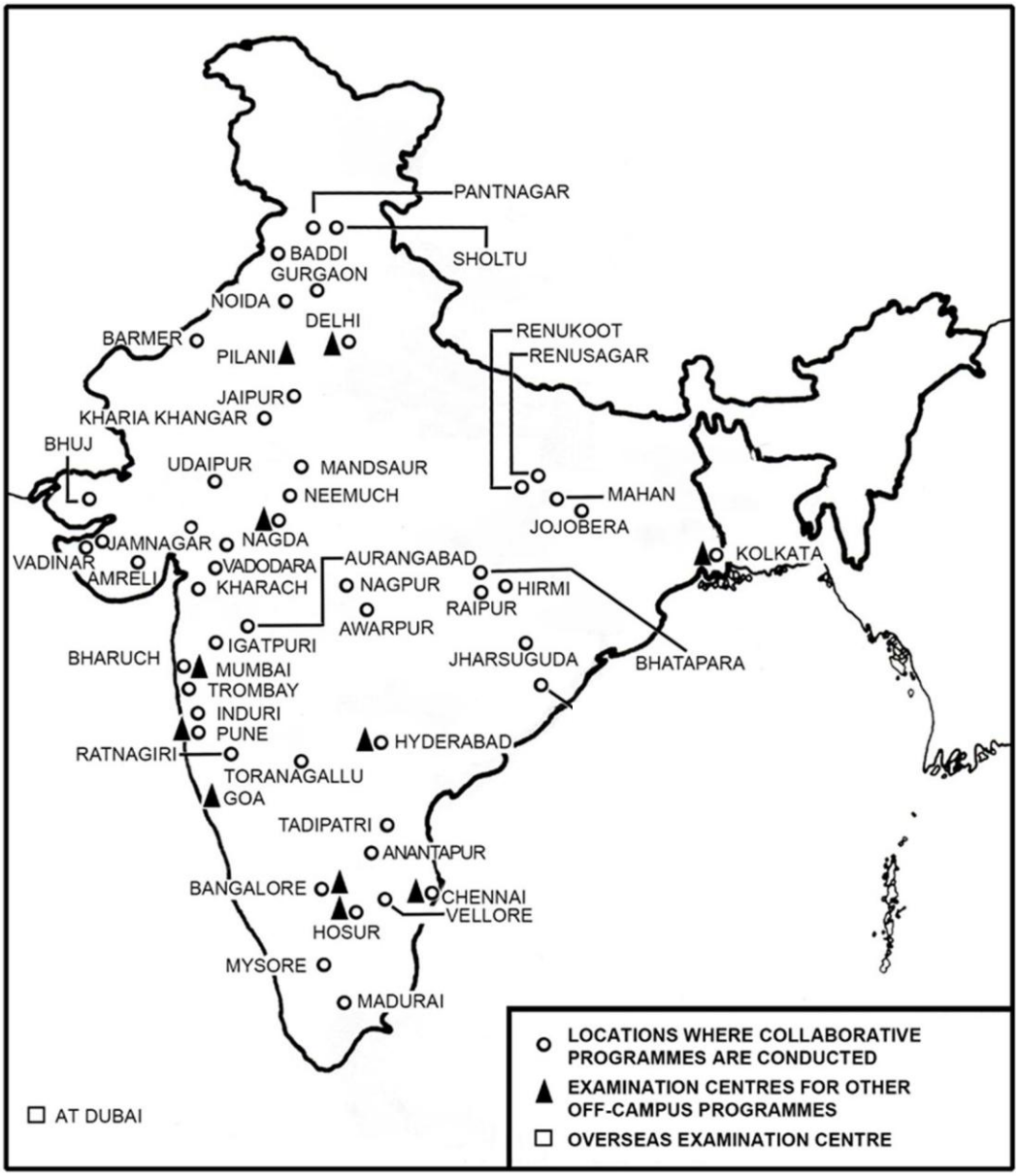
PART V

WORK INTEGRATED LEARNING PROGRAMMES

MAP OF BITS WORK-INTEGRATED LEARNING & COLLABORATIVE PROGRAMMES

2024-2025



Introduction

Since 1979, the Institute has been participating in the human resources development activities of the industries by evolving several degree programmes that integrate the working environment of the employees with the learning environment required by the Institute. These programmes are offered in several domains like Information Technology, Engineering Technology and Management.

The Institute conducts **Work Integrated Learning Programmes (WILP)** as a means of continuing education for employed professionals to meet the Learning & Development needs of a diverse spectrum of industries. These programmes are a conducted through a collaborative arrangement between BITS Pilani and the collaborating organization / industry, whose ultimate aim is to build competencies and to attain advancement of technical workplace skills.

Salient Features of WILP

For the conduct of Work Integrated Learning programmes, the basic requirement is the participation of the collaborative organizations. Such a collaboration includes extending physical and other facilities and by agreeing to integrate their work requirements with the academic requirements of the Institute for the pursuit of the programme. The WILP Division of the Institute operates these programmes.

The Work Integrated Learning Programmes are offered in two modes: Programmes that are designed to meet exclusive requirements of specific collaborating organizations are offered as Enterprise Education Solutions for sponsored employees, with classes organized in the premises of the collaborating organizations. Programmes designed to meet the generic industry requirements are offered as Programmes for Individual students from various organizations. Instruction in such programmes is typically delivered through technology.

The Work Integrated Learning Programmes are characterized by the following salient features:

1. Enrollment is permitted only to suitably qualified, employed professionals having specified educational qualifications, with adequate and relevant work experience, to programmes that are closely aligned with their work profiles.

2. Enrollment also requires endorsement of the employer, and a commitment from the employer to provide necessary support (including that of a qualified mentor) and facilities to enable effective work integrated learning. The rationale for permitting only qualified employed professionals to enroll under WILP alongwith the consent from the employer is with the objective that the skill and knowledge enhancement attained by the employee through these WILP would ultimately benefit, add value to the organization and increase productivity.

3. A judicious combination of synchronous and asynchronous modes of instruction is used, for regular and effective interaction between the students and faculty members, to maintain the necessary academic rigor and standards of instruction.

4. WILP are characterized by person-centered approach with the same rigor and standards at par with the on-campus system of education. There is no replacement of inter-personal communication of conventional classroom based education, since all courses are conducted in a manner akin to actual classroom teaching ensuring two-way communication between experienced faculty of BITS and the students.

5. The pedagogy of WILP is based on the successful and established methodologies followed by BITS for on-campus education system without compromising on the duration of the programme, methodology of

study, assessment and programme completion requirements which are comparable to programmes offered on-campus. All the programmes under WILP follow a credit-based system at par with the on-campus education system.

6. For each WILP course there is an instructor who is a BITS faculty responsible for the conduct of the course, as well as a qualified mentor (being a senior professional from the student's own organization who agrees to act as a mentor and a resource person) at the work place to provide structured guidance to the employee throughout the duration of the programme, which helps in strengthening the work-study integration.

7. All programmes are designed to meet the industry needs, and hence require application of concepts learnt in the classroom. Therefore, the Institute provides several technology enabled tools like simulators, virtual labs and remote labs to enable experiential learning. Such labs are equipped with contemporary computational simulators and remote operating equipment. Students spend sufficient time in learning, practicing and experimenting industry oriented problems designed and developed by BITS faculty in collaboration with industry experts.

The currently operative programmes are given in Table on pages V-4to V-7. The curriculum structure and semesterwise pattern of courses for the currently operative programmesare given on Pages V-13 to V-153.

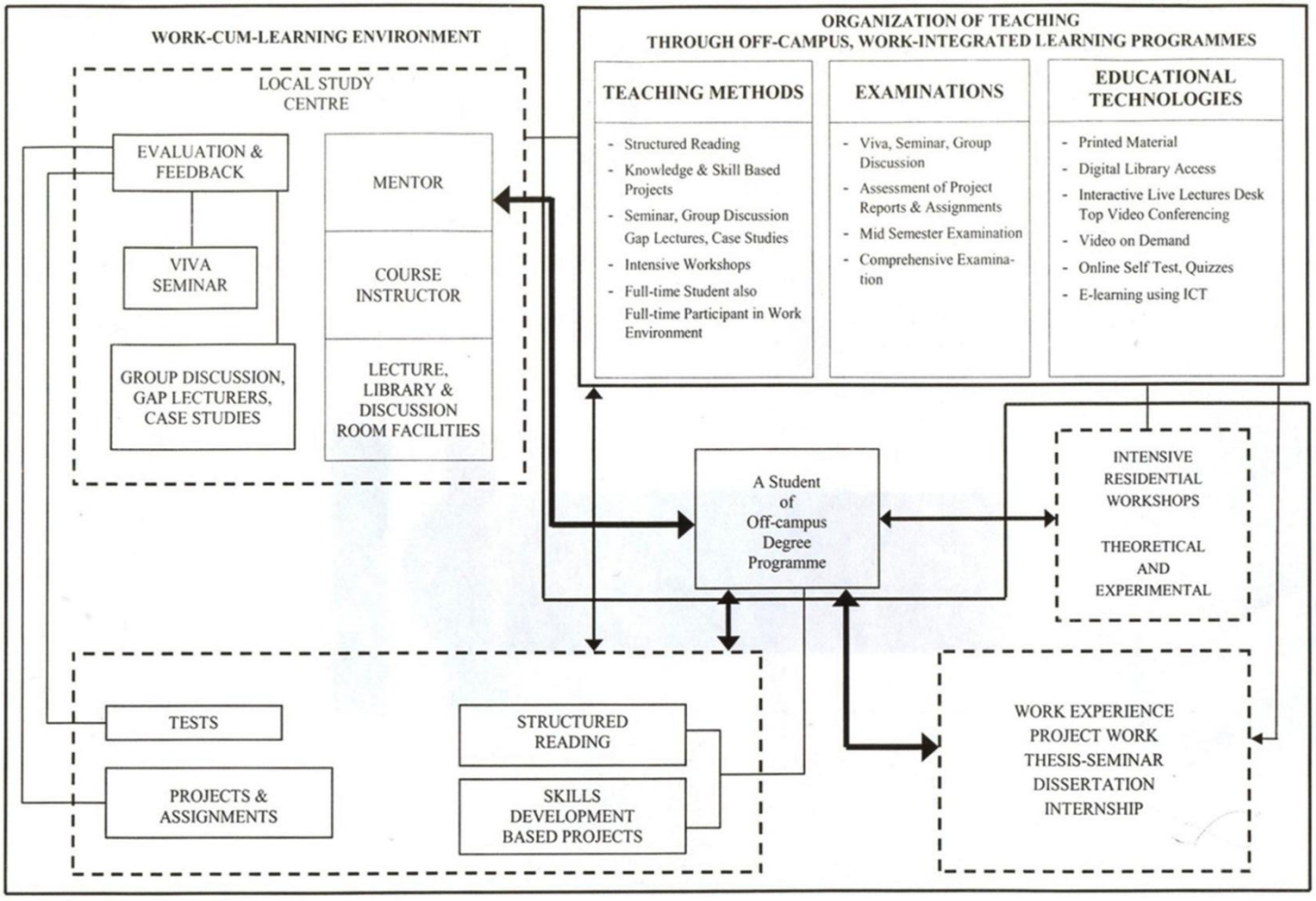


Figure 1: Person-centred Approach in the Off-campus Work-Integrated Learning Programme

Table: Currently Operative Work-Integrated-Learning Programmes at a Glance

Programmes		Collaborating / Sponsoring Organization
B.Tech. Programmes		
1. Electronics Engineering	-	Designed for the HRD needs of a diverse spectrum of Electronics Industries
2. Engineering Design	-	Designed for the HRD needs of a diverse spectrum of Engineering Industries
3. Engineering Technology	-	Designed for the HRD needs of a diverse spectrum of Engineering Industries and John Deere, Pune
4. Information Systems	-	Designed for the HRD needs of a diverse spectrum of IT Industries and Wipro Bangalore
5. Manufacturing Technology	-	Kirloskar Oil Engines, Kolhapur, Bharat Forge, Pune, Tata Motors, Jamshedpur; TACO, Pune; Maruti Suzuki, Gurgaon; Mahindra Motor Vehicles; Cummins, Pune; GE Locomotives
6. Power Engineering	-	Aditya Birla Group, Tata Power, JSW Energy – Mumbai
7. Process Engineering	-	Aditya Birla Group, Mumbai; JSW Steel, Toranagallu; Vedanta, Jharsuguda; BPCL, Mumbai; Arcelor Mittal Nippon Steel India
8. Software Systems and Engineering	-	Designed for the HRD needs of a diverse spectrum of IT Industries
M.Sc. Programmes		
1. Business Analytics	-	Designed for the HRD needs of a diverse spectrum of IT Industries; KPMG Global Services
2. Information Systems	-	Designed for the HRD needs of a diverse spectrum of IT Industries
B.Sc. Programme		
1. Computer Science		Designed for the HRD needs of a diverse spectrum of IT Industries
2. Design & Computing	-	Designed for the HRD needs of a diverse spectrum of IT Industries, and HCL Technologies, Noida
3. Engineering Science	-	Designed for the HRD needs of a diverse spectrum of Manufacturing, Mechanical, Chemical, and circuits Industries
4. Pharmaceutical Sciences	-	Designed for the HRD needs of a diverse spectrum of Pharmaceutical Industries, and Dr. Reddy's Laboratories, Hyderabad; CIPLA
B.Sc. (Hons) Programme		
1. Computer Science	-	Designed for the HRD needs of a diverse spectrum of IT Industries
M.Tech. Programmes		
1. Applied Energy Engineering	-	Designed for the HRD needs of a diverse spectrum of

		Engineering Industries
2.	Artificial Intelligence and Machine Learning	- Designed for the HRD needs of a diverse spectrum of IT industries
3.	Automotive Electronics	- Designed for the HRD needs of a diverse spectrum of Automotive Industries and Aptive
4.	Automotive Engineering	- Designed for the HRD needs of a diverse spectrum of Automotive Industries, Tata Technologies, Tata Motors, Pune; Mercedes Benz; Cummins
5.	Cloud Computing	- Designed for the HRD needs of a diverse spectrum of IT Industries
6.	Computing Systems & Infrastructure	- Designed for the HRD needs of a diverse spectrum of IT Industries, and Wipro, Bangalore, VMware
7.	Data Science & Engineering	- Designed for the HRD requirements of a diverse spectrum of IT Industries and Intuit; Avaya; BEL; Wipro Technologies; CitiusTech Healthcare Technology; Cognizant Technology Solutions; Comcast India Engineering; CISCO; HCL
8.	Design Engineering	- Designed for the HRD needs of a diverse spectrum of Engineering Industries, SKF and John Deere, Pune
9.	Digital Manufacturing	- Designed for the HRD needs of a diverse spectrum of Digital Industries
10.	Embedded Systems	- Designed for the HRD needs of a diverse spectrum of IT Industries, Aricent Technologies; Cisco, Bangalore; UTC Bangalore and Hyderabad.
11.	Environmental Engineering	- Goa State Pollution Control Board, Goa
12.	Manufacturing Management	- Designed for the HRD needs of a diverse spectrum of Engineering Industries
13.	Microelectronics	- Designed for the HRD needs of a diverse spectrum of IT Industries; Synopsys, Bangalore; Samsung, Gurgaon; Aricent Technologies
14.	Pharmaceutical Operations and Management	- Designed for the HRD needs of a diverse spectrum of Pharmaceutical Industries, and Sun Pharmaceutical Industries, Vadodara; Lupin, Mumbai
15.	Quality Management	- Designed for the HRD needs of a diverse spectrum of Engineering Industries
16.	Sanitation Science, Technology and Management	- Designed for the HRD needs of a diverse spectrum of Engineering Industries
17.	Software Engineering	- Wipro Technologies, Dell,SAP Labs, Sabre,EMC, Oracle, Lowe's Services, Bangalore; Avaya, Tech Mahindra, Pune; Capgemini; Qualcomm, Hyderabad; Hexaware; Mindtree; Cognizant Technology Solutions
18.	Software Systems	- Designed for the HRD requirements of a diverse spectrum of IT Industries; Wipro Technologies,

		Bangalore; TCS, Hyderabad;Cisco, Synopsys, Bangalore; Samsung, Gurgaon; Aricent Technologies, Mercedes-Benz, Bangalore; ATMECS; Cognizant Technology Solutions; Mindtree; Hexaware Technologies; Jio Platforms
19. Systems Engineering	-	Wipro Infotech, Bangalore

M.B.A. Programmes		
1. Business Analytics	-	Designed for the HRD needs of a diverse spectrum of IT Industries; Citus; Hinudstan Zink
2. Consultancy Management	-	Designed for the HRD needs of a diverse spectrum of consulting firms
3. Digital Business	-	Designed for the HRD needs of business organizations
4. Finance	-	Designed for the HRD needs of business organizations; Hindustan Zink
5. FinTech	-	Designed for the HRD needs of business organizations
6. Hospital and Health Systems Management	-	Designed for the HRD needs of a diverse spectrum of Hospitals and Healthcare organizations
7. Manufacturing Management	-	Designed for the HRD needs of a diverse spectrum of Engineering Industries and Bosch
8. Quality Management	-	Designed for the HRD needs of a diverse spectrum of Engineering Industries

Diploma	
1. Software Development	Designed for the HRD needs of a diverse spectrum of IT Industries

Post Graduate Diploma Programmes		
1. Automotive Cyber Security	-	Designed for the HRD needs of a diverse spectrum of Automotive Industries
2. Business Analytics	-	Designed for the HRD needs of a diverse spectrum of IT Industries
3. Electric Vehicles	-	Designed for the HRD needs of a diverse spectrum of Electronics Industries
4. Finance		Designed for the HRD needs of a diverse spectrum of business organizations
5. FinTech		Designed for the HRD needs of business organizations
6. Manufacturing Management	-	Designed for the HRD needs of a diverse spectrum of Manufacturing organizations; Bosch
7. Smart Manufacturing	-	Designed for the HRD needs of a diverse spectrum of

		Manufacturing organizations
8. Smart Mobility	-	Designed for the HRD needs of a diverse spectrum of Automotive Industries
Post Graduate Certificate Programmes		
1. Artificial Intelligence and Machine Learning	-	Designed for the HRD needs of a diverse spectrum of IT industries
2. Big Data & Analytics	-	Designed for the HRD needs of a diverse spectrum of IT industries
3. Big Data Engineering	-	Designed for the HRD needs of a diverse spectrum of IT industries
4. Data Science for Climate and Health	-	Designed for the HRD needs of a diverse spectrum of IT industries
5. Full Stack Engineering		Designed for the HRD needs of a diverse spectrum of IT industries
6. General Management	-	Designed for the HRD needs of a diverse spectrum of Engineering industries
7. Internet of Things	-	Designed for the HRD needs of a diverse spectrum of IT industries
8. Manufacturing Practice	-	Designed for the HRD needs of a diverse spectrum of Manufacturing organizations
9. Non-sewered Sanitation	-	Designed for the HRD needs of a diverse spectrum of Engineering industries
Certificate Programmes		
1. Manufacturing Practice	-	Designed for the HRD needs of a diverse spectrum of Manufacturing organizations
2. General Management	-	Designed for the HRD needs of a diverse spectrum of Engineering industries

Note: The Institute looks for the viable minimum number (around 50) of candidates sponsored by an organization or a group of organizations in any centre for a degree programme. Any organization interested in having a dialogue with the Institute for offering any collaborative and innovative programme directed towards the human resource development needs of their industry may write to the Institute. The Institute has an open mind to offer any of the existing programmes or devise any other new programme.

Admission Modality

1. The Institute is one of the very few universities in India, which has ventured into work integrated learning programmes in science and technology areas. In order to maintain the standard as well as rigour required in these areas, the Institute could cater only to those inputs, which have the facilities and environment for such a learning process. So the Institute treats these degree programmes as continuing technical education programmes for employed professionals. Hence admissions are given normally to candidates who are already employed in relevant professional domains and whose employing organizations sponsor them in their academic pursuit subject to the candidates having the required academic qualifications and relevant work experience. The Institute looks for candidates who have the necessary computer, laboratory and other physical facilities including access to Email and Internet, as well as certain intellectual input in terms of guidance by superior / co-officer / professional expert preferably from the workplace of the candidate who will be termed as Mentor, while the candidate is in pursuit of studies.

II. These degree programmes are work-integrated learning programmes. Hence, for students to get admission to these programmes, they must be engaged in work in the relevant professional areas. The final offer of admission would be based on candidate's educational background, academic achievements, work profile, relevant work experience, profile of the employing organization and Mentor's profile.

III. If the number of applications for a particular programme is less than a critical number, that programme may not be offered in that semester.

IV. Once the candidate accepts the admission offer and confirms registration, any request for deferment of admission to a subsequent semester cannot be entertained. The candidate can only withdraw from the registered semester.

Fees Structure

The fees schedule applicable for all programmes is as follows:

Admission Fees : Rs. 16,500/-

Each Semester Fees:Rs. 66,750/-

A candidate who has been offered admission will have to pay Rs. 83,250/- (Admission fees and Semester fees for the Starting Semester of the programme) immediately on receiving the Admit Offer Letter. Any candidate who desires to discontinue from the programme after confirmation of admission & registration for the courses specified in the admit offer letter will forfeit the total amount of fees paid.

Note 1: Certain specific facilities such as access to a digital library or virtual laboratories, if provided, may be charged extra in addition to the above mentioned fees.

Note 2: For the examination centre at Dubai, in addition to the semester fees, for each semester there will be an examination centre fees of 1000 UAE Dirhams or equivalent per semester out of which 500 UAE Dirhams is to be paid at the time of appearing in Mid-semester Tests at Dubai exam centre for that semester, and the remaining 500 UAE Dirhams is to be paid at the time of appearing in Comprehensive Examinations at Dubai exam centre for that semester.

Educational Process

The education in the work integrated learning programmes is characterized by person-centered approach where the rigour and standards are maintained on par with Institute's system of education on-campus. These programmes judiciously combine the flexibility and ingenuity of the continuing education system with the regular features of the on-campus education system. Also, the learning and evaluation process draws upon the successful and established methodologies followed by the Institute.

