



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 Computer Science & Engineering[DS])

### CURRICULUM SCHEME FOR UNDERGRADUATE ACADEMIC PROGRAM (COMPUTER SCIENCE & ENGG[DS]) AT SPIT

(For 2021-2025 Batch)

#### Salient Features

- 160-Credit **Liberal** Engineering Education Model.
- A strong **program core of 15 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**”<sup>®</sup> (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**”<sup>®</sup>(Social Empowerment through Various Activities”, and “**SATVA**”<sup>®</sup> (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 21<sup>st</sup> 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 Science and 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 21<sup>st</sup> 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 15 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 border="1"> <thead> <tr> <th data-bbox="773 785 976 884">Percentile Score</th> <th data-bbox="980 785 1130 884">STARs Earned</th> </tr> </thead> <tbody> <tr> <td data-bbox="773 890 976 947">Above 99</td> <td data-bbox="980 890 1130 947">6</td> </tr> <tr> <td data-bbox="773 953 976 1010">Above 98</td> <td data-bbox="980 953 1130 1010">5</td> </tr> <tr> <td data-bbox="773 1016 976 1073">Above 95</td> <td data-bbox="980 1016 1130 1073">4</td> </tr> <tr> <td data-bbox="773 1079 976 1136">Above 90</td> <td data-bbox="980 1079 1130 1136">4</td> </tr> <tr> <td data-bbox="773 1142 976 1199">Valid score</td> <td data-bbox="980 1142 1130 1199">2</td> </tr> </tbody> </table>	Percentile Score	STARs Earned	Above 99	6	Above 98	5	Above 95	4	Above 90	4	Valid score	2	8 STARs
Percentile Score	STARs Earned													
Above 99	6													
Above 98	5													
Above 95	4													
Above 90	4													
Valid score	2													
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 border="1"> <thead> <tr> <th data-bbox="773 1423 976 1522">Percentile Score</th> <th data-bbox="980 1423 1130 1522">STARs Earned</th> </tr> </thead> <tbody> <tr> <td data-bbox="773 1528 976 1585">Above 95</td> <td data-bbox="980 1528 1130 1585">3</td> </tr> <tr> <td data-bbox="773 1591 976 1648">Above 90</td> <td data-bbox="980 1591 1130 1648">2</td> </tr> <tr> <td data-bbox="773 1654 976 1707">Above 80</td> <td data-bbox="980 1654 1130 1707">1</td> </tr> </tbody> </table>	Percentile Score	STARs Earned	Above 95	3	Above 90	2	Above 80	1	6 STARs				
Percentile Score	STARs Earned													
Above 95	3													
Above 90	2													
Above 80	1													

#Winning prestigious technical competitions at National level	Rank	STARs Earned	6 STARs
	1	4	
	2	3	
	3	2	
**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 21<sup>st</sup> 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 21<sup>st</sup> 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 21<sup>st</sup> 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 <sup>2</sup> 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 <b>Open elective</b> by the <b>Departments</b>
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**

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

### **Open Elective III-Engineering Science Electives**

<b>OEXXX</b>	Thermal & Fluid Engineering
<b>OEXXX</b>	Manufacturing Processes
<b>OEXXX</b>	Electric Drives
<b>OEXXX</b>	Engineering Materials
<b>OEXXX</b>	Data Structures
<b>OEXXX</b>	Algorithms
<b>OEXXX</b>	Sensors and Actuators
<b>OEXXX</b>	Communication Engineering
<b>OEXXX</b>	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)**

<b>HSEC01</b>	Film Appreciation	<b>HSEC02</b>	Universal Values
<b>HSEC03</b>	Game Theory	<b>HSEC04</b>	Human Behavior
<b>HSEC05</b>	Ecology and Society	<b>HSEC06</b>	Energy Economics and Policies
<b>HSEC07</b>	Drama Appreciation	<b>HSEC08</b>	Political Ideologies
<b>HSEC09</b>	Justice	<b>HSECXX</b>	Any other Approved Course
<b>HSEXX</b>	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: SEVA**

