31,2T32 2X, 2Y	1T13,1T14, 1T23,1T24 1T33, 1T34 **1P**,1Q, 2T13,2T14, 2T23,2T24 2T33,2T34 2P, 2Q	1T13,1T14, 1T23,1T24 1T33, 1T34 **1P**,1Q, 2T13,2T14, 2T23,2T24 2T33,2T34 2P, 2Q		

In this case the Computer Engineering Department has to offer 1T11,1T12,1T21,1T22, 1X,1Y, 1T13,1T23,1T14,1T24, 1T31, 1T32, 1T33, 1T34, 1P,1Q i.e. 16 Courses to take care of 6 Elective Baskets, where,

1X: Human Machine Interaction
1Y: Computer Vision
1P: Robotics and Automation
1Q: Blockchain Technology