The work integrated learning environment of a student consists of two broad-based facets:

1. Academic Environment created by BITS faculty drawn from different disciplines.

2. Student's own Work Environment from which assignments, projects, seminars etc., may

emerge to integrate theory and practice. A (locally-based) Mentor imparts structured guidance and conducts certain evaluation components (see Role of Mentor' below).

Central to the educational philosophy of the Institute being the dialectical link between theory and practice, the student's own work environment provides an ideal ground where theory could be meaningfully combined with practice through Assignments, Case Studies, Laboratory-Oriented Projects, Work Experience, In-service Training, Internship, Thesis-Seminar, Project Work and Dissertation. These evaluation components and courses search for evidence of self-study, time planning, conceptual understanding & application of the concepts in a real-life situation, self-reliant articulation, enthusiasm for, awareness of and participation in new pedagogy. One of the distinctive features of this system is the complete formalization of pursuit of education at the work-learning environment. An organization creates a work learning environment by providing academic sponsorship for the candidates as well as infrastructural facilities such as place for conducting formal classes / mentor interactions / examination apart from library, computer and laboratory access. The work learning environment form a strict requirement in order to infuse a strong component of teacher-student contact through course instructors as well as Mentor (a senior officer of the student's own organization). Thus work-learning environment is a very important component of the person-centered learning process. There is in the design, a clear arrangement of periodic personal discussion in the work-learning environment with the students so that their progress is directly monitored by planned interaction. Further, the students at the work-learning environment receive help from mentors. Throughout the student's learning process, which is conducted in his own work place, through systematic self-study, and self-learning process, the student remains continually in contact with the course instructors for any clarifications. Thus the operation is an imaginative combination of the contact hours and tutoring of the on-campus system with the student-centered self-study feature of the off-campus system and an organizational and pedagogic commitment of the collaborating organizations. The student is at once, a full-time student as well as full-time employee.

Work Integrated Learning: For each course offered by the Institute, there would be an Instructor, who is a BITS faculty, drawn from the relevant discipline. He is charged with the responsibility of the conduct of that course. This will be in terms of preparing question papers, evaluation of answer papers and answering student's queries. He will also prepare instruction manuals, question bank, supplementary notes, etc. wherever required in order to strengthen the course.

For each course, there will be a handout, which will spell out the plan of study and evaluation scheme, apart from other details. The evaluation schedule is also announced in the beginning of the semester itself. All details pertaining to the operation of the course including study plan are shared with the students through this document.

The BITS, Pilani model of cooperative education has a structured method of integrating education with practical work experience, faculty-student interaction as well as mentor-employer involvement. Further, the BITS model of education deploys ICT both in synchronous and asynchronous modes. Synchronous instruction through Internet based desktop video conferencing enables effective interaction between students and faculty. Asynchronous instruction, including on-demand lectures and electronic mail through list servers, is more flexible as it accommodates multiple learning levels and schedules. In addition, intensive residential contact classes are held for various programmes at the Institute campus as well as at the locations of various organizations. Thus, the BITS, Pilani model emphasizes on acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies, in the work-integrated learning environment.

The Role of a Mentor: A Mentor is a senior officer of the student-employee who has been nominated by his employing organization or is a person in a senior position willing to undertake and discharge the academic responsibilities on his own volition. It is expected of the Mentor to possess adequate qualifications to guide the student. Typically for the B.Tech. / M.Sc.

programmes, the mentor is expected to have minimum educational qualification of the level of Integrated First Degree of BITS or its equivalent such as B.E./B.Tech. / B.S. / M.Sc. / A.M.I.E.,and for the M.B.A. / M.Tech. programmesthe mentor is expected to have a minimum educational qualification of the level of Higher Degree of BITS or its equivalent such as M.E. / M.Tech. / M.S / M.Phil.

The Mentors would assist the course instructors in terms of the following:

b) Achieving the set of academic objectives specified by the instructors;

c) Verifying if a student is indeed adhering to the plan of study given in the handout;

d) Monitoring involvement of the student in self-study, time planning, understanding of concepts and their use, developing self-reliant articulation, awareness of and enthusiasm for new pedagogy, responsibility to meet deadlines, develops familiarity with the library, etc.

e) Conducting certain evaluation components like Seminars, Assignments, Case Studies and Projects.

Additional features include:

(a) Courseware (pre-recorded digital content) developed by BITS faculty for certain courses.

(b) Course Handouts which provide a detailed plan of study, evaluation scheme, and experiential learning components. ***It is the responsibility of each student to acquire textbooks and other reference materials recommended for each course.***

(c) Curricula designed on S&T approach for modernizing the workbench by purposeful acquisition of scientific methods and modern skills.

(d) Intensive contact sessions (where required) conducted at any of the BITS campuses or at the collaborating organizations. The contact sessions could include one or more of the following:

- Special Lectures
- Field, Library and Laboratory work
- Projects
- Tutorials
- Case discussions
- Seminars
- Social activities.

Evaluation Methodology

Evaluation for a given course is internal and continuous and has the following features:

- Quizzes, Assignments, Projects, Case Studies, spread over a semester for making the course relevant and meaningful to the work learning environment of the students;
- Written examinations – one at the mid-semester point and acomprehensive examination at the end of semester. These examinations are conducted at specified examcentres of BITS in a centralized manner under the supervision of BITS faculty.
- For programmes offered for individuals, the Institute presently has examination centres at Bangalore, Chennai, Coimbatore, Delhi, Goa, Hyderabad, Kolkata, Mumbai, Pilani and Pune in India, and at Dubai in UAE.
- Strict adherence to the evaluation schedule as announced through the course handout at the start of the semester.
- The Institute follows continuous system of internal evaluation and letter grades A, A-, B, B-, C, C-, D, E carrying grade points 10, 9, 8, 7, 6, 5, 4, 2 respectively are awarded for all courses other than Dissertation / Project Work / Project for which only non-letter grades namely EXCELLENT, GOOD, FAIR, POOR are awarded. If a student does not offer adequate opportunity for evaluation in a course, reports such as RRA (Require to Register Again) may be awarded.
- The final grading in a course is done by tabulating in descending order (equivalently a histogram) the total marks of all students in a particular course. The performance of the course will be analyzed in terms of average, highest and lowest marks and dividing lines between various clusters. Gaps between clusters and the nature of clusters will guide drawing the dividing lines between various grades. In a normal class of large size, the C-

band will usually include the average mark. This is not a hard and fast rule and exceptions may arise in cases of small classes or a skewed histogram etc.

- The Cumulative Grade Point Average (CGPA) on a 10 Scale basis is used to describe the overall performance of a student in all courses for which LETTER GRADES are awarded.

$$CGPA = \frac{U_1G_1 + U_2G_2 + U_3G_3 + ... + U_nG_n}{U_1 + U_2 + U_3 + ... + U_n}$$

Where U_1, U_2, U_3, … U_n denote units associated with the courses taken by the student and G_1, G_2, G_3,…G_n denote grade points of the letter grades awarded in the respective courses. Non-Letter grades do not go into computation of CGPA.

- In the case of Integrated First Degree programmes the final division for the degree is decided on the basis of CGPA and there are three classifications, namely Distinction (CGPA 9.00 or more), First Division (CGPA 7.00 or more but less than 9.00) and Second Division (CGPA 4.50 or more but less than 7.00). However, no Division will be awarded in diploma, higher degrees and Ph.D. programmes.
- Subject to fulfilling the Academic Regulations of the Institute, the student will be issued at the end of each semester a grade sheet and at the end of the programme a Transcript and Provisional Certificate followed by the Final Degree Certificate. The grade sheet / transcript – provisional certificate will be withheld when a student has not paid his dues or when there is a pending case of breach of discipline or a case of unfair means against him.
- The minimum academic requirements for higher degreeprogrammes stipulate that a student obtains a CGPA of 5.50 and no E grade in any course. For the Integrated First Degree programmes such as B.S. and B.Tech. programmes, a student should obtain a CGPA of 4.50 and no E grade in any course. Students who fail to meet the minimum academic requirements are placed under the purview of Academic Monitoring Board (AMB), which monitors their progress, and gives guidance so that they are properly rehabilitated at the earliest.
- The Institute's Academic Regulations must be consulted for additional details.

Some Stipulations

(a) All degrees offered through Work Integrated Learning Programmes are equivalent to the corresponding degreesoffered on-campus, and for admissions to any higher degree programme of the Institute, these degrees will not be distinguished from on-campus degrees.

(b) In any examination, as far as possible, the direct interactive process of the evaluation would be made at a place nearest to the work location of the candidates. Wherever there is not adequate number of candidates, the Institute will be free to demand that all candidates come to one of the campuses or other examination centers for this purpose.

(c) In case of organization specific collaborative programmes, a student who is admitted to the Institute because of sponsorship from an organization will cease to be a student if he discontinues employment from the organization. In case of other programmes, the student may be allowed to continue if the new organization in which he is employed agrees to sponsor him for the degree and if the work integrated learning environment is relevant to the degree programme. However, if the person becomes unemployed he may not be continued because of the requirement of work integrated learning environment for the degree, which may no longer be available to the student.

(d) Any student admitted to a programme may be allowed to transfer to another programme provided he is eligible for the same and is supported by his work environment and sponsorship of his employer.

(e) Since every student admitted to work integrated learning programme is treated as a full-time student and a full time employee, it is essential that such a student be not enrolled for any degree or diploma programme, part-time or otherwise, in any other university. If it is found that a student is admitted / registered in some other

university for degree programme, then his admission / registration will be cancelled.

Operating Definitions of Certain Key Terms

1. A course is a component of knowledge, which serves as the irreducible minimum building block in the curriculum or syllabus.
2. A programme of studies is a set of courses constituting the requirements of a degree.
3. A regular student is one who is enrolled for a degree programme.
4. A collaborating organization is an organization that helps the Institute in setting up the necessary facilities and in the running of classes and laboratories for all students. Such an organization may simultaneously be also a sponsoring organization.
5. A sponsoring organization is an organization, which fulfills one or more of the following features:
   a) The organization is the employer of the student and pays fully / partly the fees/dues of the student and also provides facilities required for the learning process.
   b) The organization is an employer of the student but does not pay the fees/dues of the student. Nonetheless the organization agrees to encourage and actively participate in the special nature of the educational process for the mutual benefit of the organization and the employee.
6. An Associate Student is one who is allowed to register in any of the courses offered in each semester with an ultimate goal of obtaining a diploma/degree or without any such ambition. The treatment of these students will be different from that of the casual students in that these students will be registered on credit and not on audit basis and may be admitted for a degree or a diploma, if situation so warrants. Further, admission procedure and the fee structure may also differ in contrast to the casual students. Presently the Institute considers only sponsored candidates from structured collaborative programmes for admission as Associate Student.

Duration: This may vary from programme to programme depending upon the input qualification, experience, nature as well as the need of the collaborating organizations including the viability and feasibility of course offerings.

The curriculum details of programmes and semesterwise pattern of courses given in the following pages indicate the currently operational details for various programmes, which are subject to change if the situation warrants.

B.Tech. Programmes

The structure of the B.Tech. programmes for working professionals is given below:

a. **Normal Input:** Employed professionals holding a Technical Diploma or B.Sc. degree with adequate preparation in Mathematics, and having adequate, relevant work experience.
b. **Curriculum requirements:** Completion of the B.Tech. degree would require completion of coursework of minimum 24 courses (84 units minimum) and Project Course (10 units minimum), adding up to a total of 100 units (minimum).
c. **Nominal duration:** 7 semesters.

Note: Wherever feasible summer terms (maximum 2) may be introduced in lieu of 1 semester

d. **Curriculum Structure** for B.Tech. programmes for working professionals:

Category	Number of Courses Required	Number of Units Required
Foundation Courses (Math, Science, Engineering, HSS and GA)	3-10	6-40
Discipline Core	8-18	26-60
Discipline Elective	3-9	9-36
Other Electives#	0-5	0-16
Coursework Sub-Total	24 courses (min)	84 units (min)
Project Courses*	1-2	10-20
Total	25 courses (min)	100 units (min)

* Project Courses may include Design Projects, Lab Projects or Project Work.

* Concurrent Registration of at most 2 courses along with the final semester Project may be permitted subject to the constraint that the total credits in that semester does not exceed 18.

Other electives refer to a set of elective courses included or customized per the needs of specific programmes, which are in addition to the primary area/discipline of study.

In addition, the Department(s) may offer **Concentrations** for a specific programme if applicable:

Concentration (if applicable):

i. 3 courses / 9 units (min.) to 6 courses / 24 units (max.) to be chosen from the pool of Discipline electives
ii. Some Concentration courses may be mandatory and some may be electives

B.Tech. (Electronics Engineering)

Type of Input: Employed professionals with a Technical Diploma in Electrical & Electronics, Electronics & Instrumentation, Electronics & Communication or equivalent with a minimum of 1-year experience and adequate preparation in Maths.

Curriculum Requirements:
Completion of the programme would require:

1. 24 Courses (totalling to a minimum of 84 units) towards coursework, and
2. Project Work (16 units)
3. Concentrations: Communication Technologies, Embedded IoT and Edge, Processor Architectures [Students may graduate without any concentration.]
4. For concentrations: Minimum 5 elective courses from the pool of electives in a particular thread including mandatory electives in that concentration (denoted by #), totaling a minimum of 18 units.
5. Total number of electives: 9 with minimum 30 units and not more than 7 electives from any single concentration

Program Structure:

Foundation Courses (6)

Course No.	Course Title	Units
BTEE ZC212	Engineering Mathematics	3
BTEE ZC216	Probability Theory and Random Process	4
BTEE ZC214	Object Oriented Programming	4
BTEE ZC213	Engineering Physics	3
BTEE ZC215	Principles of Management	3
BTEE ZC211	Elements of Electrical and Electronic Circuits	4

Core Courses (9)

Course No.	Course Title	Units
BTEE ZC217	Digital Electronics and Microprocessors	4
BTEE ZC311	Analog Electronics	4
BTEE ZC218	Signals and Systems	3
BTEE ZC314	Electromagnetic Theory	3
BTEE ZC312	Communication Systems	4
BTEE ZC313	Digital Control Systems	4
BTEE ZC315	Introduction to Digital Signal Processing	4
BTEE ZC316	Microwave and Antenna Theory	3
BTEE ZC411	Computer Networks	4

Concentrations:

1) Communication Technologies
2) Embedded IoT and Edge
3) Processor Architectures

Pool of Electives for Concentration 1: Communication Technologies
Communication Systems are evolving to support new business cases such as industrial revolution 4.0, massive machine-type communication, tactile internet, AR/VR, etc. The pool of courses in the communication thread provides the foundation and skills for understanding the technologies in modern wireline and wireless communication systems.

Course No.	Course Title	Units

BTEE ZC319	Information Theory and Coding#	4
BTEE ZG516	Wireless & Mobile Communication#	5
BTEE ZC322	Telecommunication Switching Systems and Networks#	3
BTEE ZG513	Network Security	4
BTEE ZC416	Mobile Telecommunication Networks	4
BTEE ZG514	Optical Communication	4
BTEE ZC418	Satellite Communication	3
BTEE ZC317	Communication & Networking Technologies for IoT	4

Requirements:

- 5 courses are to be chosen from the designated pool of electives for this concentration
- # indicates mandatory electives for this concentration

Pool of Electives for Concentration 2: Embedded IoT and Edge

Smart living is the driving factor for connecting sensors to the internet, leading to a plethora of applications/use cases such as smart agriculture, smart cities, smart environment etc. This thread offers courses to equip professionals with skills related to sensing technologies, signal conditioning and building intelligent systems.

Course No.	Course Title	Units
BTEE ZC414	Introduction to Edge Computing#	4
BTEE ZC320	Introduction to IoT#	4
BTEE ZC317	Communication & Networking Technologies for IoT#	4
BTEE ZC412	Digital Image Processing	3
BTEE ZG512	Machine Learning	4
BTEE ZC419	Sensor Technologies	4
BTEE ZC415	Machine Learning for Edge	4
BTEE ZG515	Real-Time Operating Systems	5
BTEE ZC318	Computer Architecture	4

Requirements:

- 5 courses are to be chosen from the designated pool of electives for this concentration
- # indicates mandatory electives for this concentration

Pool of Electives for Concentration 3: Processor Architectures

The advent of computationally intensive applications such as AI/ML, self-driving cars, etc has resulted in customized processors such as GPUs, TPUs, Hardware accelerators etc. The courses in this thread will provide professionals with the foundational knowledge and skill required to understand the processor architectures for different applications.

Course No.	Course Title	Units
BTEE ZG511	Embedded System Design#	4
BTEE ZC318	Computer Architecture#	4
BTEE ZC321	Semiconductor Devices and Technologies#	4
BTEE ZC417	Modern Processor Architectures	3
BTEE ZC420	SoC Design & EDA	4
BTEE ZC413	FPGA-based System Design	4
BTEE ZG515	Real-Time Operating Systems	5

Requirements:

- 5 courses are to be chosen from the designated pool of electives for this concentration
- # indicates mandatory electives for this concentration

Project

Course No.	Course Title	Units
BTEE ZC425T	Project Work	16

Semester-wise pattern of courses

Year	First Semester			Second Semester		
	Course No.	Course Title	Units	Course No.	Course Title	Units
I	BTEE ZC212	Engineering Mathematics	3	BTEE ZC216	Probability Theory and Random Process	4
	BTEE ZC214	Object Oriented Programming	4	BTEE ZC217	Digital Electronics and Microprocessors	4
	BTEE ZC213	Engineering Physics	3	BTEE ZC215	Principles of Management	3
	BTEE ZC211	Elements of Electrical and Electronic Circuits	4	BTEE ZC218	Signals and Systems	3
		Total	14		Total	14
II	BTEE ZC311	Analog Electronics	4	BTEE ZC316	Microwave and Antenna Theory	3
	BTEE ZC314	Electromagnetic Theory	3	BTEE ZC315	Introduction to Digital Signal Processing	4
	BTEE ZC313	Digital Control Systems	4		Elective 1	3 (min)
	BTEE ZC312	Communication Systems	4		Elective 2	3 (min)
		Total	15		Total	13 (min)
III	BTEE ZC411	Computer Networks	4		Elective 6	4 (min)
		Elective 3	4 (min)		Elective 7	4 (min)
		Elective 4	3 (min)		Elective 8	3 (min)
		Elective 5	3 (min)		Elective 9	3 (min)
		Total	14 (min)		Total	14 (min)
IV	BTEE ZC425T	Project Work	16			
		Total	100(min)			

B. TECH. (ENGINEERING DESIGN))

Curriculum Structure

Normal Input: Employed professionals holding a Technical Diploma or B.Sc. degree with adequate preparation in Mathematics, and having minimum two years work experience in relevant domains.

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Nominal duration: The nominal duration of a B.Tech. programme will be 7 semesters.

Curriculum Requirements :

Foundation Courses	:9 courses	(32 units min.)
Discipline Core	:11 courses	(40 units min.)
Discipline Electives	:4 courses	(12 units min.)
Coursework sub total	:24 courses	(84 units min.)
Project Work	:16 units	

Category-wise Programme Structure:

Category	Course No.	Course Title	Units
Foundation Courses (9)			
Mathematics Foundation	ED* ZC233	Calculus	4
	ED* ZC235	Linear Algebra & Optimization	3
Technical Arts / Professional Courses	ED* ZC164	Computer Programming	4
	ED* ZC241	Technical Report Writing	3
	ED* ZC 231	Principles of Management	3
EngineeringFoundation	ED* ZC232	Engineering Materials	3
	ED* ZC261	Mechanical Technology	4
	ED* ZC211	Electrical and Electronics Technology	4
	ED* ZC251	Engineering Measurements	4
Discipline Courses			
Core (11)	ED* ZC321	Mechanics of Solids	3
	ED* ZC245	Fluid Mechanics & Machines	4
	ED* ZC332	Mechanical Engineering Design-I	4
	ED* ZC322	Kinematics & Dynamics of Machines	3
	ED* ZC311	Manufacturing Processes	4
	ED* ZC453	Product Design & Development	4
	ED* ZC342	Mechanical Engineering Design-II	4
	ED* ZC434	Quality Control, Assurance & Reliability	4
	ED* ZC433	Mechanical Vibrations &Acoustics	3
	ED* ZC441	Automotive Vehicles	3
	ED* ZC436	Computer Aided Design	4
Electives (any 4)	ED* ZC471	Management Information Systems	3
	ED* ZC324	Mechatronics & Automation	4
	ED* ZC325	Fluid Power Systems	4
	ED* ZC452	Composite Materials and Design	4
	ED* ZC454	Reverse Engineering and Rapid Prototyping	4

B. TECH. (ENGINEERING DESIGN)

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	ED* ZC211	Electrical and Electronics Technology	4	ED* ZC164	Computer Programming	4
	ED* ZC232	Engineering Materials	3	ED* ZC235	Linear Algebra and Optimization	3
	ED* ZC233	Calculus	4	ED* ZC251	Engineering Measurements	4
	ED* ZC261	Mechanical Technology	3	ED* ZC321	Mechanics of Solids	3
		Total	14		Total	14
II	ED* ZC245	Fluid Mechanics and Machines	4	ED* ZC342	Mechanical Engineering Design-II	4
	ED* ZC311	Manufacturing Processes	4	ED* ZC436	Computer Aided Design	4
	ED* ZC322	Kinematics & Dynamics of Machines	3	ED* ZC453	Product Design & Development	4
	ED* ZC332	Mechanical Engineering Design-I	4		Discipline Elective	3(min.)
		Total	15		Total	15
III	ED* ZC433	Mechanical Vibrations &Acoustics	3	ED* ZC241	Technical Report Writing	3
	ED* ZC434	Quality Control, Assurance & Reliability	4	ED* ZC231	Principles of Management	3
	ED* ZC441	Automotive Vehicles	3		Discipline Elective	3(min.)
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Total	13		Total	12
	ED* ZC425T	Project Work	16			

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

B. TECH. (ENGINEERING TECHNOLOGY)

Curriculum Structure

Normal Input: Employed professionals holding a Technical Diploma or B.Sc. degree with adequate preparation in Mathematics, and having minimum two years work experience in relevant domains.