<b>SEVA (Social Empowerment through Various Activities)</b>			
<b>Module</b>	<b>Title</b>	<b>Courses</b>	<b>CODE</b>
SEVA-I	<b>SOCHO BHARAT</b>	Study of Green & White Revolutions in India	SV10
		Government Missions [Study of any 2]	SV11
		Study of India's top 2 problems	SV12
		Study of World's top 2 problems	SV13
		How Government Works? [Study of one department of the Central/ State Government]	SV14
		Study of one of the identified Books	SV15
		Study of two National policies	SV16
		Any other activity approved by Dean Academics	SV1X
<b>Module</b>	<b>Title</b>	<b>Courses</b>	<b>CODE</b>
SEVA-II	<b>SWACCH BHARAT</b>	River/Beach/Mohalla/School/Campus/Govt offices Cleaning	SV20
		Waste Segregation Surveys	SV21
		NSS camp in village for a week	SV22
		Medical camps in schools	SV23
		First Aid training for a week	SV24
		Surveys and Estimation for roof top solar	SV25
		NCC participation	SV26
		Any activity approved by Dean Academics	SV2X
<b>Module</b>	<b>Title</b>	<b>Courses</b>	<b>CODE</b>
SEVA-III	<b>SHIKSHIT BHARAT</b>	Mentoring of School Children	SV30
		Digital Literacy for yielders	SV31
		Value addition for deprived schools	SV32
		Mentoring junior (first year) students at SPIT	SV33
		Teaching Assistantship at SPIT	SV34
		Development of learning material for schools/ITIs	SV35
		Participation in "Teach-for-India" movement	SV36

		Any other activity approved by Dean Academics	SV3X
<b>Module</b>	<b>Title</b>	<b>Courses</b>	<b>CODE</b>
SEVA-IV	<b>SAMRUDDHA</b> BHARAT	Great Grass Root Innovations	SV40
		Innovation and Creativity	SV41
		Critical Thinking and Problem solving	SV42
		Team work and collaboration	SV43
		Leadership & Entrepreneurship	SV44
		Design Thinking	SV45
		Study of one of the identified books	SV47
		Work with START-UP at SPIT	SV48
		Any other activity approved by Dean Academics	SV49

**Table 3: SATVA**

<b>SATVA (Self Accomplishment Through Various Activities)</b>			
<b>Module</b>	<b>Title</b>	<b>Courses</b>	<b>CODE</b>
SATVA-I	<b>SANSKARIT BHARAT</b>	Values and Ethos of Bhavan	<b>ST10</b>
		Essence of Indian traditional knowledge	<b>ST11</b>
		Philosophy of religion (any)	<b>ST12</b>
		Study of Life Management / Kindle Life / Life Empowerment and Enriching Program or any other book cited.	<b>ST13</b>
		Study of any of GREAT sons of INDIA [Ex. Gandhi, Ambedkar, Phule, Savarkar, Sardar Patel, Nehru, Shivaji, JRD Tata etc]	<b>ST14</b>
		Any other course approved by Dean Academics	<b>ST1X</b>
SATVA-II	<b>SAKSHAM BHARAT</b>	Target based Physical Exercise for example-Running [Test 5 kms in a stretch], Swimming [Test 1 km in a stretch], Walking [Test 20 kms in a stretch], Trekking [7days], Cycling	<b>ST20</b>
		Sports – Representation of Institute at University level/Inter college level and above in ANY sport	<b>ST21</b>
		Participation in National Tech Fest, AICTE-Hackathon, Industry floated global and national competitions, Robocon, BAHA etc	<b>ST22</b>
		Yoga vidya -I	<b>ST23</b>
		Any other activity approved by Dean Academics	<b>ST2X</b>
SATVA-III	<b>SUNDER BHARAT</b>	Institute representation in prestigious cultural fests/competitions	<b>ST30</b>
		Dance [ Bharatanatyam /Kathak /Lavani /Western Dance]. Only for beginners	<b>ST31</b>
		Learning musical instruments [Any type]. Only for beginners.	<b>ST32</b>
		Film Appreciation/Dramatics/Seeing through Painting	<b>ST33</b>
		Making short film/Photography	<b>ST34</b>