Nominal duration: The nominal duration of a B.Tech. programme will be 7 semesters.

Curriculum Requirements:

Foundation Courses	:10 courses	(35 units min.)
Discipline Core	:9 courses	(34 units min.)
Discipline Electives	:5 courses	(15 units min.)
Coursework sub total	:24	(84units min.)
Project Work	:16 units	

Category-wise Programme Structure:

Sub-Category	Course No.	Course Title	Units
Foundation Courses (10)			
Mathematics Foundation	MATH ZC233	Calculus	4
	MATH ZC234	Linear Algebra & Optimization	3
	AAOC ZC111	Probability and Statistics	3
Technical Arts / ProfessionalCourses	TA ZC164	Computer Programming	4
	TA ZC312	Technical Report Writing	3
	MGTS ZC211	Principles of Management	3
Engineering Foundation	ENGG ZC243	Engineering Materials	3
	ENGG ZC241	Mechanical Technology	4
	ENGG ZC112	Electrical & Electronics Technology	4
	ENGG ZC233	Engineering Measurements	4
Discipline Courses			
Core (9)	ET ZC413	Engineering Design	4
	ETZC423	Essentials of Project Management	3
	ETZC344	Instrumentation & Control	4
	ENGG ZC242	Maintenance & Safety	3
	ETZC235	Manufacturing Processes	4
	ETZC343	Materials Management	4
	ETZC416	Production Planning & Control	4
	ETZC434	Quality Control, Assurance & Reliability	4
	ETZC449	IoT in Manufacturing	4
Electives (any 5)	ET ZC352	Energy Management	4
	ET ZC362	Environmental Pollution Control	3
	EA ZC412	Flexible Manufacturing Systems	4

	BITS ZC471	Management Information Systems	3
	ET ZC417	Manufacturing Excellence	4
	ET ZC323	Mechatronics & Automation	4
	ES ZC343	Microprocessors & Microcontrollers	3
	ET ZC448	Additive Manufacturing	4
	ET ZC442	Advanced Driver Assistance Systems	4
	ET ZC443	Connected Cars	4
	ET ZC424	Plant Layout and Design	4
	ET ZC419	Electric & Hybrid Vehicles	4

Semesterwise Pattern

Year	First Semester		U	Second Semester		U
I	ENGG ZC112	Electrical & Electronics Technology	4	AAOC ZC111	Probability & Statistics	3
	ENGG ZC243	Engineering Materials	3	ENGG ZC233	Engineering Measurements	4
	MATH ZC233	Calculus	4	MATH ZC234	Linear Algebra & Optimization	3
	TA ZC164	Computer Programming	4	ENGG ZC241	Mechanical Technology	4
		Total	15		Total	14
II	ENGG ZC242	Maintenance & Safety	3	ET ZC344	Instrumentation & Control	4
	ET ZC235	Manufacturing Processes	4	ET ZC343	Materials Management	4
	ET ZC413	Engineering Design	4	ET ZC423	Essentials of Project Management	3
	ET ZC416	Production Planning & Control	4	ET ZC449	IoT in Manufacturing	4
		Total	15		Total	15
III	ET ZC434	Quality Control, Assurance & Reliability	4	MGTS ZC211	Principles of Management	3
		Discipline Elective	3(min.)	TA ZC312	Technical Report Writing	3
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Total	13(min)		Total	12(min)
	BITS ZC425T	Project Work	16			

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

B. TECH. (INFORMATION SYSTEMS)
Curriculum Structure

Normal Input: Employed professionals holding a Technical Diploma or B.Sc. degree with adequate preparation in Mathematics, and having minimum two years work experience in relevant domains.

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Nominal duration: The nominal duration of a B.Tech. programme will be 7 semesters.

Curriculum Requirements:

Foundation Courses	:8 courses	(27 units min.)
Discipline Core	:10 courses	(39 units min.)
Discipline Electives	:6 courses	(18 units min.)
Course work sub total	: 24	(84 units min.)
Project Work	: 16 units	

Category-wise Programme Structure:

Sub-category	Course No.	Course Title	Units
Foundation Courses(8)			
Mathematics Foundation	MATH ZC234	Linear Algebra & Optimization	3
	AAOC ZC111	Probability and Statistics	3
	MATH ZC222	Discrete Structures for Computer Science	3
	MATH ZC233	Calculus	4
Technical Arts/ Professional Courses	TA ZC163	Computer Programming	4
	TA ZC312	Technical Report Writing	3
	MGTS ZC211	Principles of Management	3
Engineering Foundation	ESZC264	Digital Electronics and Microprocessors	4
Discipline Courses			
Core (10)	IS ZC467	Computer Networks	4
	IS ZC353	Computer Organization & Architecture	4
	IS ZC363	Data Structures & Algorithms	4
	IS ZC337	Database Systems & Applications	4
	IS ZC373	Compiler Design	4
	IS ZC313	Object Oriented Programming & Design	4
	IS ZC364	Operating Systems	4
	IS ZC343	Software Engineering	4
	IS ZC327	Systems Programming	4
	IS ZC328	Software Testing	3
Electives (6)	BITS ZC471	Management InformationSystems	3
	IS ZC423	Software Development for Portable Devices	3
	IS ZC415	Data Mining	3

	ISZC472	Computer Graphics	3
	IS ZC447	Data Storage Technologies & Networks	4
	EA ZC473	MultimediaComputing	3
	IS ZC462	Network Programming	3
	IS ZC422	Parallel Computing	3
	IS ZC424	Software for Embedded Systems	3

Semesterwise Pattern

Year	First Semester		U	Second Semester		U
I	MATH ZC222	Discrete Structures for Computer Science	3	IS ZC313	Object Oriented Programming & Design	4
	MATH ZC233	Calculus	4	IS ZC327	Systems Programming	4
	TA ZC163	Computer Programming	4	MATH ZC234	Linear Algebra & Optimization	3
	ES ZC263	Digital Electronics and Microprocessors	4	IS ZC363	Data Structures and Algorithms	4
Total			15	Total		15
II	IS ZC353	Computer Organization & Architecture	4	IS ZC373	Compiler Design	4
	IS ZC337	Database Systems & Applications	4	IS ZC343	Software Engineering	4
	IS ZC364	Operating Systems	4	IS ZC467	Computer Networks	4
	AAOC ZC111	Probability and Statistics	3	IS ZC328	Software Testing	3
Total			15	Total		15
III		Discipline Elective	3(min.)	MGTS ZC211	Principles of Management	3
		Discipline Elective	3(min.)	TA ZC312	Technical Report Writing	3
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
Total			12(min)	Total		12(min)
	BITS ZC425T	Project Work	16			

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

B. TECH. MANUFACTURING TECHNOLOGY

Curriculum Structure

Normal Input: Employed professionals holding a Technical Diploma or B.Sc. degree with adequate preparation in Mathematics,and having minimum two years work experience in relevant domains.

Nominal duration: The nominal duration of a B.Tech. programme will be 7 semesters.

Curriculum Requirements:

Foundation Courses	:9 courses	(32 units min.)
Discipline Core	:11 courses	(40 units min.)
Discipline Electives	:4 courses	(12 units min.)
Coursework sub total	:24 courses	(84 units min.)
Project Work	:16 units (min.)	

Category-wise Programme Structure:

Category	Course No.	Course Title	Units
Foundation Courses (9)			
Mathematics Foundation	MT*ZC233	Calculus	4
	MT*ZC235	Linear Algebra & Optimization	3
Technical Arts / Professional Courses	MT*ZC221	Computer Programming	4
	MT*ZC241	Technical Report Writing	3
	MT*ZC 231	Principles of Management	3
EngineeringFoundation	MT*ZC236	Engineering Materials	3
	MT*ZC251	Mechanical Technology	4
	MT*ZC112	Electrical and Electronics Technology	4
	MT*ZC213	Engineering Measurements	4
Discipline Courses			
Core (11)	MT*ZC261	Mechanics of Solids	3
	MT*ZC245	FluidMechanics& Machines	4
	MT*ZC342	Machine Design	4
	MT*ZC344	Metal Forming and Machining	4
	MT*ZC315	Casting and Welding	4
	MT*ZC331	Production Planning & Control	4
	MT*ZC418	Lean Manufacturing	4
	MT*ZC434	Quality Control, Assurance & Reliability	4
	MT*ZC448	Additive Manufacturing	4
	MT*ZC421	Essentials of Project Management	3
	MT*ZC449	IoT in Manufacturing	4
Electives (any 4)	MT*ZC412	Flexible Manufacturing Systems	4
	MT*ZC324	Mechatronics & Automation	4

	MT*ZC343	Materials Management	4
	MT* ZC346	Instrumentation & Control	4
	MT* ZC347	Microprocessors and Microcontrollers	3
	MT*ZC471	Manufacturing Excellence	4
	MT*ZC311	Automobile Technology-I	4
	MT*ZC312	Automobile Technology-II	4
	MT*ZC332	Operations Research	4
	MT*ZC234	Maintenance & Safety	3
	MT*ZC452	Composite Materials and Design	4

Semesterwise Pattern

Year	First Semester		U	Second Semester		U
I	MT* ZC233	Calculus	4	MT* ZC235	Linear Algebra and Optimization	3
	MT* ZC261	Mechanics of Solids	3	MT* ZC251	Mechanical Technology	4
	MT* ZC236	Engineering Materials	3	MT* ZC213	Engineering Measurements	4
	MT* ZC112	Electrical and Electronics Technology	4	MT* ZC221	Computer Programming	4
Total			14	Total		15
II	MT* ZC245	Fluid Mechanics & Machines	4	MT* ZC449	IoT in Manufacturing	4
	MT* ZC315	Casting and Welding	4	MT* ZC331	Production Planning and Control	4
	MT* ZC344	Metal Forming and Machining	4	MT* ZC342	Machine Design	4
	MT* ZC448	Additive Manufacturing	4		Discipline Elective	3(min.)
Total			16	Total		15
III	MT* ZC418	Lean Manufacturing	4	MT* ZC241	Technical Report Writing	3
	MT* ZC434	Quality Control Assurance and Reliability	4	MT* ZC231	Principles of Management	3
	MT* ZC421	Essentials of Project Management	3		Discipline Elective	3(min.)
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
Total			14(min)	Total		12(min)
	MT* ZC425T	Project Work	16			

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborating Organizations: Kirloskar Oil Engines, Kolhapur, Bharat Forge, Pune, Tata Motors, Jamshedpur; TACO, Pune; Maruti Suzuki, Gurgaon; Mahindra Motor Vehicles, Cummins, Pune

B. TECH. (POWER ENGINEERING)

Curriculum Structure

Normal Input: Employed professionals holding a Technical Diploma or B.Sc. degree with adequate preparation in Mathematics, and having minimum two years work experience in relevant domains.

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Nominal duration: The nominal duration of a B.Tech. programme will be 7 semesters.

Curriculum Requirements:

Foundation Courses	: 9 courses (31units min.)
Discipline Core	: 10 courses (36 units min.)
Discipline Electives	:5 courses (17units min.)
Coursework sub total	:24 courses (84units min.)
Project Work	:16 units

Sub- Category	Course No	Course Title	Unit
Foundation Courses (9)			
Mathematics Foundation	POW*ZC233	Calculus	4
	POW*ZC234	Linear Algebra & Optimization	3
General Awareness / Technical Arts	POW*ZC164	Computer Programming	4
	POW*ZC232	Principles of Management	3
	POW*ZC321	Technical Report Writing	3
Engineering Foundation	POW* ZC112	Electrical & Electronics Technology	4
	POW* ZC343	Microprocessors & Microcontrollers	3
	POW* ZC231	Thermodynamics	3
	POW* ZC242	Engineering Measurements	4
Discipline Courses (10)			
Core (10)	POW*ZC434	Quality Control, Assurance & Reliability	4
	POW*ZC313	PowerPlant Engineering	4
	POW*ZC314	Prime Movers & Fluid Machines	4
	POW*ZC342	Power System Engineering I	3
	POW*ZC344	Instrumentation & Control	4
	POW*ZC421	Essentials of Project Management	3
	POW*ZC431	Maintenance & Safety	3
	POW* ZC316	Power Electronics	4
	POW*ZC441	Power System Engineering II	3
	POW* ZC315	Transport Phenomena	4

Electives (any 5)	POW*ZC332	Energy Management	4
	POW*ZC411	Environmental Pollution Control	3
	POW*ZC412	Power System Operation and Control	3
	POW*ZC413	Process Control	3
	POW*ZC422	Power System Drawing & Design	3
	POW*ZC452	Renewable Energy	3
	POW*ZC471	Power Electronics & Drives	3
	POW*ZC481	Plant Layout & Design	4

Semesterwise Pattern

Year	First Semester		U	Second Semester		U
I	POW* ZC112	Electrical & Electronics Technology	4	POW* ZC234	Linear Algebra & Optimization	3
	POW* ZC164	Computer Programming	4	POW* ZC242	Engineering Measurements	4
	POW* ZC231	Thermodynamics	3	POW* ZC343	Microprocessors & Microcontrollers	3
	POW* ZC233	Calculus	4	POW* ZC315	Transport Phenomena	4
		Total	15		Total	14
II	POW* ZC342	Power System Engineering I	3	POW* ZC434	Quality Control, Assurance & Reliability	4
	POW* ZC344	Instrumentation & Control	4	POW* ZC314	Prime Movers and Fluid Machines	4
	POW* ZC431	Maintenance & Safety	3	POW* ZC441	Power System Engineering II	3
	POW* ZC313	Power Plant Engineering	4		Discipline Elective	3(min.)
		Total	14		Total	14
III	POW* ZC316	Power Electronics	4	POW* ZC321	Technical Report Writing	3
	POW* ZC421	Essentials of Project Management	3	POW* ZC232	Principles of Management	3
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Total	13		Total	12
	POW* ZC425T	Project Work	16			

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborating Organizations: Aditya Birla Group, Tata Power, JSW Energy – Mumbai

B. TECH. (PROCESS ENGINEERING)

Curriculum Structure

Normal Input: Employed professionals holding a Technical Diploma or B.Sc. degree with adequate preparation in Mathematics, and having minimum two years work experience in relevant domains.

Nominal duration: The nominal duration of a B.Tech. programme will be 7 semesters.

Curriculum Requirements:

Foundation Courses	:8 courses	(28 units min.)
Discipline Core	:9 courses	(35 units min.)
Discipline Electives	:7 courses	(21 units min.)
Coursework sub total	:24 courses	(84 units min.)
Project Work	:16 units	

Category-wise Programme Structure:

Category	Course No.	Course Title	Units
Foundation Courses (8)			
Mathematics Foundation	PE* ZC233	Calculus #	4
	PE* ZC235	Linear Algebra & Optimization #	3
	PE* ZC113	Probability and Statistics	3
Technical Arts / Professional Courses	PE* ZC164	Computer Programming #	4
	PE* ZC211	Principles of Management #	3
	PE* ZC313	Technical Report Writing #	3
Engineering Foundation	PE* ZC231	Engineering Materials #	3
	PE* ZC213	Engineering Measurements #	4
	PE* ZC112	Electrical & Electronics Technology #	4
Discipline Courses			
Core	PE* ZC321	Chemical Process Calculations	3
	PE* ZC311	Chemical Engineering Thermodynamics	4
	PE* ZC318	Fundamentals of Transport Processes	4
	PE* ZC319	Unit Operations – I	4
	PE* ZC352	Energy Management	4
	PE* ZC452	Process Plant Safety and Environment	4
	PE* ZC453	Process Control & Instrumentation	4
	PE* ZC322	Process Design Principles	4
	PE* ZC412	Process Equipment Design	4
Elective Courses			
Electives	PE* ZC434	Quality Control Assurance & Reliability	4
	PE* ZC314	Power Plant Engineering	4
	PE* ZC234	Manufacturing Processes	4
	PE* ZC411	Production Planning and Control	4
	PE* ZC342	Materials Management	4
	PE* ZC353	Industrial Engineering	3
	PE* ZC423	Essentials of Project Management	3
	PE* ZC361	Environmental Pollution Control	3
	PE* ZC383	Extractive Metallurgy	3
	PE* ZC385	Fertilizer Technology	3

	PE* ZC382	Cement Technology	3
	PE* ZC384	Fibre& Cellulosic Technology	3
	PE* ZC214	Pharmaceutical Analysis	3
	PE* ZC221	Disinfection & Sterilization Processes	3
	PE* ZC344	Pharmaceutical Quality Control & Regulatory Affairs	3
	PE* ZC252	Mineral Beneficiation & Agglomeration	3
	PE* ZC262	Iron Making	3
	PE* ZC273	Advances in Material Science & Testing	3
	PE* ZC312	Steel Making & Casting	3
	PE* ZC362	Steel Processing	3
	PE* ZC320	Unit Operations – II	4
	PE* ZC323	Corrosion Engineering	3
	PE* ZC324	Chemical Reaction Engineering	3
	PE* ZC272	Furnace Technology	3
	PE* ZC442	Advances in Materials Science	3

Mandatory Foundation Course

Semesterwise Pattern

Year	First Semester		U	Second Semester		U
I	PE* ZC112	Electrical & Electronics Technology	4	PE* ZC352	Energy Management	4
	PE* ZC231	Engineering Materials	3	PE* ZC213	Engineering Measurements	4
	PE* ZC233	Calculus	4	PE* ZC235	Linear Algebra & Optimization	3
	PE* ZC164	Computer Programming	4	PE* ZC321	Chemical Process Calculations	3
		Total	15		Total	14
II	PE* ZC311	Chemical Engineering Thermodynamics	4	PE* ZC322	Process Design Principles	4
	PE* ZC318	Fundamentals of Transport Processes	4	PE* ZC412	Process Equipment Design	4
	PE* ZC319	Unit Operations – I	4		Discipline Elective	3(min.)
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Total	15		Total	15
III	PE* ZC452	Process Plant Safety & Environment	4	PE* ZC313	Technical Report Writing	3
	PE* ZC453	Process Control & Instrumentation	4	PE* ZC211	Principles of Management	3
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Total	14		Total	12
	PE* ZC425T	Project Work	16			

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborating Organizations: Aditya Birla Group, Mumbai; JSW Steel, Toranagallu; Vedanta, Jharsuguda; BPCL, Mumbai

B.Tech. (Software Systems and Engineering)

Type of Input: Employed professionals holding B.Sc. degree in relevant disciplines with strong mathematics background, and minimum one year of work experience in IT services or product industry. The graduate must have studied at least three Math courses in B.Sc. including at least two of the following: Calculus, Probability & Statistics, Linear Algebra, Optimization

Curriculum Requirements:
Completion of the programme would require:

a) 27 courses (totalling minimum of 95 units) towards course work (including a minimum of 4 discipline electives) and
b) Project (10 Units)

Program Structure:

Foundation Courses (3)

Course No.	Course Title	Units
BTSSE ZC212	Basic Electronics Circuits	4
BTSSE ZC215	Environmental Studies	3
BTSSE ZC213	Discrete Structures for Computer Science	3

Core Courses (16)

Course No.	Course Title	Units
BTSSE ZC216	Introduction to Computing Systems	3
BTSSE ZC217	Introduction to Progressive Web Apps	4
BTSSE ZC314	Data Structures & Algorithms	4
BTSSE ZC218	Introduction to Scripting	4
BTSSE ZC313	Computer Organization & Architecture	4
BTSSE ZC324	Software Engineering	4
BTSSE ZC436	Software Design Principles	4
BTSSE ZC323	Operating Systems	4
BTSSE ZC317	Incremental Software Development	4
BTSSE ZC315	Database Systems & Applications	4
BTSSE ZC413	Computer Networks	4
BTSSE ZC211	Algorithm Design	3
BTSSE ZC312	Compilers and Code Automation	4
BTSSE ZC311	Cloud Systems and Services	4
BTSSE ZC325	Software Testing and Automation	4
BTSSE ZC318	Information Security	3

Discipline Electives (20)
The Discipline Electives below are grouped according to their sub-domains into Software Engineering, Data, Systems and other horizontal sub-domains. This is only a logical grouping to provide clarity on the nature of electives, and does not impose any constraint on selection by students. A minimum of 4 courses has to be chosen from the list of discipline electives.

Course No.	Course Title	Units
Software Engineering		
BTSSE ZC435	Software Deployment	4
BTSSE ZC417	Full Stack Web Development	4
BTSSE ZG512	Cloud Native Development	3
BTSSE ZG511	Advanced Topics in Software Engineering	4
BTSSE ZC433	Security Practices in SDLC	4
Data		
BTSSE ZC414	Data Analytics and Visualization	4
BTSSE ZC411	Applied Data Mining and Machine Learning	4
BTSSE ZC424	Introduction to Search Engines	4
BTSSE ZC321	Modern Databases	4
BTSSE ZC425	Introduction to Statistical Inference	3
Systems		
BTSSE ZC322	Multi-Core Programming and GPGPU Programming	3
BTSSE ZC437	Systems Programming for Constrained Devices	4
BTSSE ZC416	Distributed Systems	4
BTSSE ZC415	Distributed Programming	4
Horizontal Domains		
BTSSE ZC320	Microprocessors and Interfacing	4
BTSSE ZC319	Introduction to IoT	4
BTSSE ZC316	Human Computer Interaction	3
BTSSE ZC422	Introduction to Augmented and Virtual Reality	4
BTSSE ZC430	Multimedia Computing	3
BTSSE ZC434	Social Network Analysis	4

Other Electives (11)

Other Electives are courses offered in vertical domains such as BFSI, healthcare, cyber law and public health.

Course No.	Course Title	Units
BTSSE ZC418	Fundamentals of Finance and Accounts	3
BTSSE ZC431	Principles of Economics	3
BTSSE ZC426	Investment Management	3
BTSSE ZC421	Information Law and Cyber Law	3
BTSSE ZC429	Legal Software	4
BTSSE ZC420	Health Systems Management and Environmental Health	4
BTSSE ZC432	Public Health & Diseases	4
BTSSE ZC419	Health Informatics	4
BTSSE ZC423	Introduction to Digital Manufacturing	4
BTSSE ZC427	IoT for Manufacturing	4
BTSSE ZC412	Automotive Software	4

Project

Course No.	Course Title	Units
BTSSE ZC428T	Project	10

Semester wise Pattern of courses

Year	First Semester			Second Semester		
	Course No.	**Course Title**	**Units**	**Course No.**	**Course Title**	**Units**
I	BTSSE ZC216	Introduction to Computing Systems	3	BTSSE ZC314	Data Structures & Algorithms	4
	BTSSE ZC213	Discrete Structures for Computer Science	3	BTSSE ZC217	Introduction to Progressive Web Apps	4
	BTSSE ZC218	Introduction to Scripting	4	BTSSE ZC313	Computer Organization & Architecture	4
	BTSSE ZC212	Basic Electronics Circuits	4	BTSSE ZC215	Environmental Studies	3
		Total	14		Total	15
II	BTSSE ZC324	Software Engineering	4	BTSSE ZC315	Database Systems & Applications	4
	BTSSE ZC436	Software Design Principles	4	BTSSE ZC413	Computer Networks	4
	BTSSE ZC323	Operating Systems	4	BTSSE ZC211	Algorithm Design	3
	BTSSE ZC317	Incremental Software Development	4	BTSSE ZC312	Compilers and Code Automation	4
		Total	16		Total	15
III	BTSSE ZC311	Cloud Systems and Services	4	DE/OE-II		4 (min)
	BTSSE ZC325	Software Testing and Automation	4	DE/OE-III		4 (min)
	BTSSE ZC318	Information Security	3	DE/OE-IV		4 (min)
	DE/OE-I		3(min)	DE/OE-V		3 (min)
		Total	14 (min)		Total	15 (min)
IV	BTSSE ZC428T	Project	10			
	DE/OE-VI		3 (min)			
	DE/OE-VII		3 (min)			
	Total		16 (min)			

* DE refers to Discipline Elective; OE refers to Other Elective
* Discipline electives (Minimum 4) – To be chosen from the elective pool of Courses offered under categories such as software related, data related, systems related, and horizontal sub-domains.
* Other electives - Courses offered under vertical domains such as BFSI, healthcare, law and public health.

Master of Science (M.Sc.) programmes

Program Structure:

Normal Input: Three-year undergraduate degree in relevant disciplines.

Curriculum requirements: Completion of the **M.Sc.** degree programme would require completion of coursework ofminimum 15 courses (52 units minimum) and one Project / Thesis / Practice School (8 – 20 units), adding up to a total of 72 units minimum.

Nominal duration: The nominal duration of a M.Sc. programme will be 4 semesters.

Curriculum Structure for M.Sc.programs:

Category	**Number of Courses Required**	**Number of Units Required**
I Foundation Courses	2-8	6-32
II Discipline Courses		
Discipline Core	5-10	15-40
Discipline Electives	2-6	6-20
Coursework Sub-Total	**15 courses (min)**	**52 units (min)**
III Project / Thesis / Practice School	1	8 -20
Total	**16 courses (min)**	**72 units (min)**

Note:Concurrent registration in two courses (upto 8 units) alongwith Project is to be permitted.

M.Sc. (BUSINESS ANALYTICS)
Curriculum Structure

Type of Input: Employed professionals working in a variety of business domains, holding a three year undergraduate degree in relevant disciplines with adequate preparation in mathematics, with minimum one year work experience in relevant domains.

Nominal Duration: Five Semesters

Curriculum Structure

Foundation courses

Course No.	Course Title	Units
BA* ZG522	Business Data Mining	4
BA* ZG521	Financial Management	4
BA* ZC413	Introduction to Statistical Methods	3
BA* ZC471	Management Information Systems	3
BA* ZC411	Marketing	4
BA* ZC412	Models and Applications in Operations Research	4
BA* ZG621	Supply Chain Management	4

Core courses

Course No.	Course Title	Units
BA* ZG524	Advanced Statistical Methods	4
BA* ZC415	Analytics for Competitive Advantage	4
BA* ZG525	Big Data Analytics	4
BA* ZG523	Introduction to Data Science	3
BA* ZC414	Optimization Methods for Analytics	4
BA* ZG512	Predictive Analytics	4

Pool of electives

Course No.	Course Title	Units
BA* ZC418	Advanced Financial Modeling	4
BA* ZC420	Data Visualization	3
BA* ZC417	Financial Risk Analytics	4
BA* ZC425	HR Analytics	4
BA* ZC416	Investment Banking Analytics	4
BA* ZC422	Marketing Analytics	4
BA* ZC421	Marketing Models	4
BA* ZC423	Retail Analytics	4
BA* ZC424	Supply Chain Analytics	4
BA* ZC426	Real-time Analytics	4
BA* ZG537	Text Analytics	4

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	BA* ZC411	Marketing	4	BA* ZG521	Financial Management	4
	BA* ZC471	Management Information Systems	3	BA* ZG522	Business Data Mining	4
	BA* ZC412	Models and Applications in Operational Research	4	BA* ZG621	Supply Chain Management	4
	BA* ZC413	Introduction to Statistical Methods	3	BA* ZG523	Introduction to Data Science	3
		Total	14		Total	15
II	BA* ZG524	Advanced Statistical Methods	4	BA* ZC415	Analytics for Competitive Advantage	4
	BA* ZG525	Big Data Analytics	4		Elective 1	(3 min)
	BA* ZG512	Predictive Analytics	4		Elective 2	(3 min)
	BA* ZC414	Optimization Methods for Analytics	4		Elective 3	(3 min)
		Total	16		Total	13 (min)
III		Elective 4	(3 min)			
	BA* ZG625T	Project	10			
		Total	13 (min)			

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

M.Sc. (INFORMATION SYSTEMS)

Curriculum Structure

Normal Input: Employed professionals holding a B.Sc. or BCA degree with adequate preparation in Mathematics, and having minimum one year work experience in relevant domains.

Nominal duration: 5 semesters.

Curriculum Requirements :

Foundation Courses : 5 courses (17 units min.)
Discipline Core : 9 courses (36 units min.)
Discipline Electives : 4 courses (12 units min.)
Coursework sub total :18 courses (65units min.)
Project :8 units

Category-wise Programme Structure:

Sub- Category	Course No	Course Title	Unit
Foundation Courses (5)			
Mathematics Foundation	MATH ZC234	Linear Algebra & Optimization	3
	AAOC ZC111	Probability and Statistics	3
	MATH ZC222	Discrete Structures for Computer Science	3
General Awareness / Technical Arts	TA ZC163	Computer Programming	4
Engineering Foundation	ESZC264	Digital Electronics and Microprocessors	4
Discipline Courses			
Core	IS ZC373	Compiler Design	4
	IS ZC467	Computer Networks	4
	IS ZC353	Computer Organization & Architecture	4
	IS ZC363	Data Structures & Algorithms	4
	IS ZC337	Database Systems & Applications	4
	IS ZC313	Object Oriented Programming & Design	4
	IS ZC364	Operating Systems	4
	IS ZC343	Software Engineering	4
	IS ZC327	Systems Programming	4
Electives (4)	CS ZG551	Advanced Compilation Techniques	5
	CS ZG623	Advanced Operating Systems	5
	IS ZC444	Artificial Intelligence	3
	BITS ZC471	Management Information Systems	3
	IS ZC472	Computer Graphics	3
	EA ZC473	Multimedia Computing	3
	IS ZC415	Data Mining	3
	IS ZC422	Parallel Computing	3
	IS ZC423	Software Development for Portable Devices	3
	IS ZC424	Software for Embedded Systems	3
	IS ZC447	Data Storage Technologies & Networks	4
	IS ZC462	Network Programming	3

M.Sc. (INFORMATION SYSTEMS)

Semesterwise Pattern

Normal Input: Employed professionals holding a B.Sc. or BCA degree with adequate preparation in Mathematics, having minimum one year work experience in relevant domains.

Nominal duration: 5 semesters.

Year	First Semester		U	Second Semester		U
I	MATH ZC222	Discrete Structures for Computer Science	3	IS ZC313	Object Oriented Programming & Design	4
	MATH ZC234	Linear Algebra & Optimization	3	IS ZC327	Systems Programming	4
	TA ZC163	Computer Programming	4	AAOC ZC111	Probability and Statistics	3
	ES ZC263	Digital Electronics and Microprocessors	4	IS ZC363	Data Structures and Algorithms	4
		Total	15		Total	14
II	IS ZC353	Computer Organization & Architecture	4	IS ZC373	Compiler Design	4
	IS ZC337	Database Systems & Applications	4	IS ZC343	Software Engineering	4
	IS ZC364	Operating Systems	4	IS ZC467	Computer Networks	4
		Discipline Elective	3(min.)		Discipline Elective	3(min.)
		Total	15		Total	15
III	BITS ZC426T	Project	8			
		Discipline Elective	3(min.)			
		Discipline Elective	3(min.)			
		Total	14(min)			

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

B.Sc. Programmes for Trainees / Working Professionals

Normal Input:	Trainees / Employed professionals who have completed their 10+2 (in Science stream) or equivalent educational qualification with minimum 60% aggregate marks.
Completion requirement	Successful completion of the B.Sc. degree programme would require completion of minimum of 23 courses (105 units minimum) with a CGPA of at least 4.50.
Nominal duration	The nominal duration of a B.Sc. programme will be 8 semesters.

Curriculum Structure of B.Sc. Programmes

Category	Number of Courses Required	Number of Units Required
I. Foundation Courses	8-12	24-40
II. Discipline Courses		34-58
Discipline Core	10-16	
Electives	4-6	12-24
Coursework Sub-Total	**28 courses (min)**	**90 units (min)**
III. Project Courses	Min 1 and Max 2	15-20 units
Total	**29 courses (min)**	**105 Units (min)**

Note: Concurrent registration in at most two courses (upto 8 units) along with a Project Course may be permitted if the total units in that semester do not exceed 15.

B.Sc. (Computer Science)

Input Qualification (for the online offering of B.Sc. Computer Science).

For Applicants from India

1) Candidates should have passed the class 12th examination in any stream under the 10+2 system from a recognized central or state board from India or its equivalent.
2) Candidates must have adequate proficiency in Maths. The Candidates Class 12th mark sheet issued by the respective board should show Maths as one of the subjects and that the candidate has secured minimum 60% marks in Maths.

   Or

   Candidates who have either **not studied maths in Class 12th** or **failed to secure minimum 60% marks in Maths in Class 12th**are expected to appear in a qualifying examination in mathematics to be conducted by BITS. The admission offer will be on the basis of the performance in the exam.
3) Candidates must have adequate proficiency in English. All applicants who have studied "English" as a subject till Class 10th will be considered eligible.

For Applicants from other countries:

1) Candidates should have passed the qualifying examination conducted by their respective country's or province's board of higher/senior secondary school education (High School Board) and must obtain an equivalence certificate from Association of Indian Universities that indicates that the certificate issued by their respective country's/province's board of school education is equivalent to class 12 certificate issued from recognized central or state board from India or its equivalent.
2) Candidates must have adequate proficiency in maths. The candidate's final year marks sheet issued by their respective country's / province's high school education board should show maths as one of the subject and that applicant has secured in maths either a minimum 60% marks or a minimum grade point of 6 on a scale of 10.

   Or

   Candidates who have either not studied maths at high school level or failed to secure in maths a minimum 60% marks or a minimum grade point of 6 on a scale of 10 in the final year examination conducted by their respective country's/province's recognised high school board are expected to appear in a qualifying examination in mathematics to be conducted by BITS. The admission offer will be on the basis of the performance in the exam.
3) Candidates must have adequate proficiency in English. Candidates must have had "English" as the primary medium of instruction for their high school studies. This will need to be supported by uploading a certificate issued by the school along with the application.

or

Must submit a valid IELTS or TOEFL score card with the application.

Normal Duration: Six Semesters.
Programme Structure:

Foundation courses

Course No.	Course Title	Units
Humanities Foundation		
BCS ZC151	Writing Practice	3
BCS ZC113	Online Social Media#	2
BCS ZC114	Video Games - Technology and Social Impacts#	2
Mathematics Foundation		
BCS ZC219	Discrete Mathematics	3
BCS ZC230	Linear Algebra and Optimization	3
BCS ZC233	Probability and Statistics	3
BCS ZC112	Introduction to Logic	2
Science & Engineering Foundation		
BCS ZC223	General Biology$	3
BSC ZC240	General Physics$	3
BCS ZC111	Basic Electronics	2
Other Courses		

BCS ZC220	Environmental Studies	3
BCS ZC229	Introduction to Economics[@]	3
BCS ZC235	Science, Technology and Modernity[@]	3

[$]One course must be chosen from this list of courses (Foundation Option 1 in the program chart)
[#] One course must be chosen from this list of courses (Foundation Option 2 in the program chart).
[@]One course must be chosen from this list of courses (Foundation Option 3 in the program chart).

Discipline Core Courses

Course No.	Course Title	Units
BCS ZC313	Introduction to Programming	4
BCS ZC228	Introduction to Computing Systems	3
BCS ZC216	Computer Systems and Performance	3
BCS ZC215	Command Line Interfaces and Scripting	3
BCS ZC311	Data Structures and Algorithms	4
BCS ZC212	Algorithm Design	3
BCS ZC316	Object Oriented Programming	4
BCS ZC317	Relational Databases	4
BCS ZC234	Programming for Mobile Devices	3
BCS ZC238	Web Programming	3
BCS ZC232	Operating Systems	3
BCS ZC236	Software Design Principles	4
BCS ZC214	Building Database Applications	3
BCS ZC211	Software Development Practices	3
BCS ZC231	Network Programming and Client-Server Programming	3
BCS ZC222	Formal Languages and Applications	3

Pool of Electives

Course No.	Course Title	Units
BCS ZC224	Graphs and Networks	3
BCS ZC213	Automata and Computability	3
BCS ZC221	Experimental Algorithmics	3
BCS ZC227	Introduction to Bioinformatics	3
BCS ZC217	Data Visualization	3
BCS ZC312	Introduction to Data Analytics	4
BCS ZC315	Multicore and GPGPU Programming	4
BCS ZC237	TCP/IP and Internet	3
BCS ZC226	Information Security	3
BCS ZC225	Human Computer Interaction	3
BCS ZC218	Designing Multimodal Interfaces	3
BCS ZC314	Modern Databases	4

Elective courses enable students to gain technical proficiency and skills in specific subject areas or tracks by way of chosen courses

Project Type Courses

Course No.	Course Title	Units
BCS ZC241T	Study Project	5
BCS ZC428T	Project	10

Semester-wise Pattern:

Year	First Semester		U		Second Semester	U
I	BCS ZC313	Introduction to Programming	4	BCS ZC311	Data Structures and Algorithms	4
	BCS ZC219	Discrete Mathematics	3	BCS ZC316	Object Oriented Programming	4
	BCS ZC230	Linear Algebra and Optimization	3	BCS ZC215	Command Line Interfaces and Scripting	3
	BCS ZC228	Introduction to Computing Systems	3	BCS ZC233	Probability and Statistics	3
	BCS ZC111	Basic Electronics	2	BCS ZC112	Introduction to Logic	2
	BCS ZC239	Writing Practice	3		Foundation Option 1	3
		Units	18		Units	19
II	BCS ZC212	Algorithm Design	3	BCS ZC232	Operating Systems	3
	BCS ZC317	Relational Databases	4	BCS ZC214	Building Database Applications	3
	BCS ZC238	Web Programming	3	BCS ZC234	Programming Mobile Devices	3
	BCS ZC236	Software Design Principles	4	BCS ZC220	Environmental Studies	3
	BCS ZC216	Computer Systems and Performance	3	BCS ZC222	Formal Languages and Applications	3
		Foundation Option 2	2		Discipline Elective #1	3
		Units	19		Min Units	18
III	BCS ZC211	Software Development Practices	3		Foundation Option 3	3
	BCS ZC231	Network Programming and Client-Server Programming	3		Discipline Elective #4	3/4
		Discipline Elective #2	3/4	BCS ZC428T	Project	10
		Discipline Elective #3	3/4			
	BCS ZC241T	Study Project	5			
	Units		17-19	Units		16-17

B.Sc. (Design & Computing)

Input Qualification
Trainees / Employed professionals who have completed their 10+2 (including Mathematics and Physics) or equivalent educational qualification with minimum 60% aggregate marks (and minimum 60% marks each in Mathematics and Physics), and having at least one year of industry experience.

Normal Duration: Eight semesters

Program Structure

Foundation courses

Course No.	Course Title	Units
Humanities Foundation		
BSDC* ZC151	Writing Practice	3
BSDC* ZC231	Dynamics of Social Change	3
BSDC* ZC236	Symbolic Logic	3
BSDC* ZC242	Cultural Studies	3
BSDC* ZC322	Critical Analysis of Literature and Cinema	3
Mathematics Foundation		
BSDC* ZC111	Probability & Statistics	3
BSDC* ZC234	Linear Algebra and Optimization	3
BSDC* ZC355	Statistical Inferences and Applications	3
Science & Engineering Foundation		
BSDC* ZC112	Electrical Sciences	3
Other Courses		
BSDC* ZC142	Computer Programming	4
BSDC* ZC225	Environmental Studies	3

Discipline Core courses

Course No.	Course Title	Units
BSDC* ZC215	Digital Design	4
BSDC* ZC222	Discrete Structures for Computer Science	3
BSDC* ZC226	Creative Thinking	3
BSDC* ZC311	Information Security	3
BSDC* ZC312	Evolution of Design	3
BSDC* ZC313	Object Oriented Programming and Design	4
BSDC* ZC316	Computing and Design	3
BSDC* ZC317	Algorithm Design	3
BSDC* ZC328	Humanities and Design	3
BSDC* ZC353	Computer Organization and Architecture	4

BSDC* ZC356	Data Structures	4
BSDC* ZC365	Human Computer Interaction	3
BSDC* ZC412	Software Design Principles	4

Pool of Electives		
Course No.	**Course Title**	**Units**
BSDC* ZC211	Principles of Economics	3
BSDC* ZC214	Science, Technology and Modernity	3
BSDC* ZC224	Print and Audio-Visual Advertisement	3
BSDC* ZC314	Software Development for Portable Devices	3
BSDC* ZC315	Web Programming	3
BSDC* ZC327	Systems Programming	3
BSDC* ZC329	Design for Social Media	3
BSDC* ZC330	Appreciation of Art	3
BSDC* ZC342	Computer Mediated Communication	3
BSDC* ZC343	Software Engineering	4
BSDC* ZC344	Professional Ethics	3
BSDC* ZC350	Human Rights: History, Theory and Practice	3
BSDC* ZC351	Organizational Behaviour	3
BSDC* ZC352	Advanced Writing Course	3
BSDC* ZC354	Introduction to Architecture	3
BSDC* ZC364	Operating Systems	3
BSDC* ZC413	Database Design	4
BSDC* ZC432	Applied Statistical Methods	3
BSDC* ZC481	Computer Networks	3

Project Type Courses

Course No.	**Course Title**	**Units**
BSDC* ZC229T	Design Project	5
BSDC* ZC499T	Capstone Project	15

B.Sc. (Design & Computing)

Semester-wise Pattern

Course No.	Course Title	Units	Course No.	Course Title	Units
First Year					
BSDC* ZC151	Writing Practice	3	BSDC* ZC231	Dynamics of Social Change	**3**
BSDC* ZC236	Symbolic Logic	3	BSDC* ZC142	Computer Programming	**4**
BSDC* ZC112	Electrical Sciences	**3**	BSDC* ZC222	Discrete Structures for Computer Science	**3**
BSDC* ZC111	Probability & Statistics	3	BSDC* ZC225	Environmental Studies	**3**
	Total	**12**		**Total**	**13**
Second Year					
BSDC* ZC215	Digital Design	4	BSDC* ZC353	Computer Organization and Architecture	**4**
BSDC* ZC356	Data Structures	4	BSDC* ZC313	Object Oriented Programming and Design	**4**
BSDC* ZC234	Linear Algebra & Optimization	3	BSDC* ZC242	Cultural Studies	**3**
BSDC* ZC226	Creative Thinking	3	BSDC* ZC312	Evolution of Design	3
	Total	**14**		**Total**	**14**
Summer Term					
BSDC* ZC229T Design Project5 Units					
Third Year					
BSDC* ZC317	Algorithm Design	**3**	BSDC* ZC412	Software Design Principles	**4**
BSDC* ZC322	Critical Analysis of Literature and Cinema	**3**	BSDC* ZC316	Computing and Design	**3**
BSDC* ZC328	Humanities and Design	**3**	BSDC* ZC355	Statistical Inferences and Applications	**3**
	Elective	3/4		Elective	**3/4**
	Total	**12/13**		**Total**	**13/14**
Fourth Year					
BSDC* ZC311	Information Security	3	BSDC* ZC499T	Capstone Project	**15**
BSDC* ZC365	Human Computer Interaction	**3**			
	Elective	3/4			
	Elective	3/4			
	Total	**12/14**		**Total**	**15**

Note: In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing collaborating organization.

B.Sc. (Engineering Science)

Input Qualification

Trainees/ Employed professionals who have completed their 10+2 (including Math, Physics and Chemistry) educational qualification with minimum of 60% aggregate marks in Math, Physics and Chemistry and having at least 6 months of work experience.