		Yogvidya-II	ST35
		Any other activity approved by Dean Academics and DOSA	ST3X
SATVA-IV	<b>SURAKSHIT BHARAT</b>	Food that Heals	ST40
		Personal and Social Hygiene	ST41
		Intellectual Property Rights	ST42
		Etiquette and Conversational skills	ST43
		Basics of Ayurveda	ST44
		Study of one of the identified Books	ST45
		Any other course approved by Dean Academics	ST4X

## 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**

**2021-ITERATION: B.Tech. (Computer Science and Engineering [Data  
Science])**

**Nomenclature of the Courses**

<b>BSC</b>	Basic Science Course	<b>PC</b>	Program Core
<b>BSE</b>	Basic Science Elective	<b>PE</b>	Program Elective
<b>ESC</b>	Engineering Science Course	<b>MLC</b>	Mandatory Learning Course
<b>ESE</b>	Engineering Science Elective	<b>SCOPE</b>	Skill Certification for Outcome based Professional Education
<b>SBC</b>	Skilled Based Course	<b>OE</b>	Open Elective
<b>ABL-SATVA</b>	Self- Accomplishment Through Various Activities	<b>HSSE</b>	Humanities and Social Science Elective
<b>ABL-SEVA</b>	Social Empowerment Through Various Activities		

**Abbreviations**

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



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	4	10	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
<b>TOTAL</b>				<b>15</b>	<b>1</b>	<b>12</b>	<b>29</b>	<b>57</b>	<b>22</b>

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	4	10	4
6	SBC	AS106	Skill Shop	0	0	2	0	02	1
7	ABL	SV1X/ST1X	SEVA-I or SATVA-I	0	0	0	2	02	1
<b>TOTAL</b>				<b>11</b>	<b>2</b>	<b>12</b>	<b>27</b>	<b>52</b>	<b>20</b>

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	SVXX/ STXX	SEVA II or III /SATVA II or III	0	0	0	3	03	1
7	HSSE	HSEX1	HSS-I	2	0	0	3	05	2
<b>TOTAL</b>				<b>17</b>	<b>0</b>	<b>6</b>	<b>29</b>	<b>52</b>	<b>21</b>

*\*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	3	0	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	SVXX/STXX	SEVA II or III /SATVA II or 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
<b>TOTAL</b>				<b>14</b>	<b>0</b>	<b>10</b>	<b>32</b>	<b>54</b>	<b>22</b>

*\*Only for Lateral Entry Students*

Summer term for HSC students									
No	Type	Code	Course	L	T	P	O	E	C
1	MLC	AS202	Constitution of India	1	0	0	05	06	NC

Summer term (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	DS301	Theory of Computation	3	0	0	6	9	3
2	PC	DS302	Soft Computing	3	0	2	5	10	4
3	PC	DS303	Fundamentals of Data Science	3	0	2	5	10	4
4	PC	DS304	Fundamentals of signal & Image Processing	3	0	2	5	10	4
5	SBC	DS305	Internet Technology Lab	1	0	2	5	08	2
7	HSSE	HSEX3	HSS-III	2	0	0	3	05	2
8	ABL	SVXX/STXX	SEVA II or III /SATVA II or III	0	0	0	3	3	1
9	S/M	SCX2/MNX2	SCOPE-II/Minor-II						3
<b>TOTAL</b>				<b>15</b>	<b>0</b>	<b>8</b>	<b>29</b>	<b>52</b>	<b>20</b>

<b>Sem VI (Cat 1- For Students who have NOT preferred semester-long internship)</b>									
<b>No</b>	<b>Type</b>	<b>Code</b>	<b>Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>O</b>	<b>E</b>	<b>C</b>
1	OE	OEXXX	Open Elective-I	2	0	2	4	8	3
2	PC	DS306	Distributed Computing	3	0	2	5	10	4
3	PC	DS307	Machine Learning	3	0	2	5	10	4
4	PE	DS3X1	PE-I	2	0	2	4	8	3
5	PE	DS3X2	PE-II	2	0	2	4	8	3
6	SBC	DS308	Main Project-Stage-I	0	0	0	8	08	3
7	ABL	SVXX/STX X	SEVA II or III /SATVA II or III	0	0	0	3	3	1
8	S/M	SCX3/MNX3	SCOPE-III/Minor-III						3
<b>TOTAL</b>				<b>12</b>	<b>0</b>	<b>10</b>	<b>33</b>	<b>55</b>	<b>21</b>