Nominal Duration: Eight semesters

Programme Structure

Foundation Courses

Course No.	Course Title	Units
Humanities Foundation		
ES* ZC116	English Language Practice	3
ES* ZC220	Introduction to Economics	3
Mathematics Foundation		
ES* ZC111	Probability and Statistics	3
ES* ZC131	Engineering Mathematics - I	3
ES* ZC212	Engineering Mathematics - II	3
ES* ZC234	Linear Algebra & Optimization	3
Science and Engineering Foundation		
ES* ZC115	General Physics I	3
ES* ZC117	Chemistry - I	3
ES* ZC118	General Physics II	3
ES* ZC119	General Physics III	3
ES* ZC120	Chemistry - II	3
Other Courses		
ES* ZC142	Computer Programming	4
Foundation course required: 8-12 (Units:24-40)		**37**

Core Courses

Course No.	Course Title	Units
ES* ZC217	Materials Science -I	3
ES* ZC219	Materials Science –II	3
ES* ZC218	Introduction to Thermodynamics & Applications	4
ES* ZC333	Introduction to Transport Phenomena	3
ES* ZC319	Mechanisms	4
ES* ZC227	Basic Electrical and Electronics Engineering	4
ES* ZC320	Introduction to Industrial Instrumentation	4

ES* ZC232	Fundamentals of Engineering Measurements	3
ES* ZC225	Environmental Studies	3
ES* ZC321	Manufacturing Science	4
ES* ZC334	Numerical & Computational Methods	3
ES* ZC335	Integrated Engineering Science	3
Discipline Core Courses Required : 10-16 (Units: 34-58)		**41**

Pool of Electives

Course No.	Course Title	Units
ES* ZC336	Contemporary Manufacturing Processes	4
ES* ZC337	Digital Electronics & Microcontrollers	3
ES* ZC338	Digital Manufacturing	4
ES* ZC339	Engineering Design & Drawing	4
ES* ZC340	Introduction to Supply Chain Management	3
ES* ZC345	Maintenance for Productivity & Safety	3
ES* ZC346	Manufacturing Systems Design & Analysis	4
ES* ZC347	Quality Control & Metrology	4
ES* ZC348	Robotics & Automation	3

Project Type Courses

Course No.	Course Title	Units
ES* ZC229T	Project	5
ES* ZC498T	Capstone Project	10

B.Sc. (Engineering Science)

Semester wise Pattern

Course No.	Course Title	Units	Course No.	Course Title	Units
Semester I			**Semester II**		
First Year					
ES* ZC115	General Physics I	3	ES* ZC118	General Physics II	3
ES* ZC117	Chemistry - I	3	ES* ZC111	Probability and Statistics	3
ES* ZC116	English Language Practice	3	ES* ZC142	Computer Programming	4
ES* ZC131	Engineering Mathematics - I	3	ES* ZC120	Chemistry - II	3
	Total	12		**Total**	13
Second Year					
ES* ZC119	General Physics III	3	ES* ZC212	Engineering Mathematics - II	3
ES* ZC234	Linear Algebra & Optimization	3	ES* ZC218	Introduction to Thermodynamics & Applications	4
ES* ZC217	Materials Science - I	3	ES* ZC219	Materials Science - II	3
ES* ZC227	Basic Electrical & Electronics Engineering	4	ES* ZC220	Introduction to Economics	3
	Total	13		**Total**	13
Summer Term					
ES* ZC229T Project 5 Units					
Third Year					
ES* ZC232	Fundamentals of Engineering Measurements	3	ES* ZC225	Environmental Studies	3
ES* ZC319	Mechanisms	4	ES* ZC320	Introduction to Industrial Instrumentation	4
ES* ZC333	Introduction to Transport Phenomena	3	ES* ZC321	Manufacturing Sciences	4
ES* ZC334	Numerical & Computational Methods	3	ES* ZC335	Integrated Engineering Science	3
	Total	13		**Total**	14
Fourth Year					
	Elective I	3 (min)		Elective V	3 (min)
	Elective II	3 (min)	ES* ZC498T	Capstone Project	10
	Elective III	3 (min)			
	Elective IV	3 (min)			
	Total	12 (min)		**Total**	13 (min)

B.Sc. (Pharmaceutical Sciences)

Type of Input
Trainees / Employed professionals who have completed their 10+2 (including Mathematics/Biology, Physics, and Chemistry as subjects) or equivalent educational qualification, with minimum 60% aggregate marks.
Nominal Duration: Eight semesters

Programme Structure

Foundation Courses

Course No.	Course Title	Units
Humanities Foundation		
PS*ZC221	Business Communication	3
PS*ZC313	Technical Report Writing	3
PS*ZC343	Professional Ethics	3
Mathematics Foundation		
PS*ZC111	Probability and Statistics	3
PS*ZC113	General Mathematics - I	3
PS*ZC114	General Mathematics - II	3
PS*ZC235	Linear Algebra & Optimization	3
Science and Engineering Foundation		
PS*ZC318	Fundamentals of Transport Processes	4
Other Courses		
PS*ZC225	Environmental Studies	3

Core Courses

Course No.	Course Title	Units
PS*ZC112	Human Anatomy and Physiology	3
PS*ZC222	Pharmaceutical Quality & GMP	4
PS*ZC223	Fundamentals of Biochemistry and Microbiology	4
PS*ZC231	Physical and Inorganic Chemistry	3
PS*ZC234	Techniques in Pharmaceutical Analysis	4
PS*ZC241	Pharmaceutical Chemistry	3
PS*ZC244	Physical Pharmacy	3
PS*ZC311	Pharmaceutical Unit Operations – I	3
PS*ZC312	Pharmaceutical Unit Operations – II	3
PS*ZC314	Pharmaceutical Jurisprudence in India	3
PS*ZC331	Pharmaceutical Formulations – I	3
PS*ZC332	Pharmaceutical Formulations – II	4
PS*ZC341	Drug Discovery and Action	4
PS*ZC342	Medicinal Chemistry	3
PS*ZC344	Natural Drugs	3

Pool of Electives

Course No.	Course Title	Units
PS*ZC212	Basic Statistical Process Control	3
PS*ZC213	Scale-up of Pharmaceutical Operations	3
PS*ZC214	Utilities in Pharmaceutical Operations	3
PS*ZC224	Novel Drug Delivery Systems	3
PS*ZC232	Chemistry of Synthetic Drugs	3
PS*ZC233	Pharmaceutical Packaging	3
PS*ZC321	Chemical Process Calculations	3
PS*ZC322	Pharmaceutical Quality by Design	3
PS*ZC323	Sterile Pharmaceutical Products	3
PS*ZC324	Name Reactions in Chemical Synthesis	3
PS*ZC361	Environmental Pollution Control	3
PS*ZC414	Biopharmaceutics	3

Project Type Courses

Course No.	Course Title	Units
PS*ZC229T	Project	5
PS*ZC499T	Capstone Project	15

B.Sc. (Pharmaceutical Sciences)

Semesterwise Pattern

Course No.	Course Title	Units	Course No.	Course Title	Units
First Year					
PS*ZC113	General Mathematics - I	3	PS*ZC114	General Mathematics - II	3
PS*ZC231	Physical & Inorganic Chemistry	3	PS*ZC311	Pharmaceutical Unit Operations- I	3
PS*ZC112	Human Anatomy and Physiology	3	PS*ZC241	Pharmaceutical Chemistry	3
PS*ZC313	Technical Report Writing	3	PS*ZC221	Business Communication	3
	Total	12		**Total**	12
Second Year					
PS*ZC235	Linear Algebra & Optimization	3	PS*ZC111	Probability and Statistics	3
PS*ZC312	Pharmaceutical Unit Operations – II	3	PS*ZC331	Pharmaceutical Formulations – I	3
PS*ZC244	Physical Pharmacy	3	PS*ZC341	Drug Discovery and Action	4
PS*ZC223	Fundamentals of Biochemistry and Microbiology	4	PS*ZC234	Techniques in Pharmaceutical Analysis	4
	Total	13		**Total**	14
Summer Term					
PS*ZC229T Project5 Units					
Third Year					
PS*ZC332	Pharmaceutical Formulations – II	4	PS*ZC318	Fundamentals of Transport Processes	4
PS*ZC342	Medicinal Chemistry	3	PS*ZC344	Natural Drugs	3
PS*ZC314	Pharmaceutical Jurisprudence in India	3	PS*ZC222	Pharmaceutical Quality & GMP	4
	Elective	3/4		Elective	3/4
	Total	13/14		**Total**	14/15
Fourth Year					
PS*ZC343	Professional Ethics	3	PS*ZC499T	Capstone Project	15
PS*ZC225	Environmental Studies	3			
	Elective	3/4			
	Elective	3/4			
	Total	12-14		**Total**	15

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

B.Sc. (Hons) Program Structure

i) **Type of Input:** Students who have completed 10+2. Additional eligibility criteria may be prescribed by specific programs.
ii) **Nominal Duration:** 4 years
iii) **Programme Structure:**

Category	Number of Courses Required	Number of Units Required
I. Foundation Courses		
Mathematics Foundation	3-6	9-18
Science Foundation	1-6	3-20
Humanities Foundation	2-6	4-18
Others	0-3	2-10
Foundation (Sub-Total)	**8-12**	**24-40**
II. Discipline Courses		
Core	**14-21**	**47-67**
Discipline Electives	6 - 12	18-40
III. Open Electives	3-6	9-20
Coursework (Sub-Total)	**39 courses (min)**	**129 units (min)**
IV. Project Courses	1-3	15-20 units
Total	**41 courses (min)**	**144 Units (min)**

B.Sc. (Hons) in Computer Science

i) Input Qualification for the online offering of B.Sc. (Hons) in Computer Science.

Entry Option - 1:

Candidates who have completed 10+2 and seek admission to the B.Sc. (Hons) in Computer Science

For Applicants from India

1) Candidates should have passed the class 12th examination in any stream under the 10+2 system from a recognized central or state board from India or its equivalent.
2) Candidates must have adequate proficiency in Maths. The Candidates Class 12th mark sheet issued by the respective board should show Maths as one of the subjects and that the candidate has secured minimum 60% marks in Maths.

   Or

   Candidates who have either **not studied maths in Class 12th** or **failed to secure minimum 60% marks in Maths in Class 12th** are expected to appear in a qualifying examination in mathematics to be conducted by BITS. The admission offer will be on the basis of the performance in the exam.
3) Candidates must have adequate proficiency in English. All applicants who have studied "English" as a subject till Class 10th will be considered eligible.

For Applicants from other countries:

1) Candidates should have passed the qualifying examination conducted by their respective country's or province's board of higher/senior secondary school education (High School Board) and must obtain an equivalence certificate from Association of Indian Universities that indicates that the certificate issued by their respective country's/province's board of school education is equivalent to class 12 certificate issued from recognized central or state board from India or its equivalent.
2) Candidates must have adequate proficiency in maths. The candidate's final year marks sheet issued by their respective country's / province's high school education board should show maths as one of the subject and that applicant has secured in maths either a minimum 60% marks or a minimum grade point of 6 on a scale of 10.

   Or

   Candidates who have either not studied maths at high school level or failed to secure in maths a minimum 60% marks or a minimum grade point of 6 on a scale of 10 in the final year examination conducted by their respective country's/province's recognised high school board are expected to appear in a qualifying examination in mathematics to be conducted by BITS. The admission offer will be on the basis of the performance in the exam.
3) Candidates must have adequate proficiency in English. **Candidates must have had "English" as the primary medium of instruction for their high school studies.** This will need to be supported by uploading a certificate issued by the school along with the application. **or**

   Must submit a valid IELTS or TOEFL scorecard with the application.

Entry Option - 2:

Candidates who are initially admitted for the B.Sc. in Computer Science programme and are willing to opt for B.Sc. (Hons) in Computer Science:

Option to transition into B.Sc.(Hons) in Computer Science programme will be provided to candidates already admitted to the B.Sc. in Computer Science programme based on their request

Entry Option - 3:

Candidates who have taken intermediate exits from B.Sc. in Computer Science / B.Sc. (Honours) in Computer Science

Candidates who have taken intermediate exits from these programs will be eligible for admission to the B.Sc. (Honours) program in Computer Science, However they have to follow the curriculum at that point in time to

complete the degree requirements. Details of the admission modality and other operational aspects will be worked out and reported to senate.

ii) Programme Structure of B.Sc. (Hons) in Computer Science:

Category	Number of Courses	Units
I. Foundation Courses		
Mathematics Foundation	4	11
Science Foundation	2	5
Humanities Foundation	2	5
Others	2	6
Foundation (Sub-Total)	**10**	**27**
II. Discipline Courses		
Core	16	**53**
Discipline Electives	8(min)	27(min)
III. Open Electives	3(min)	**9**(min)
Coursework (Sub-Total)	**39(min)**	**129 (min)**
IV. Project Courses	2-3	**15/20**
Total	**41(min)**	**144 (min)**

Note: A specialization is awarded when a student chooses 4 Discipline Elective courses, in their VIIth and VIIIthsemesters, for a minimum of 14 units, from a pool of courses in that specialization and Mini Project for 5 units. Details regarding specializations are provided later in the document.

iii) Normal Duration: Eight Semesters

iv) Intermediate Exits:

- Intermediate exit is permitted with the award of B.Sc. Computer Science when meeting the curriculum requirements for the same as approved by the Senate
- Intermediate exit is permitted with the award of a Diploma in Software Development when meeting the curriculum requirements for the same as approved by the Senate

v) List of courses &Semester-wise structure

The semester-wise structure and the courses for the B.Sc. (Hons) in Computer Science for the semester I to VI are the same as the structure B.Sc. Computer Science as already approved by the senate. In addition the following discipline electives will be added to the Pool of electives in the B.Sc. Computer Science Programme already approved. A new pool of electives categorised as other electives and a project course called mini Project will also be added additionally in to the B.Sc. (Hons) Computer Science Programme.

Discipline Electives: (22)

Course No.	Course Title	Units
BHCS ZC321	Software Testing and Automation	3
BHCS ZC319	Natural Language Processing	4
BHCS ZC423	Introduction to Social Media Analytics	4
BHCS ZC416	Cryptography	3
BHCS ZG511	Agile Software Processes	4
BHCS ZC418	Distributed Systems	4

BHCS ZC429	Open Source Software	3
BHCS ZC433	Topics in Algorithms and Complexity	4
BHCS ZC324	Compiler Design	4
BHCS ZG512	Network Security	4
BHCS ZC421	Introduction to Machine Learning #	4
BHCS ZC412	Artificial Intelligence #	3
BHCS ZC417	Deep Learning and Applications #	4
BHCS ZC434	Topics in Data Mining#	4
BHCS ZC414	Cloud Computing Fundamentals##	3
BHCS ZC422	Introduction to Networking for Cloud##	3
BHCS ZC420	Introduction to DevOps for Cloud##	4
BHCS ZC430	Scalable Services in Cloud##	4
BHCS ZC413	Backend and API Development###	4
BHCS ZC419	Frontend Development###	3
BHCS ZC415	Cross-platform Applications###	3
BHCS ZC432	Software Deployment###	4

Project Course (1)

Course No.	Course Title	Units
BHCS ZC427T	Mini Project*	5

\# - Mandatory electives for Artificial Intelligence and Machine Learning Specialization
- Mandatory electives for Full-Stack Development Specialization
- Mandatory electives for Cloud Computing Specialization
* - Mandatory elective for all the specializations

Open Electives (9)

Course No.	Course Title	Units
BHCS ZC327	Introduction to Calculus	3
BHCS ZC325	Differential Equations and Applications	3
BHCS ZC320	Numerical Analysis	3
BHCS ZC241	Microprocessors, Programming & Interfacing	4
BHCS ZC328	Introduction to IoT	4
BHCS ZC244	Accounting for Managers	3
BHCS ZC322	Corporate Finance	3
BHCS ZC323	Investment Management	3
BHCS ZC243	Signals & Systems	3

Semester-wise Pattern

Year	First Semester		U		Second Semester	U
I	BCS ZC313	Introduction to Programming	4	BCS ZC311	Data Structures and Algorithms	4
	BCS ZC219	Discrete Mathematics	3	BCS ZC316	Object Oriented Programming	4
	BCS ZC230	Linear Algebra and Optimization	3	BCS ZC215	Command Line Interfaces and Scripting	3
	BCS ZC228	Introduction to Computing Systems	3	BCS ZC233	Probability and Statistics	3
	BCS ZC111	Basic Electronics	2	BCS ZC112	Introduction to Logic	2
	BCS ZC239	Writing Practice	3		Foundation Option 1	3
		Units	18		Units	19
II	BCS ZC212	Algorithm Design	3	BCS ZC232	Operating Systems	3
	BCS ZC317	Relational Databases	4	BCS ZC214	Building Database Applications	3
	BCS ZC238	Web Programming	3	BCS ZC234	Programming Mobile Devices	3
	BCS ZC236	Software Design Principles	4	BCS ZC220	Environmental Studies	3
	BCS ZC216	Computer Systems and Performance	3	BCS ZC222	Formal Languages and Applications	3
		Foundation Option 2	2		Discipline Elective #1	3
		Units	19		Min Units	18
III	BCS ZC211	Software Development Practices	3		Foundation Option 3	3
	BCS ZC231	Network Programming and Client-Server Programming	3		Discipline Elective #4	3/4
		Discipline Elective #2	3/4	BCS ZC428T	Project	10
		Discipline Elective #3	3/4			
	BCS ZC241T	Study Project	5			
		Units	17-19		Units	16-17
IV		Discipline Elective	3/4		Discipline Elective	3/4
		Discipline Elective	3/4		Discipline Elective	3/4
		Open Elective	3/4		Discipline Elective/ Mini Project	3/5
		Open Elective	3/4		Open Elective / Discipline Elective	3/4
		Open Elective/Discipline Elective	3/4		Open Elective / Discipline Elective	3/4
		Discipline Elective$	3/4		Discipline Elective$	3/4
			17-20			17-20
	Minimum Units for Semesters VII and VIII					37

- Courses for Discipline Electives can be chosen from the list of Discipline Electives
  - **$-** These Discipline Electives may be dropped if the minimum required units for the respective semesters are met by the choice of the remaining five courses.
  - A specialization is awarded when a student chooses 4 Discipline Elective courses, in their VIIth

and VIIIthsemesters, for a minimum of 14 units, from a pool of courses in that specialization and Mini Project for 5 units

- Open Electives must be chosen from the Open Elective pool.
- A minimum of 4 Discipline Electives (or 4 Discipline Electives and a Mini Project) and 3 Open Electives must be chosen in the VIIth and VIIIth semesters

vi) Details of Specialization

The online B.Sc. (Hons) in Computer Science program offers three specializations to choose from. The Specializations are (1) Artificial Intelligence and Machine Learning (2) Cloud Computing (3) Full-stack Development. The specialization is structured to have four mandatory courses in the specialization area and a mini project in the domain of specialization. The specialization enhances the depth of knowledge and skills in one of the demanding areas and thereby enhances a learner's employable skills. The learner also has the option to choose courses from across the specializations (on offer) and from disciplinary electives to meet his learning needs. The program's structure allows the specializations to be added/updated as required.

The details of each of the specializations are presented below

(1) Title of the Specialization: Artificial Intelligence and Machine Learning

Objective(s):

- To introduce the domain AI, various algorithms and their applications
- To introduce AI and ML concepts and techniques required for data-driven decision-making.

(2) Title of the specialization: Cloud Computing

Objective:
Provide an understanding of cloud computing fundamentals and experience with developing, deploying, and managing cloud applications.

(3) Title of the Specialization: Full-Stack Development
Objective(s):
Enable the students to

- Design and develop end-to-end web applications with full-stack frameworks involving frontend, backend, databases, and APIs as essential components
- Design and develop mobile applications using cross-platform frameworks
- Build, test, deploy, and release the applications using state-of-art DevOps practices and tools
- Understand and apply industry practices in agile software development

Four-semester M.Tech. programmes

Input Qualification:

The students admitted to the proposed four-semester M.Tech. programsmust

(i) hold an Integrated First Degree of BITS or its equivalent and

(ii)be employed professionals with adequate work experience in a relevant industry.

Curriculum Requirements for M.Tech. programs

The nature of the input to these programs and the objectives / orientation of Work Integrated Learning Programs are different from those of the on-campus programs. These programs may be offered across a broad spectrum of (i) technical disciplines and specializations with as well as (ii) industry domains and cross-disciplinary subjects.It is also to be observed that learning and coursework in these programs are integrated within a professional / technical environment.

Based on these facts and observations, the curriculum has been designed in such a way to broadly enable different combinations of subjects at a higher degree level. In particular, the structure will enable Departments to offer an M.Tech.program in a broad discipline with or without specialization, or offer an M.Tech. program in a specialized area within a discipline or across multiple disciplines.

A. Completion of the program would require:

i. At least 12 courses (totaling at least 48 units) towards coursework nominally spread over three semesters and

ii. Dissertation (16 units) in one semester, that is usually the final semester.

B. The Department(s) offering a specific program must then categorize the coursework requirement as follows:

i. **Core**: 8 courses / 30 units (max.)

ii. **Specialization** (if applicable):

a. 3 courses / 12 units (min.) to 6 courses / 30 units (max.)

b. Some Specialization courses may be mandatory and some may be electives.

iii. Total of Core and Specialization courses may not exceed 10 courses (and 45 units).

iv. Rest of the coursework requirement may be obtained via general electives within the discipline but not necessarily within the specialization.

v. At most 3 courses out of the total of 12 taken by a student may be at the 4^{th} level – the rest must be higher degree courses (i.e. specifically, 5^{th} or 6^{th} level).

Eight-semester Integrated M.Tech. programme

Curriculum Structure for an Integrated M.Tech. programme:

The curriculum structure and requirements of the eight-semester Integrated M.Tech. programme will include the requirements of the corresponding Integrated First Degree programme and four-semester M.Tech. programme, with the following provisions:

1. The electives requirement of the Integrated First Degree programme will be subsumed by the coursework requirement of the Integrated M.Tech. programme, and
2. The Project Work requirement of the Integrated First Degree programme, will be subsumed by the Dissertation requirement of the Integrated M.Tech. programme.

Given these provisions, the following requirements for the curriculum are proposed:

Category	Number of Courses Required	Number of Units Required
I Foundation Courses	5-10	15-32
II Discipline Courses		
Discipline Core	12-16*	42-66*
Discipline Electives	6-12	20-36
Sub-Total	18 - 22 courses#	64 - 80 units
Course-Work Sub-Total	28 courses (min)	96 units (min)
III DISSERTATION	1	16
Total	29 courses (min)	112 units (min)

* Nominally, each course is of 3 units.But, at least two of the Discipline courses are required to be of 4 units or higher.

\# At least eight of these courses must be Higher Degree courses (i.e. specifically, 5^{th} or 6^{th} level)

Specializations (if applicable)

The Department(s) offering **specializations** within a specific Integrated M.Tech. programme should ensure that the following requirements are met:

1. Specialization (if applicable):
    a. 3 courses / 12 units (min.) to 6 courses / 30 units (max.)
    b. Some specialization courses may be mandatory and some may be electives.
2. Rest of the elective requirements may be obtained through general electives within the discipline, but not necessarily within the specialization.

M.Tech. Applied Energy Engineering

Programme Structure

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./B.Tech. in relevant disciplines, with minimum one year work experience.

Nominal Duration: Four Semester (2 Years)

List of core courses (7)

Course No.	Course Title	Units
AEE ZG512	Project Management	4
AEE ZG513	Advanced Statistical Methods	4
AEE ZG611	Supply Chain Management	4
AEE ZG612	Managerial Corporate Finance	4
AEE ZG524	Environmental Management System	5
AEE ZG514	Energy Systems Engineering	4
AEE ZG613	Industrial IoT	4

Project

Course No.	Course Title	Units
AEE ZG628T	Dissertation	16

Pool of Electives

Course No.	Courses	Units
AEE ZC411	Process Plant Safety and Environment	4
AEE ZG511	Utility Applications of Power Electronics	3
AEE ZG515	Petroleum Refining & Petrochemicals	4
AEE ZG516	Natural Gas Processing	4
AEE ZG517	Petroleum Production Economics	4
AEE ZG518	Infrastructure Planning & Management	4
AEE ZG519	Transportation Systems Planning & Management	4
AEE ZG520	Airport Planning and Design	4
AEE ZG521	Transportation Economics & Finance	4
AEE ZG522	Water Resource Planning & Management	4
AEE ZG525	Manufacturing Planning & Control	5

AEE ZG523	Alternate Energy Resources	4
AEE ZG526	Mechatronics	5
AEE ZG527	Computational Fluid Dynamics	5
AEE ZG528	Thermal Equipment Design	5
AEE ZG529	Distribution Apparatus and Configuration	5
AEE ZG530	Power Quality	5
AEE ZG531	High Voltage Engineering	5
AEE ZG532	Advances in Transmission and Distribution	5
AEE ZG533	Water Chemistry & Metallurgy	5
AEE ZG534	Boiler Technology	5
AEE ZG535	Multicriteria Analysis in Engineering	4
AEE ZG614	Advances in Materials, Composites and Plastics	4
AEE ZG615	Energy Integration Analysis	5
AEE ZG616	Petroleum Downstream Processing	5
AEE ZG617	Advanced Control Systems	5

Semester-wise pattern of courses

Year	First Semester			Second Semester		
	Course #	**Course Title**	**Units**	**Course #**	**Course Title**	**Units**
I	AEE ZG512	Project Management	4	AEE ZG524	Environmental Management System	5
	AEE ZG513	Advanced Statistical Methods	4	AEE ZG514	Energy Systems Engineering	4
	AEE ZG611	Supply Chain Management	4	AEE ZG613	Industrial IoT	4
	AEE ZG612	Managerial Corporate Finance	4		Elective I	
	Total		16	Total		(16min)
II		Elective II		AEE ZG628T	Dissertation	16
		Elective III				
		Elective IV				
		Elective V				
	Total		(16min)	Total		16

M.Tech. Artificial Intelligence and Machine Learning

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E. / M.Sc. in relevant math and statistics oriented disciplines, with minimum one-year work experience in IT services and products industry.

Nominal Duration: Four Semesters

Curriculum Requirements:

Completion of the programme would require:
(a) 12 courses (totalling a minimum of 48 units) towards course work, and
(b) Dissertation (16 Units)
(c) Specializations available: Deep Learning, Natural Language Processing. [Students may graduate without any specialization.]

Programme Structure:

Core Courses

Course No.	Course Title	Units
AIML* ZC416	Mathematical Foundations for Machine Learning	4
AIML* ZC418	Introduction to Statistical Methods	4
AIML* ZG511	Deep Neural Networks	4
AIML* ZG512	Deep Reinforcement Learning	4
AIML* ZG557	Artificial and Computational Intelligence	5
AIML* ZG565	Machine Learning	4

Pool of Electives

Course No.	Course Title	Units
AIML* ZG523	MLOps	4
AIML* ZG524	Design of Algorithms	5
AIML* ZG525	Computer Vision	4
AIML* ZG526	Probabilistic Graphical Models	4
AIML* ZG527	Audio Analytics	4
AIML* ZG528	AI and ML for Robotics	4
AIML* ZG529	Data Management for Machine Learning	4
AIML* ZG531	Video Analytics	4
AIML* ZG532	Automated Reasoning	4
AIML* ZG548	Advanced Data Mining	4
AIML* ZG567	AI and ML techniques for Cyber Security	5
AIML* ZG577	Metaheuristics for Optimization	4

The following specializations are proposed for M.Tech. in Artificial Intelligence and Machine Learning

Specializations	Existing/New Specialization
Deep Learning	New
NLP	New

Pool of Electives for specialization 1: Deep Learning Specialization

Course No.	Course Title	Units
AIML* ZG513	Advanced Deep learning #	4
AIML* ZG514	Graph Neural Networks	4
AIML* ZG515	Distributed Machine Learning	4
AIML* ZG516	ML System Optimization	4
AIML* ZG517	Fair, Accountable, Transparent Machine Learning	4
AIML* ZG518	Computational Learning Theory	4

Note: 3 courses are required including the course marked in #

Pool of Electives for specialization 2: NLP Specialization

Course No.	Course Title	Units
AIML* ZG519	NLP Applications	4
AIML* ZG520	Speech Processing	4
AIML* ZG521	Conversational AI	4
AIML* ZG522	Social Media Analytics	4
AIML* ZG530	Natural Language Processing #	4
AIML* ZG537	Information Retrieval	4

Note: 3 courses are required including those marked with #

Project

Course No.	Course Title	Units
AIML* ZG628T	Dissertation	16

Semester-wise pattern of courses

Year	First Semester			Second Semester		
	Course No.	Course Title	Units	Course No.	Course Title	Units
I	AIML* ZC416	Mathematical Foundations for Machine Learning	4	AIML* ZG511	Deep Neural Networks	4
	AIML* ZC418	Introduction to Statistical Methods	4	AIML* ZG512	Deep Reinforcement Learning	4
	AIML* ZG557	Artificial and Computational Intelligence	5		Elective 1	
	AIML* ZG565	Machine Learning	4		Elective 2	
		Total	17		Total	16
II		Elective 3		AIML* ZG628T	Dissertation	16
		Elective 4				
		Elective 5				
		Elective 6				
		Total	16		Total	16

M. Tech. (Automotive Electronics)

Type of Input: Employed professionals holding a B.E./B.Tech. degree in Automotive/ EEE /ECE/Instrumentation/Mechatronics or equivalent, with minimum one year work experience in relevant domains.

Nominal Duration: Four Semesters

Programme Structure:

Core Courses

Course No.	Course Title	Units
AEL* ZC441	Automotive Vehicles	3
AEL* ZC442	Advanced Driver Assistance Systems	4
AEL* ZG510	Automotive Control Systems	5
AEL* ZG512	Embedded System Design	4
AEL* ZG513	Automotive Communication Systems	5
AEL* ZG533	Autotronics	5
AEL* ZG534	Automotive Networking	4

Pool of Electives

Course No.	Course Title	Units
AEL* ZC443	Connected Cars	4
AEL* ZG514	Robust and Intelligent Systems Design	5
AEL* ZG517	Automotive Systems Engineering	4
AEL* ZG518	Electric and Hybrid Vehicles	4
AEL* ZG519	Automotive Security	4
AEL* ZG531	Product Design	5
AEL* ZG554	Reconfigurable Computing	5
AEL* ZG557	Artificial and Computational Intelligence	5
AEL* ZG621	Safety Critical Advanced Automotive Systems	4
AEL* ZG626	Hardware Software Co-Design	5
AEL* ZG631	Automotive Diagnostics and Interfaces	5

Dissertation

Course No.	Course Title	Units
AEL* ZG628T	Dissertation	16

M. Tech. (Automotive Electronics)

Semesterwise pattern

Year	First Semester			Second Semester		
	Course No.	**Course Title**	**Units**	**Course No.**	**Course Title**	**Units**
I	AEL* ZC441	Automotive Vehicles	3	AEL* ZG510	Automotive Control Systems	5
	AEL* ZG533	Autotronics	5	AEL* ZG513	Automotive Communication Systems	5
	AEL* ZG512	Embedded System Design	4	AEL* ZG534	Automotive Networking	4
	AEL* ZC442	Advanced Driver Assistance Systems	4		Elective I	4/5
	Total		16	Total		18-19
II		Elective II	4/5	AEL* ZG628T	Dissertation	16
		Elective III	4/5			
		Elective IV	4/5			
		Elective V	4/5			
	Total		16-20	Total		16

M. Tech. Automotive Engineering

Curriculum Structure

Completion of the program requires:

(a) Total of 12 courses (min. 48 units) towards course work and Dissertation (16 Units)
(b) Core courses: 5
(c) Elective courses: 7 across three pools of elective courses
(d) Two specializations are offered:
(i) Vehicle Systems & Controls and (ii) Advanced Driver Assistance Systems (ADAS)
(e) Students opting for specialization MUST take 5 elective courses from the chosen specialization, of which three are compulsory and 2 must be chosen from the pool of electives for that specialization. The remaining 2 elective courses may be chosen from ANY of the three pools of electives.
(f) Students opting to graduate without any specialization can take 7 elective courses from ANY of the three pools of electives

Programme Structure:

List of core courses (5)

Course No.	Course Title	Units
AE ZG516	Advances in IC Engines	4
AE ZG524	Vehicle Dynamics	4
AE ZG517	Automotive Systems Engineering	4
AE ZG533	Autotronics	5
AE ZG518	Electric and hybrid vehicles	4

The Following Specializations are proposed for M.Tech. in Automotive Engineering

Specialization	Existing/New Specialization
Vehicle Systems & Controls	New
Advanced Driver Assistance Systems	New

Pool of Electives for Specialization 1: Vehicle Systems & Controls

Course No.	Course Title	Units
AE ZG535	Advanced Engineering Mathematics#	5
AE ZG510	Automotive Control Systems#	5
AE ZG631	Automotive Diagnostics & Interfaces	5
AE ZG512	Embedded System Design#	4
AE ZG521	Power Electronics and Drives	4
AE ZG616	Applied Digital Signal Processing	5

Note: 5 courses are required including the courses marked #

Pool of Electives for Specialization 2: Advanced Driver Assistance Systems (ADAS)

Course No.	Course Title	Units
AE ZG535	Advanced Engineering Mathematics	5
AE ZG510	Automotive Control Systems#	5
AE ZG519	Automotive Security	4
AE ZC442	Advanced Driver Assistance Systems#	4
AE ZG623	Safety Critical Advanced Automotive Systems	4
AE ZG557	Artificial and Computational Intelligence#	5

Note: 5 courses are required including the courses marked #

Pool of general elective courses

Course No.	Course Title	Units
AE ZG633	Advances in Vehicle Body Structures	4
AE ZG621	Durability, Crash & Safety Engineering	4
AE ZG612	Advances in Materials, Composites & Plastics	4
AE ZG522	Advanced Vehicle Acoustics	4
AE ZC443	Connected Cars	4
AE ZG614	Fracture Mechanics	5
AE ZG523	Project Management	4
AE ZG532	Computer Aided Engineering	5
AE ZG531	Product Design	5

Project

Course No.	Course Title	Units
AE ZG628 T	Dissertation	16

Semester-wise pattern of courses

Year	First Semester			Second Semester		
	Course #	Course Title	Units	Course #	Course Title	Units
I	AE ZG533	Autotronics	5	AE ZG 518	Electric and hybrid vehicles	4
	AE ZG516	Advances in IC Engines	4		Elective II	5
	AE ZG524	Vehicle Dynamics	4		Elective III	4-5
		Elective I	4-5		Elective IV	4-5
	Total		(17min)	Total		(17min)
II	AE ZG517	Automotive Systems Engineering	4	AE ZG628T	Dissertation	16
		Elective V	4-5			
		Elective VI	4-5			
		Elective VII	4-5			
	Total		(18min)	Total		16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborating Organizations: Tata Technologies and Tata Motors, Pune; Mercedes Benz, Bangalore

M.Tech. (Cloud Computing)

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E. / M. Sc. with minimum one-year work experience in IT services and products industry with experience in computing, especially systems and programming is expected.

Nominal Duration: Four Semesters

Curriculum Requirements:

Completion of the programme would require:
(a) 12 courses (totaling a minimum of 48 units) towards course work, and
(b) Dissertation (16 Units)

Programme Structure

Core Courses (6)

Course No.	Course Title	Units
CC* ZG501	Introduction to Parallel and Distributed Programming	4
CC* ZG502	Cloud Infrastructure and Systems Software	5
CC* ZG503	Network Fundamentals for Cloud	4
CC* ZG522	Big Data Systems	5
CC* ZG526	Distributed Computing	5
CC* ZG527	Cloud Computing	5

Pool of Electives (13)

Course No.	Course Title	Units
CC* ZC447	Data Storage Technology and Networks	4
CC* ZG504	Security Fundamentals for Cloud	4
CC* ZG505	Cloud Economics	4
CC* ZG506	API-driven Cloud Native Solutions	5
CC* ZG507	DevOps for Cloud	5
CC* ZG508	Design and Operation of Data Centers	5
CC* ZG515	Data Warehousing	5
CC* ZG532	Introduction to Data Science	5
CC* ZG538	Infrastructure Management	4
CC* ZG556	Stream Processing and Analytics	5
CC* ZG566	Secure Software Engineering	5
CC* ZG583	Scalable Services	5
CC* ZG586	Edge Computing	5

Course No.	Course Title	Units
CC* ZG628T	Dissertation	16

Semester-wise pattern of courses

Year	First Semester			Second Semester		
	Course No.	**Course Title**	**Units**	**Course No.**	**Course Title**	**Units**
I	CC* ZG501	Introduction to Parallel and Distributed Programming	4	CC* ZG502	Cloud Infrastructure and Systems Software	5
	CC* ZG503	Network Fundamentals for Cloud	4	CC* ZG526	Distributed Computing	5
	CC* ZG522	Big Data Systems	5		Elective 1	
	CC* ZG527	Cloud Computing	5		Elective 2	
		Total	18		Total	Min 18
II		Elective 3		CC* ZG628T	Dissertation	16
		Elective 4				
		Elective 5				
		Elective 6				
		Total	Min 18		Total	16

M. Tech. (Computing Systems & Infrastructure)

Curriculum

Type of Input

The students admitted to the M.Tech. Computing Systems & Infrastructure programme must:

(i) Hold an Integrated First Degree of BITS or its equivalent in relevant disciplines, and

(ii) Be employed professionals with minimum one-year work experience in relevant domains.

Normal Duration: Four Semesters

Programme Structure

Core Courses (6)

Course No.	Course Title	Units
CSI* ZG525	Advanced Computer Networks	5
CSI* ZG527	Cloud Computing	5
CSI* ZG522	Design and Operation of Data Centers	5
CSI* ZG538	Infrastructure Management	4
CSI* ZG524	Middleware Technologies	4
CSI* ZG513	Network Security	4

Pool of Electives (11)

Course No.	Course Title	Units
CSI* ZC447	Data Storage Technologies and Networks	4
CSI* ZC463	Cryptography	3
CSI* ZG511	IT Infrastructure Projects & Processes	3
CSI* ZG523	Introduction to Data Science	3
CSI* ZG528	Cyber Physical Systems	4
CSI* ZG514	Data Warehousing	5
CSI* ZG515	Introduction to DevOps	4
CSI* ZC462	Network Programming	3
CSI* ZG656	Networked Embedded Applications	4
CSI* ZG533	Service-Oriented Computing	4
CSI* ZC424	Software Development for Portable Devices	3
CSI* ZG582	Telecom Network Management	5
CSI* ZG526	Web Technologies	4
CSI* ZG520	Wireless & Mobile Communication	5
CSI* ZG518	Database Design & Applications	5

M. Tech. (Computing Systems & Infrastructure)

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	CSI* ZG513	Network Security	4	CSI* ZG522	Design and Operation of Data Centers	5
	CSI* ZG527	Cloud Computing	5	CSI* ZG525	Advanced Computer Networks	5
		Elective 1	(3 min)		Elective 3	(3 min)
		Elective 2	(3 min)		Elective 4	(3 min)
		Total	15		Total	16
II	CSI* ZG524	Middleware Technologies	4	CSI* ZG628T	Dissertation	16
	CSI* ZG538	Infrastructure Management	4			
		Elective 5	(3 min)			
		Elective 6	(3 min)			
		Total	14		Total	16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborating Organizations: Wipro Bangalore

Integrated M. Tech. (Computing Systems & Infrastructure)

Type of Input

The students admitted to the Integrated M.Tech. Computing Systems & Infrastructure programme must:

(i) Hold a B.Sc. / BCA degree or its equivalent in relevant disciplines with adequate background in Mathematics, and

(ii) Be employed professionals with minimum one-year work experience in relevant domains.

Normal Duration: Eight Semesters

Programme Structure

Foundation Courses (5)

	Course NO.	Course Title	Units
Mathematics Foundation	CSI* ZC132	Linear Algebra & Optimization	3
	CSI* ZC213	Probability & Statistics	3
	CSI* ZC252	Discrete Structures for Computer Science	3
Engineering Foundation	CSI* ZC263	Digital Electronics & Microprocessors	4
Technical Arts / Professional Course	CSI* ZC163	Computer Programming	4

Core Courses (15)

Course No.	Course Title	Units
CSI* ZG525	Advanced Computer Networks	5
CSI* ZG527	Cloud Computing	5
CSI* ZC467	Computer Networks	4
CSI* ZC353	Computer Organization & Architecture	4
CSI* ZC447	Data Storage Technologies & Networks	4
CSI* ZC363	Data Structures & Algorithms	4
CSI* ZC337	Database Systems & Applications	4
CSI* ZG522	Design and Operation of Data Centers	5
CSI* ZG538	Infrastructure Management	4
CSI* ZG511	IT Infrastructure Projects & Processes	3
CSI* ZG524	Middleware Technologies	4
CSI* ZG513	Network Security	4
CSI* ZC313	Object Oriented Programming & Design	4
CSI* ZC364	Operating Systems	4
CSI* ZC327	Systems Programming	4

Pool of Electives (13)

Course No.	Course Title	Units
CSI* ZC311	Information Security	3
CSI* ZC424	Software Development for Portable Devices	3
CSI* ZC447	Data Storage Technology and Networks	4

CSI* ZC462	Network Programming	3
CSI* ZC463	Cryptography	3
CSI* ZG514	Data Warehousing	5
CSI* ZG515	Introduction to DevOps	4
CSI* ZG520	Wireless & Mobile Communication	5
CSI* ZG523	Introduction to Data Science	3
CSI* ZG526	Web Technologies	4
CSI* ZG528	Cyber Physical Systems	4
CSI* ZG532	Introduction to Data Science	5
CSI* ZG533	Service Oriented Computing	4
CSI* ZG582	Telecom Network Management	5
CSI* ZG656	Networked Embedded Applications	4

Integrated M. Tech. (Computing Systems & Infrastructure)

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	CSI* ZC132	Linear Algebra & Optimization	3	CSI* ZC213	Probability & Statistics	3
	CSI* ZC252	Discrete Structures for Computer Science	3	CSI* ZC353	Computer Organization & Architecture	4
	CSI* ZC163	Computer Programming	4	CSI* ZC363	Data Structures & Algorithms	4
	CSI* ZC263	Digital Electronics & Microprocessors	4	CSI* ZC327	Systems Programming	4
		Total	**14**		**Total**	**15**
II	CSI* ZC337	Database Systems & Applications	4	CSI* ZC313	Object Oriented Programming & Design	4
	CSI* ZC364	Operating Systems	4	CSI* ZC447	Data Storage Technologies & Networks	4
	CSI* ZC467	Computer Networks	4	CSI* ZG511	IT Infrastructure Projects & Processes	3
		Elective 1	(3 min)		Elective 2	(3 min)
		Total	**15 (min)**		**Total**	**(13 min)**
III	CSI* ZG513	Network Security	4	CSI* ZG522	Design and Operation of Data Centers	5
	CSI* ZG525	Advanced Computer Networks	5	CSI* ZG538	Infrastructure Management	4
	CSI* ZG527	Cloud Computing	5		Elective 4	(3 min)
		Elective 3	(3 min)		Elective 5	(3 min)
		Total	**(17 min)**		**Total**	**(15 min)**
IV	CSI* ZG524	Middleware Technologies	4	CSI* ZG628T	Dissertation	16
		Elective 6	(3 min)			
		Elective 7	(3 min)			
		Elective 8	(3 min)			
		Total	**(13 min)**		**Total**	**16**

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborating Organizations: Wipro Bangalore

M.Tech. (Data Science & Engineering)

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./B.Tech. or M.Sc. / MCA with minimum one-year work experience in relevant domains.