<b>Sem VI (Cat 2-For Students who have preferred semester-long internship)</b>									
<b>No</b>	<b>Type</b>	<b>Code</b>	<b>Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>O</b>	<b>E</b>	<b>C</b>
1	PE*	DS3X1	PE-I	2	0	2	4	8	3
2	PE*	DS3X2	PE-II	2	0	2	4	8	3
4	SBC	DS309	Research Internship	0	0	0	40	40	15
5	S/M*	SCXX/MNXX	SCOPE-III/Minor-III						3
<b>TOTAL</b>				<b>4</b>	<b>0</b>	<b>4</b>	<b>48</b>	<b>56</b>	<b>21</b>
*To be completed online mode or allied courses from MOOCs									

Sem VII									
No	Type	Code	Course	L	T	P	O	E	C
1	PC	DS401	Big Data Analytics	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	DS4X3	PE-III	2	0	2	4	8	3
4	PE	DS4X4	PE-IV	2	0	2	4	8	3
5	SBC	DS402	Main Project Stage-I/ Main Project Stage- II	0	0	0	6	6	3
6	ABL	SVXX/STXX	SEVA-IV/SATVA-IV	0	0	0	4	4	1
7	S/M/H	SCX4/MNX4 /HOXX	SCOPE-IV/Minor-IV/Honors-I						3
<b>TOTAL</b>									<b>19</b>
*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	DS403	Human-Machine Interaction	2	0	2	4	8	3
2	OE *	OEHXX	OE-IV	2	0	2	4	8	3
3	PE	DS4X5	PE-V	2	0	2	4	8	3
4	PE	DS4X6	PE-VI	2	0	2	4	8	3
5	SBC	DS404	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									
<b>TOTAL</b>									<b>15</b>

Sem VIII (Option B: Only for Cat1 students)									
No	Type	Code	Course	L	T	P	O	E	C
1	SBC	DS405	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									
<b>TOTAL</b>								<b>40</b>	<b>15</b>

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**

Sem	VI		VII		VIII	
Program Elective / Thread	Program Elective-I	Program Elective-II	Program Elective- III	Program Elective- IV	Program Elective- V	Program Elective- VI
AI-driven Data Science	1T11: Natural Language Processing	1T12: Data Warehouse and Mining	IT13: Deep Learning	1T14: Advanced Data Visualization	1T11,1T12, 1T21,1T22, 1X,1Y, 2T11,2T12, 2T21,2T22	1T11,1T12, 1T21,1T22, 1X,1Y, 2T11,2T12, 2T21,2T22
Business-driven Data Analytics	1T21: Business analytics with Python	1T22: Decision Making and Business Intelligence	1T23: Recommendation Systems	1T24: Social Media Analytics	2T31,2T32  2X, 2Y	2T31,2T32  2X, 2Y
General	1T11,1T12, 1T21,1T22, 1X,1Y, 2T11,2T12, 2T21,2T22 2T31,2T32 2X, 2Y	1T11,1T12, 1T21,1T22, 1X,1Y, 2T11,2T12, 2T21,2T22 2T31,2T32 2X, 2Y	1T13,1T14, 1T23,1T24 1P,1Q, 2T13,2T14, 2T23,2T24 2T33,2T34 2P, 2Q	1T13,1T14, 1T23,1T24 1P,1Q, 2T13,2T14, 2T23,2T24 2T33,2T34 2P, 2Q		
<p>In this case the Computer Science &amp; Engineering Department has to offer 1T11,1T12,1T21,1T22, 1X,1Y, 1T13,1T23,1T14,1T24, 1P,1Q i.e. 12 Courses to take care of 6 Elective Baskets, where,</p> <p>1X: Software Engineering</p> <p>1Y: User Experience Design</p> <p>1P: Information System and Security</p> <p>1Q: Advanced Algorithm and Complexity</p>						