Nominal Duration: Four Semesters

Programme Structure

Core Courses (6)

Course No.	Course Title	Units
DSE* ZC416	Mathematical Foundation for Data Science	4
DSE* ZC418	Introduction to Statistical Methods	4
DSE* ZG516	Computer Organization and Software Systems	5
DSE* ZG519	Data Structures and Algorithm Design	5
DSE* ZG522	Big Data Systems	5
DSE* ZG532	Introduction to Data Science	5

Pool of Electives

Course No.	Course Title	Units
DSE* ZG515	Data Warehousing	5
DSE* ZG521	Graphs – Algorithms and Mining	5
DSE* ZG524	Deep Learning	4
DSE* ZG526	Probabilistic Graphical Models	4
DSE* ZG527	Ethics for Data Science	4
DSE* ZG528	Optimization Techniques for Analytics	5
DSE* ZG529	Data Management for Machine Learning	4
DSE* ZG530	Natural Language Processing	4
DSE* ZG531	Design of Experiments for Data Science	4
DSE* ZG537	Information Retrieval	4
DSE* ZG555	Data Visualization and Interpretation	5
DSE* ZG556	Stream Processing and Analytics	5
DSE* ZG557	Artificial and Computational Intelligence	5
DSE* ZG565	Machine Learning #*	4
DSE* ZG568	Applied Machine Learning #*	4

Machine Learning course is a prerequisite for Deep Learning elective course.

Project

Course No.	Course Title	Units
DSE* ZG628T	Dissertation	16

Semester wise pattern of courses

Year	First Semester			Second Semester		
	Course No.	**Course Title**	**Units**	**Course No.**	**Course Title**	**Units**
I	DSE* ZC416	Mathematical foundations for Data Science	4	DSE* ZC418	Introduction to Statistical Methods	4
	DSE* ZG532	Introduction to Data Science	5		Elective - I	
	DSE* ZG516	Computer Organization and System Software	5		Elective - II	
	DSE* ZG519	Data Structures and Algorithm Design	5		Elective - III	
		Total	19		Total	16 (min)
II	DSE* ZG522	Big Data Systems	5	DSE* ZG628T	Dissertation	16
		Elective - IV				
		Elective - V				
		Elective - VI				
		Total	16 (min)		Total	16

Note: In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing collaborating organization.

M. Tech. Design Engineering

Curriculum Structure

Input Requirements

The students admitted to the four-semester M.Tech. Design Engineeringmust:

(i) hold an Integrated First Degree of BITS or its equivalent such as B.E. / B.Tech. in relevant disciplines, and

(ii) be employed professionals with minimum one-year work experience in relevant domains.

Normal Duration: 4 Semesters

Curriculum Requirements:

Completion of the programme would require

a) At least 12 courses (totaling at least 48 units) towards coursework, and

b) Dissertation (16 units)

The coursework requirement for the program would consist of a set of core courses and elective courses. The core course requirement is mandatory for all students in a given programme. Rest of the coursework must be completed through elective courses.

Programme Structure

Core Courses (5)

Course No.	Course Title	Units
DE* ZG512	Finite Element Methods	5
DE* ZG541	Product Design	5
DE* ZG561	Mechanisms and Robotics	5
DE* ZG611	Dynamics & Vibrations	5
DE* ZG631	Materials Technology & Testing	5

Pool of Electives (7)

Course No.	Course Title	Units
DE* ZC415	Introduction to MEMS	4
DE* ZG511	Mechatronics	5
DE* ZG513	Tribology	5
DE* ZG514	Fracture Mechanics	5
DE* ZG515	Computational Fluid Dynamics	5
DE* ZG521	World-Class Manufacturing	5
DE* ZG522	Advanced Composites	5
DE* ZG523	Project Management	4
DE* ZG525	MechanicalSystem Design	5
DE* ZG531	Concurrent Engineering	5
DE* ZG532	Quality Assurance and Reliability	5
DE* ZG535	Advanced Engineering Mathematics	5
DE* ZG542	Machine Tool Engineering	5

DE* ZG544	Design for Additive Manufacturing	5
DE* ZG545	Advanced Control Engineering	5
DE* ZG546	Model Based System Design	5
DE* ZG548	Design for Industrial Internet of Things	5
DE* ZG612	Advanced Finite Element Modelling & Analysis	5
DE* ZG621	Computer Aided Analysis & Design	5
DE* ZG641	Theory of Elasticity and Plasticity	5

Note: In the above programme structure, the symbol * in the course numbers, can be substituted by the letters representing the collaborating organization

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	DE* ZG541	Product Design	5	DE* ZG512	Finite Element Methods	5
	DE* ZG631	Materials Technology & Testing	5	DE* ZG611	Dynamics & Vibrations	5
		Elective	4 (min)		Elective	4 (min)
		Elective	4 (min)		Elective	4 (min)
		Total	**18 (min)**		**Total**	**18 (Min)**
II	DE* ZG561	Mechanisms & Robotics	5	DE* ZG628T	Dissertation	16
		Elective	4 (min)			
		Elective	4 (min)			
		Elective	4 (min)			
		Total	**17 (min)**		**Total**	**16**

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Designed for the HRD needs of a diverse spectrum of Engineering Industries. Collaborating Organizations: SKF and John Deere, Pune

M.Tech. (Digital Manufacturing)

Input Requirements

The students admitted to the four-semester M.Tech. Digital Manufacturingmust:

(i) hold a B.E. / B.Tech. degree in EEE/Instrumentation/Mechatronics relevant disciplines, and

(ii) be employed professionals with minimum one-year work experience in relevant domains.

Normal Duration: 4 Semesters

Curriculum Requirements:

Completion of the programme would require

a) At least 12 courses (totaling at least 48 units) towards course work and
b) Dissertation (16 units)

The course work requirement for the programme would consist of a set of core courses (7) and elective courses (at least 5). The core course requirement is mandatory for all students in the programme. Rest of the course work must be completed through elective courses.

Programme Structure

Core Courses

Course No	Course Title	Units
DM* ZC472	Precision Engineering	3
DM* ZG511	Mechatronics	5
DM* ZG521	Design for Additive Manufacturing	5
DM* ZG531	High Precision Manufacturing	4
DM* ZG612	Advances in Materials, Composites and Plastics	4
DM* ZG622	Industrial IoT	4
DM* ZG631	Additive Manufacturing Process	5

Electives

Course No	Course Name	Units
DM* ZC412	Flexible Manufacturing Systems	4
DM* ZG512	Embedded System Design	4
DM* ZG522	Behavioral Operations	4
DM* ZG532	Big Data Analytics in Manufacturing	4
DM* ZG533	Manufacturing Planning and Control	5
DM* ZG534	Sustainable Manufacturing	5
DM* ZG535	Cyber Security in Manufacturing	4
DM* ZG541	Product Design	5
DM* ZG561	Mechanisms and Robotics	5

M.Tech. (Digital Manufacturing)

Semester-wise Pattern

Year	Course No.	Course Title	U	Course No.	Course Title	U
I	**Semester I**			**Semester II**		
	DM* ZG511	Mechatronics	**5**	DM* ZC472	Precision Engineering	**3**
	DM* ZG521	Design for Additive Manufacturing	**5**	DM* ZG612	Advances in Materials, Composites and Plastics	**4**
	DM* ZG531	High Precision Manufacturing	**4**	DM* ZG622	Industrial IoT	**4**
		Elective – 1	**4 (min)**		Elective – 2	**4 (min)**
		Total	**18 (min)**		**Total**	**15 (min)**
II	**Semester III**			**Semester IV**		
	DM* ZG631	Additive ManufacturingProcess	**5**	DM* ZG629T	Dissertation	**16**
		Elective – 3	**4 (min)**			
		Elective – 4	**4 (min)**			
		Elective – 5	**4 (min)**			
		Total	**17 (min)**		**Total**	**16**

M.Tech. (Embedded Systems)

Input Requirements

The students admitted to the four-semester M.Tech. Embedded Systemsmust:

(i) Employed Professionals holding an Integrated First Degree of BITS or its equivalent such as B.E. / B.Tech. / M.Sc. in relevant disciplines, and

(ii) be employed professionals with minimum one-year work experience in relevant domains.

Normal Duration: 4 Semesters

Curriculum Requirements:

Completion of the programme would require

a) At least 12 courses (totaling at least 48 units) towards coursework, and

b) Dissertation (16 units)

The coursework requirement for the program would consist of a set of core courses and elective courses. The core course requirement is mandatory for all students in a given programme. Rest of the coursework must be completed through elective courses.

Programme Structure

Core Courses (4)

Course No.	Course Title	Units
ES* ZC424	Software for Embedded Systems	3
ES* ZG512	Embedded System Design	4
ES* ZG553	Real Time Systems	5
ES* ZG641	Hardware Software Co-Design	5

Pool of Electives (25)

Course No.	Course Title	Units
ES* ZC441	Robotics	3
ES* ZC447	Data Storage Technologies & Networks	4
ES* ZC481	Computer Networks	4
ES* ZG511	Mechatronics	5
ES* ZG513	Network Security	4
ES* ZG514	Mechanisms & Robotics	5
ES* ZG520	Wireless & Mobile Communication	5
ES* ZG523	Project Management	4
ES* ZG524	Real Time Operating Systems	5
ES* ZG525	Avionics Systems	5
ES* ZG526	Advanced Computer Networks	5

Course No.	Course Title	Units
ES* ZG531	Pervasive Computing	4
ES* ZG532	Testability for VLSI	5
ES* ZG545	Control & Instrumentation for Systems	5
ES* ZG554	Reconfigurable Computing	5
ES* ZG556	DSP Based Control of Electric Drives	3
ES* ZG571	Optical Communication	5
ES* ZG573	Digital Signal Processing	3
ES* ZG611	Advanced Control Systems	5
ES* ZG612	Fault Tolerant System Design	5
ES* ZG613	Advanced Digital Signal Processing	5
ES* ZG621	VLSI Design	5
ES* ZG625	Safety Critical Embedded System Design	4
ES* ZG642	VLSI Architecture	4
ES* ZG651	Networked Embedded Applications	4

Note: In the above programme structure, the symbol * in the course numbers, can be substituted by the letters representing the collaborating organization.

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	ES* ZG512	Embedded System Design	4	ES* ZC424	Software for Embedded System	3
	ES* ZG553	Real Time Systems	5		Elective	(3 min)
		Elective	(3 min)		Elective	(3 min)
		Elective	(3 min)		Elective	(3 min)
		Total	15 (min)		Total	12 (min)
II	ES* ZG641	Hardware Software Co-Design	5	ES* ZG628T	Dissertation	16
		Elective	(3 min)			
		Elective	(3 min)			
		Elective	(3 min)			
		Total	14 (min)		Total	16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborating Organizations: Cisco, Bangalore; UTC Bangalore and Hyderabad

M.Tech. (Environmental Engineering)

Input requirements

Employed Professionals with minimum one year work experience in Environmental Science / Engineering and allied areas holding an Integrated First Degree of BITS or its equivalent such as B.E / B.Tech / or M.Sc. in relevant disciplines (Chemistry, Chemical Engineering, Civil Engineering, Biology, Microbiology, Biotechnology, Mechanical Engineering) with adequate preparation in Mathematics.

Normal Duration: 4 Semesters

Core Courses (5)

Course No	Course Title	Units
EE* ZG511	Environmental Chemistry	5
EE* ZG512	Environmental Biotechnology	5
EE* ZG513	Applied Transport Phenomena	5
EE* ZG514	Environmental Sampling and Analytical Methods	5
EE* ZG515	Environmental Management Systems	5

Pool of Electives (10)

Course No	Course Title	Units
EE* ZG521	Physico – Chemical Treatment Principles & Design for Wastewater systems	4
EE* ZG522	Biological Treatment Principles & Design for Wastewater systems	4
EE* ZG523	Environmental Statistics	4
EE* ZG611	Energy Generation and Management in Waste Treatment Plants	4
EE* ZG612	Environmental Remote Sensing and GIS	4
EE* ZG613	Environmental Systems Modelling	4
EE* ZG614	Air Pollution Control Technologies	4
EE* ZG621	Solid Waste Management	4
EE* ZG622	Environmental Process Engineering	4
EE* ZG623	Environmental Impact and Risk Assessment	4

M.Tech. Environmental Engineering

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	EE* ZG511	Environmental Chemistry	5	EE* ZG512	Environmental Biotechnology	5
	EE* ZG515	Environmental Management Systems	5		Elective	(4 min)
		Elective	(4 min)		Elective	(4 min)
		Elective	(4 min)		Elective	(4 min)
Total			18 (min)	Total		17 (min)
II	EE* ZG513	Applied Transport Phenomena	5	EE* ZG628T	Dissertation	16
	EE* ZG514	Environmental Sampling and Analytical Methods	5			
		Elective	(4 min)			
		Elective	(4 min)			
Total			18 (min)	Total		16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborating Organizations: Goa Pollution Control Board, Goa

M.Tech. Manufacturing Management

Curriculum Structure

Input Qualification

The students admitted to the four-semester M.Tech. in Manufacturing Managementmust:

(i) hold an Integrated First Degree of BITS or its equivalent such as B.E. / B.Tech. / M.Sc. in relevant disciplines, and

(ii) be employed professionals with minimum one-year work experience in relevant domains.

Normal Duration: 4 Semesters

Curriculum Requirements:

Completion of the programme would require

a) At least 12 courses (totaling at least 48 units) towards coursework, and

b) Dissertation (16 units)

The coursework requirement for the program would consist of a set of core courses and elective courses. The core course requirement is mandatory for all students in a given programme. Rest of the coursework must be completed through elective courses.

Programme Structure

Manufacturing Management Core (7)

Course No.	Course Title	Units
MM ZG515	Quantitative Methods	4
MM ZG522	Total Quality Management	4
MM ZG523	Project Management	4
MM ZG533	Manufacturing Planning and Control	5
MM ZG537	Lean Manufacturing	5
MM ZG541	Product Design	5
MM ZG621	Supply Chain Management	4

Pool of Electives (7)

Course No.	Course Title	Units
MM ZC412	Flexible Manufacturing Systems	4
MM ZC441	Human Resource Management *	4
MM ZC448	Additive Manufacturing	4
MM ZC449	IoT in Manufacturing	4
MM ZC472	Precision Engineering	3
MM ZG512	Manufacturing Strategy	4
MM ZG513	Maintenance Engineering	5
MM ZG514	Leadership and Managing Change *	4
MM ZG534	Sustainable Manufacturing	4

MM ZG535	Decision Analysis	4
MM ZG539	Six Sigma	4
MM ZG611	Strategic Management & Business Policy *****	4
MM ZG627	Managerial Corporate Finance *****	4

Note: A student may be allowed to take upto 3 courses from among the specified management domain electives which are indicated by an '*****'.

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	MMZG533	Manufacturing Planning & Control	5	MMZG621	Supply Chain Management	4
	MMZG522	Total Quality Management	4	MMZG537	Lean Manufacturing	5
	MMZG515	Quantitative Methods	4	MMZG523	Project Management	4
	MMZG541	Product Design	5		Elective	4 (min)
		Total	18		Total	17(min)
II		Elective	4 (min)	MMZG628T	Dissertation	16
		Elective	4 (min)			
		Elective	4 (min)			
		Elective	4 (min)			
		Total	16(min)		Total	16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

M.Tech. (Microelectronics)

Curriculum Structure

Input Requirements

The students admitted to the four-semester M.Tech. Microelectronicsmust:

(iii) hold an Integrated First Degree of BITS or its equivalent such as B.E. / B.Tech. / M.Sc. in relevant disciplines, and

(iv) be employed professionals with minimum one-year work experience in relevant domains.

Normal Duration: 4 Semesters

Curriculum Requirements:

Completion of the programme would require

a) At least 12 courses (totaling at least 48 units) towards coursework, and

b) Dissertation (16 units)

The coursework requirement for the program would consist of a set of core courses and elective courses. The core course requirement is mandatory for all students in a given programme. Rest of the coursework must be completed through elective courses.

Programme Structure

Core Courses (5)

Course No.	Course Title	Units
MEL* ZG611	IC Fabrication Technology	5
MEL* ZG621	VLSI Design	5
MEL* ZG631	Physics &Modeling of Microelectronic Devices	5
MEL* ZG632	Analog IC Design	5
MEL* ZG641	CAD for IC Design	5

Pool of Electives (17)

Course No.	Course Title	Units
MEL* ZC415	Introduction to MEMS	4
MEL* ZG510	RF Microelectronics	5
MEL* ZG511	Design & Analysis of Algorithms	5
MEL* ZG512	Optoelectronic Devices, Circuit & Systems	5
MEL* ZG520	Wireless & Mobile Communication	5
MEL* ZG524	Real Time Operating Systems	5
MEL* ZG526	Embedded System Design	4
MEL* ZG531	Testability for VLSI	5
MEL* ZG553	Real Time Systems	5
MEL* ZG554	Reconfigurable Computing	5
MEL* ZG573	Digital Signal Processing	3
MEL* ZG613	Advanced Digital Signal Processing	5
MEL* ZG623	Advanced VLSI Design	5
MEL* ZG625	Advanced Analog and Mixed Signal Design	5

MEL* ZG642	VLSI Architecture	4
MEL* ZG651	Hardware Software Co-Design	5
MEL* ZG652	Networked Embedded Applications	4

Note: In the above programme structure, the symbol * in the course numbers, can be substituted by the letters representing the collaborating organization

Semesterwise Pattern

Year	First Semester		U	Second Semester		U
I	MEL* ZG621	VLSI Design	5	MEL* ZG611	IC Fabrication Technology	5
	MEL* ZG631	Physics & Modeling of Microelectronic Devices	5	MEL* ZG632	Analog IC Design	5
		Elective	(4 min)	MEL* ZG641	CAD for IC Design	5
		Elective	(4 min)		Elective	(5 min)
		Total	18 (min)		Total	20 (min)
II		Elective	(4 min)	MEL*ZG628T	Dissertation	16
		Elective	5 (min)			
		Elective	5 (min)			
		Elective	5 (min)			
		Total	19 (min)		Total	16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborating Organizations: Samsung, Gurgaon

Integrated M.Tech. (Microelectronics)

Normal Duration: Eight Semesters

Type of Input: The students admitted to the Integrated M.Tech. Microelectronics programme must:

(a) hold a B.Sc. degree or its equivalent in relevant disciplines with adequate coursework in Mathematics and Physics

(b) be employed professionals with minimum one-year work experience in relevant domains.

Curriculum structure

Foundation Courses: (6)

Type of foundation	Course No.	Course Title	Units
Mathematics Foundation	MEL* ZC234	Linear Algebra and Optimization	3
	MEL* ZC222	DiscreteStructures for Computer Science	3
	MEL* ZC111	Probability & Statistics	3
Engineering Foundation	MEL* ZC112	Electrical Sciences	3
	MEL* ZC411	Signals and Systems	3
Technical Arts/Professional Course	MEL* ZC164	Computer Programming	4

Core Courses: (13)

Course No.	Course Title	Units
MEL* ZC215	Digital Design	4
MEL* ZC363	Data Structures and Algorithms	4
MEL* ZC321	Control Systems	3
MEL* ZC244	Microelectronic Circuits	3
MEL* ZC241	Microprocessor and Interfacing	4
MEL* ZC364	Analog Electronics	4
MEL* ZC342	Computer Architecture	4
MEL* ZG573	Digital Signal Processing	3
MEL* ZG621	VLSI Design	5
MEL* ZG631	Physics & Modeling of Microelectronic Devices	5
MEL* ZG611	IC Fabrication Technology	5
MEL* ZG632	Analog IC Design	5
MEL* ZG641	CAD for IC Design	5

Pool of Electives: (22)

Course No.	Course Title	Units
3rd and 4th level courses		
MEL* ZC464	Machine Learning	3
MEL* ZC382	Communication Systems	4
MEL* ZC214	Electronic Devices	3
MEL* ZC444	Artificial Intelligence	3
MEL* ZC415	Introduction to MEMS	4
MEL* ZC477	Modeling of Field Effect Nano-Devices	3
5th and 6th level courses		
MEL* ZG510	RF Microelectronics	5
MEL* ZG511	Design & Analysis of Algorithms	5
MEL* ZG512	Optoelectronic Devices, Circuit & Systems	5
MEL* ZG520	Wireless & Mobile Communication	5
MEL* ZG526	Embedded System Design	4
MEL* ZG531	Testability for VLSI	5
MEL* ZG553	Real Time Systems	5
MEL* ZG554	Reconfigurable Computing	5
MEL* ZG613	Advanced Digital Signal Processing	5
MEL* ZG623	Advanced VLSI Design	5
MEL* ZG625	Advanced Analog and Mixed Signal Design	5
MEL* ZG642	VLSI Architecture	4
MEL* ZG651	Hardware Software co-Design	5
MEL* ZG656	Networked Embedded Applications	4
MEL* ZG626	High-Speed Signaling: Jitter Modeling, Analysis, and Budgeting	4
MEL* ZG627	Power Integrity Analysis and Management for Integrated Circuits	4

Integrated M.Tech. (Microelectronics)

Semester wise Pattern

Year	Course No.	Course Title	U	Course No.	Course Title	U
		Semester I			**Semester II**	
I	MEL* ZC234	Linear Algebra and Optimization	**3**	MEL* ZC111	Probability & Statistics	**3**
	MEL* ZC112	Electrical Sciences	**3**	MEL* ZC215	Digital Design	**4**
	MEL* ZC164	Computer Programming	**4**	MEL* ZC363	Data Structures and Algorithm	**4**
	MEL* ZC222	Discrete Structures for Computer Science	**3**	MEL* ZC321	Control Systems	**3**
		Total	**13**		**Total**	**14**
		Semester III			**Semester IV**	
II	MEL* ZC244	Microelectronic Circuits	**3**	MEL* ZC364	Analog Electronics	**4**
	MEL* ZC411	Signals & Systems	**3**	MEL* ZG573	Digital Signal Processing	**3**
	MEL* ZC241	Microprocessor and Interfacing	**4**	MEL* ZC342	Computer Architecture	**4**
		Elective	**3 (min)**		Elective	**3 (min)**
		Total	**13 (min)**		**Total**	**14 (min)**
		Semester V			**Semester VI**	
III	MEL* ZG621	VLSI Design	**5**	MEL* ZG632	Analog IC Design	**5**
	MEL* ZG631	Physics & Modeling of Microelectronic Devices	**5**	MEL* ZG641	CAD For IC Design	**5**
	MEL* ZG611	IC Fabrication Technology	**5**		Elective	**3 (min)**
		Elective	**3 (min)**		Elective	**3 (min)**
		Total	**18 (min)**		**Total**	**16(min)**
		Semester VII			**Semester VIII**	
IV		Elective	**3 (min)**	MEL* ZG628T	Dissertation	**16**
		Elective	**3 (min)**			
		Elective	**4 (min)**			
		Elective	**4 (min)**			
		Total	**14 (min)**		**Total**	**16**

Note: In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

M.Tech. (Pharmaceutical Operations and Management)

Curriculum Structure

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent, with minimum one-year work experience in relevant domains.

Normal Duration: Four Semesters

Core Courses

Course No.	Course Title	Units
POM*ZG534	Advanced Pharmaceutical Technology	5
POM*ZG515	Pharmaceutical Administration and Management	5
POM*ZG525	Pharmaceutical Process Development and Scale-up	4
POM*ZG522	Quality Assurance and Regulatory Affairs	5

Pool of Electives

Course No.	Course Title	Units
POM* ZG551	Advanced Physical Pharmaceutics	5
POM* ZG511	Disinfection and Sterilization	4
POM* ZG512	Dosage Form Design	5
POM*ZG513	Financial Management	4
POM*ZC441	Human Resource Management	4
POM*ZG545	Intellectual Property Rights and Pharmaceuticals	3
POM*ZC471	Management Information Systems	3
POM*ZG531	Manufacturing Organization and Management	5
POM* ZG541	Modern Analytical Techniques	4
POM*ZG542	Production and Operations Management	4
POM*ZG523	Project Management	4
POM*ZG521	Statistical Process Control	5
POM*ZG611	Strategic Management & Business policy	5
POM*ZG621	Supply Chain Management	4
POM* ZG631	TQM Tools and Techniques	5

Dissertation

Course No.	Course Title	Units
POM*ZG628T	Dissertation	16

M.Tech. (Pharmaceutical Operations and Management)

Semesterwise Pattern

Year	First Semester		U	Second Semester		U
I	POM*ZG515	Pharmaceutical Administration and Management	5	POM*ZG534	Advanced Pharmaceutical Technology	5
	POM*ZG522	Quality Assurance & Regulatory Affairs	5		Elective	(5 min)
		Elective	(5 min)		Elective	(3 min)
		Elective	(5 min)		Elective	(3 min)
Total			20 (min)	Total		16 (min)
II	POM*ZG525	Pharmaceutical Process Development & Scale-up	4	POM* ZG628T	Dissertation	16
		Elective	(4 min)			
		Elective	(4 min)			
		Elective	(5 min)			
Total			17 (min)	Total		16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Designed for the HRD needs of a diverse spectrum of Pharmaceutical Industries. Collaborating Organizations: Lupin, Mumbai; Sun Pharmaceutical Industries, Vadodara

M.Tech. (Quality Management)
Curriculum Structure

Input Qualification
The students admitted to the four-semester M.Tech. in Quality Managementmust:

I. hold an Integrated First Degree of BITS or its equivalent such as B.E. / B.Tech. / M.Sc. in relevant disciplines, and
II. be employed professionals with minimum one-year work experience in relevant domains.

Normal Duration: 4 Semesters
Curriculum Requirements:
Completion of the programme would require

a) At least 12 courses (totaling at least 48 units) towards coursework, and
b) Dissertation (16 units)

The coursework requirement for the program would consist of a set of core courses and elective courses. The core course requirement is mandatory for all students in a given programme. Rest of the coursework must be completed through elective courses.

Programme Structure

Quality Management Core (7)

Course No.	Course Title	Units
QM ZG515	Quantitative Methods	4
QM ZG523	Project Management	4
QM ZG524	Quality Management Systems	5
QM ZG526	Operations Management	5
QM ZG528	Reliability Engineering	5
QM ZG531	Statistical Quality Control	5
QM ZG532	Total Quality Management	4

Pool of Electives(7)

Course No.	Course Title	Units
QM ZC441	Human Resource Management	4
QM ZG514	Leadership & Managing Change	4
QM ZG535	Decision Analysis	4
QM ZG536	Design of Experiments	4
QM ZG611	Strategic Management & Business Policy	4
QM ZG621	Supply Chain Management	4
QM ZG661	Software Quality Management	4
QM ZG663	Concurrent Engineering	5
QM ZC472	Precision Engineering	3
QM ZG539	Six Sigma	4

Project

Course No.	Course Title	Units
BITS ZG628T	Dissertation	16

M.Tech. (Quality Management)

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	QMZG524	Quality Management Systems	5	QMZG531	Statistical Quality Control	5
	QMZG532	Total Quality Management	4	QMZG526	Operations Management	5
	QMZG515	Quantitative Methods	4	QMZG523	Project Management	4
	QMZG528	Reliability Engineering	5		Elective	(4 min)
		Total	18		Total	18 (min)
II		Elective	(4 min)	QMZG628T	Dissertation	16
		Elective	(4 min)			
		Elective	(4 min)			
		Elective	(4 min)			
		Total	16 (min)		Total	16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

M.Tech. (Sanitation Science, Technology and Management)

Type of Input: Integrated First degree of BITS or its equivalent in the areas of Civil / Chemical Engineering, or an M.Sc. in Chemistry / Biology / Environmental Science with minimum one year of work experience in relevant domains. Exceptions can be made if a candidate's first degree is outside the above mentioned fields, but has substantial experience in the field of sanitation.

Nominal Duration: Four Semesters

Programme Structure:

Core Courses

Course No.	Course Title	Units
SSTM* ZG511	Sanitation Technology	5
SSTM* ZG512	Sanitation and Public Health	5
SSTM* ZG513	Sanitation Governance, Behavioral Change and Advocacy	5
SSTM* ZG514	Sanitation Financing & Project management	5
SSTM* ZG515	Emergency Sanitation & Leadership	5
SSTM* ZG516	Environmental Sampling and Analytical Methods	5

Pool of Electives

Course No.	Course Title	Units
SSTM* ZG521	Environmental Chemistry	5
SSTM* ZG522	Environmental Biotechnology	5
SSTM* ZG523	Biological Treatment Principles and Design of Waste Water Systems	4
SSTM* ZG524	Environmental Statistics	4
SSTM* ZG525	Environmental Systems Modelling	4
SSTM* ZG526	Solid Waste Management	4
SSTM* ZG527	Environmental Management Systems	5
SSTM* ZG528	Environmental Impact and Risk Assessment	4

Dissertation

Course No.	Course Title	Units
SSTM* ZG628T	Dissertation	16

M.Tech. (Sanitation Science, Technology and Management)

Semesterwise pattern

Year	First Semester			Second Semester		
	Course No.	**Course Title**	**Units**	**Course No.**	**Course Title**	**Units**
I	SSTM* ZG511	Sanitation Technology	5	SSTM* ZG514	Sanitation Financing & Project Management	5
	SSTM* ZG512	Sanitation and Public Health	5	SSTM* ZG515	Emergency Sanitation & Leadership	5
		Elective I	4 to 5	SSTM* ZG516	Environmental Sampling and Analytical Methods	5
		Elective II	4 to 5		Elective III	4 to 5
	Total		18-20	Total		19-20
II	SSTM* ZG513	Sanitation Governance, Behavioral Change and Advocacy	5	SSTM* ZG628T	Dissertation	16
		Elective IV	4/5			
		Elective V	4/5			
		Elective VI	4/5			
	Total		17/20	Total		16

M.Tech. (Software Engineering)(4-semester)
Curriculum Structure

Type of Input: Employed professionals holding B Tech., BE, M.Sc., MCA or equivalent in relevant disciplines with minimum one year of work experience in relevant domains.

Nominal Duration: Four Semesters

List of Core Courses (5)

Course No.	Course Title	Units
SE* ZG651	Software Architecture	5
SE* ZG527	Cloud Computing	5
SE* ZG544	Agile Software Processes	4
SE* ZG685	Software Product Management	5
SE* ZG501	Software Quality Assurance and Testing	4

The specializations for M.Tech. in Software Engineering

Specializations
Full Stack Engineering (FSE)
Software Product Management (SPM)

Specialization Requirements:

a) For any specialization, 4 courses (including mandatory electives marked #) are to be selected for that specialization.
b) For graduating without a specialization, at least 3 courses from those marked # (from either specialization) to be selected.

Note:

a) Student can also obtain the degree without any specialization.
b) # indicates mandatory elective for this specialization

Pool of Electives for specialization 1: Full Stack Engineering (FSE) (12)

Course No.	Course Title	Units
SE* ZG585	Cross Platform Application Development	4
SE* ZG514	Introduction to DevOps#	4
SE* ZG583	Scalable Services#	5
SE* ZG552	Software Testing Methodologies	4
SE* ZG503	Full-stack Application Development#	4
SE* ZG518	Database Design & Applications	5
SE* ZG504	API-based Products	4
SE* ZG505	User Experience Design	4
SE* ZG530	Design of Conversational Experiences	4
SE* ZG506	API-driven Cloud Native Solutions	5
SE* ZG587	Open Source Software Engineering	4
SE* ZG512	Object Oriented Analysis and Design	4

Pool of Electives for specialization 2: Software Product Management (SPM) (9)

Course No.	Course Title	Units
SE* ZG507	Product Discovery and Requirements Engineering#	4
SE* ZG508	Product Strategy and Planning#	4
SE* ZG509	Communication, Estimation and Negotiation#	4
SE* ZG510	Product Analytics	5
SE* ZG504	API-based Products	4
SE* ZG505	User Experience Design	4
SE* ZC410	Marketing	4
SE* ZG622	Software Project Management	4
SE* ZG587	Open Source Software Engineering	4

General Pool of Electives (10)

Course No.	Course Title	Units
SE* ZG519	Data Structures & Algorithms Design	5
SE* ZG555	Data visualization and Interpretation	5
SE* ZG557	Artificial and Computational Intelligence	5
SE* ZG569	Blockchain Technologies & Systems	4
SE* ZG681	Cyber Security	4
SE* ZG515	Data Warehousing	5
SE* ZG568	Applied Machine Learning	4
SE* ZG566	Secure Software Engineering	5
SE* ZG589	Middleware Technologies	4
SE* ZG502	Advanced topics in Software Engineering	4

Project

Course No.	Course Title	Units
SE*ZG628T	Dissertation	16

Curriculum Requirements:

Completion of the programme would require:

a) 12 courses (totaling minimum of 48 units) towards course work, and
b) Dissertation (16 Units)

Semester-wise pattern of courses

<table>
<tr><th rowspan="2">Year</th><th colspan="3">First Semester</th><th colspan="3">Second Semester</th></tr>
<tr><th>Course No.</th><th>Course Title</th><th>U</th><th>Course No.</th><th>Course Title</th><th>U</th></tr>
<tr><td rowspan="5">I</td><td>SE* ZG651</td><td>Software Architecture</td><td>5</td><td>SE*ZG501</td><td>Software Quality Assurance and Testing</td><td>4</td></tr>
<tr><td>SE* ZG527</td><td>Cloud Computing</td><td>5</td><td></td><td>Elective 1</td><td rowspan="3">12 (min)</td></tr>
<tr><td>SE* ZG544</td><td>Agile Software Processes</td><td>4</td><td></td><td>Elective 2</td></tr>
<tr><td>SE* ZG685</td><td>Software Product Management</td><td>5</td><td></td><td>Elective 3</td></tr>
<tr><td colspan="2">Total</td><td>19</td><td colspan="2">Min Total</td><td>16</td></tr>
<tr><td rowspan="5">II</td><td></td><td>Elective 4</td><td rowspan="4">16 (min)</td><td rowspan="4">SE*ZG628T</td><td rowspan="4">Dissertation</td><td rowspan="4">16</td></tr>
<tr><td></td><td>Elective 5</td></tr>
<tr><td></td><td>Elective 6</td></tr>
<tr><td></td><td>Elective 7</td></tr>
<tr><td colspan="2">Min Total</td><td>16</td><td colspan="2">Total</td><td>16</td></tr>
</table>

M. Tech. Software Engineering (8-semesters)

Program Structure

Type of Input:	Employed professionals holding B.Sc. / BCA degree or its equivalent in relevant disciplines with adequate background in Mathematics and minimum one year of work experience in relevant domains.
Nominal Duration:	Eight Semesters

Foundation Courses

Category	CourseNo.	CourseTitle	Units
MathematicsFoundation	SE* ZC234	LinearAlgebra&Optimization[$]	3
	SE* ZC111	ProbabilityandStatistics[$]	3
	SE* ZC222	DiscreteStructuresforComputer Science[$]	3
EngineeringFoundation	SE* ZC263	DigitalElectronicsand Microprocessors[$]	4
Technical Arts/ProfessionalCourses	SE* ZC211	PrinciplesofManagement	3
	SE* ZC312	TechnicalReportWriting	3
	SE* ZC163	ComputerProgramming[$]	4

[$]MandatoryFoundationCourses

Core Courses (14)

CourseNo.	CourseTitle	Units
SE*ZC313	ObjectOrientedProgramming&Design	4
SE*ZC333	SystemsProgramming	4
SE*ZC337	DatabaseSystems &Applications	4
SE*ZC344	SoftwareEngineering	4
SE*ZC353	ComputerOrganization&Architecture	4
SE*ZC363	DataStructures &Algorithms	4
SE*ZC364	OperatingSystems	4
SE*ZC373	CompilerDesign	4
SE*ZC467	ComputerNetworks	4
SE*ZG527	CloudComputing	5
SE*ZG544	AgileSoftwareProcesses	4
SE* ZG501	Software Quality Assurance and Testing	4
SE*ZG651	SoftwareArchitectures	5
SE*ZG685	SoftwareProductManagement	5

The specializations for Integrated M.Tech. Software Engineering

Specializations
Full Stack Engineering (FSE)
Software Product Management (SPM)

Specialization Requirements:

a) For any specialization, 4 courses (including mandatory electives marked #) are to be selected for that specialization.
b) For graduating without a specialization, at least 3 courses from those marked # (from either specialization) to be selected.

Note:

a) Student can also obtain the degree without any specialization.
b) [#]indicates mandatory elective for this specialization

Pool of Electives for specialization 1: Full Stack Engineering (FSE) (12)

Course No.	Course Title	Units
SE* ZG585	Cross Platform Application Development	4
SE* ZG514	Introduction to DevOps#	4
SE* ZG583	Scalable Services#	5
SE* ZG552	Software Testing Methodologies	4
SE* ZG503	Full-stack Application Development#	4
SE* ZG518	Database Design & Applications	5
SE* ZG504	API-based Products	4
SE* ZG505	User Experience Design	4
SE* ZG530	Design of Conversational Experiences	4
SE* ZG506	API-driven Cloud Native Solutions	5
SE* ZG587	Open Source Software Engineering	4
SE* ZG512	Object Oriented Analysis and Design	4

Pool of Electives for specialization 2: Software Product Management (SPM) (9)

Course No.	Course Title	Units
SE* ZG507	Product Discovery and Requirements Engineering#	4
SE* ZG508	Product Strategy and Planning#	4
SE* ZG509	Communication, Estimation and Negotiation#	4
SE* ZG510	Product Analytics	5
SE* ZG504	API-based Products	4
SE* ZG505	User Experience Design	4
SE* ZC410	Marketing	4
SE* ZG622	Software Project Management	4
SE* ZG587	Open Source Software Engineering	4

General Pool of Electives (12)

Course No.	Course Title	Units
SE*ZC425	DataMining	3
SE*ZC472	ComputerGraphics	3
SE* ZG519	Data Structures & Algorithms Design	5
SE* ZG555	Data visualization and Interpretation	5
SE* ZG557	Artificial and Computational Intelligence	5
SE* ZG569	Blockchain Technologies & Systems	4
SE* ZG681	Cyber Security	4
SE* ZG515	Data Warehousing	5
SE* ZG568	Applied Machine Learning	4
SE* ZG566	Secure Software Engineering	5
SE* ZG589	Middleware Technologies	4
SE* ZG502	Advanced topics in Software Engineering	4

Project

Course No.	Course Title	Units
SE* ZG628T	Dissertation	16

Curriculum Requirements:
Completion of the programme would require:

a) 28 courses (totaling minimum of 103 units) towards course work, and
b) Dissertation (16 Units)

Semester-wisepatternofcourses

Year	First Semester			SecondSemester		
	Course No.	**Course Title**	**U**	**Course No.**	**Course Title**	**U**
I	SE*ZC222	DiscreteStructuresforComputer Science	3	SE*ZC313	ObjectOriented Programming&Design	4
	SE*ZC234	LinearAlgebra&Optimization	3	SE*ZC333	SystemsProgramming	4
	SE*ZC163	ComputerProgramming	4	SE*ZC353	ComputerOrganization& Architecture	4
	SE*ZC263	DigitalElectronics& Microprocessors	4	SE*ZC363	DataStructures& Algorithms	4
		Total	14		Total	16
II	SE*ZC111	Probability&Statistics	3	SE*ZC373	ComplierDesign	4
	SE*ZC337	DatabaseSystems&Applications	4	SE*ZC344	SoftwareEngineering	4
	SE*ZC364	OperatingSystems	4	SE*ZC467	ComputerNetworks	4
		Elective	3(Min)		Elective	3(Min)
		Total	Min 14		Total	Min 15
III	SE*ZG651	SoftwareArchitectures	5	SE*ZG685	SoftwareProduct Management	5
	SE*ZG527	CloudComputing	5	SE* ZG501	Software Quality Assurance and Testing	4
		Elective	3(min)		Elective	3(min)
		Elective	3(min)		Elective	3(min)
		Total	Min 16		Total	Min 15
IV	SE*ZG544	AgileSoftwareProcesses	4	SE*ZG628T	Dissertation	16
		Elective	3(min)			
		Elective	3(min)			
		Elective	3(min)			
		Total	Min 13		Total	16

Collaborating organizations: Wipro Technologies, Dell, SAP Labs, Sabre, EMC, Oracle, Bangalore; Avaya,Tech Mahindra, Pune; Capgemini, Mumbai; Qualcomm, Hyderabad

M.Tech. Software Systems (4-semester) with specializations

Curriculum Structure

Input Requirements
Employed professionals holding an Integrated First Degree of BITS or its equivalent in relevant disciplines, with minimum one-year work experience in relevant domains.

Normal duration: Four semesters

Programme Structure

Core Courses

Course No.	Course Title	Units
SS* ZG518	Database Design & Applications *	5
SS* ZG519	Data Structures & Algorithms Design *	5
SS* ZG526	Distributed Computing	5
SS* ZG653	Software Architectures	5

* Dean, WILP may be permitted the operational flexibility of substituting these courses with others from the elective pool(s) based on certain input criteria.

General Pool of Electives

Course No.	Course Title	Units
SS* ZC444	Artificial Intelligence	3
SS* ZG514	Object Oriented Analysis & Design	4
SS* ZG516	Computer Organization and Software Systems	5
SS* ZG547	Usability Engineering	5
SS* ZG554	Distributed Data Systems	5
SS* ZG562	Software Engineering and Management	5
SS* ZG599	Natural Language Processing	4

Specialization for M.Tech. Software Systems

i) Pool of courses for Specialization 1: Networks and Cloud

Course No.	Course Title	Units
SS* ZC447	Data Storage Technologies and Networks	4
SS* ZC462	Network Programming	3
SS* ZC467	Computer Networks #	4
SS* ZG513	Network Security	4
SS* ZG520	Wireless and Mobile Communication	5
SS* ZG522	Design and Operation of Data Centres	5
SS* ZG525	Advanced Computer Networks	5

SS* ZG527	Cloud Computing #	5
SS* ZG578	Mobile Networks	4
SS* ZG580	Software Defined Networks	5
SS* ZG586	Edge Computing	5
SS* ZG589	Middleware Technologies	4

Requirements:

- 5 courses / 19 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

ii) Pool of courses for Specialization 2: Security

Course No.	Course Title	Units
SS* ZC463	Cryptography	3
SS* ZG513	Network Security	4
SS* ZG566	Secure Software Engineering	5
SS* ZG567	AI and ML Techniques in Cyber Security	5
SS* ZG569	Blockchain Technologies & Systems	4
SS* ZG570	Cloud, IoT and Enterprise Security	5
SS* ZG575	Ethical Hacking	3
SS* ZG576	Identity and Access Management Technologies	4
SS* ZG588	Cyber Crimes, Forensics and Incident Handling	4
SS* ZG681	Cyber Security#	4

Requirements:

- 5 courses / 18 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

iii) Pool of courses for Specialization 3: Internet of Things

Course No.	Course Title	Units
SS* ZG512	Embedded Systems Design#	4
SS* ZG527	Cloud Computing	5
SS* ZG528	Cyber Physical Systems#	4
SS* ZG556	Stream Processing and Analytics	5
SS* ZG584	Data Management for IoT	5
SS* ZG574	Embedded Network Security	4

SS* ZG585	Cross Platform Application Development	4
SS* ZG656	Networked Embedded Applications	4

Requirements:

- 5 courses / 20 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

iv) Pool of courses for Specialization 4: Data Analytics

Course No.	Course Title	Units
SS* ZC416	Mathematical Foundations for Data Science #	4
SS* ZC425	Data Mining	3
SS* ZG515	Data Warehousing	5
SS* ZG529	Deep Learning	4
SS* ZG599	Natural Language Processing	4
SS* ZG536	Advanced Statistical Techniques for Analytics	4
SS* ZG537	Information Retrieval	4
SS* ZG568	Applied Machine Learning	4
SS* ZG577	Metaheuristics for Optimization	4

Requirements:

- 5 courses / 18 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

v) Pool of courses for Specialization 5: Embedded Systems

Course No.	Course Title	Units
SS* ZC427	Software for Embedded Systems	4
SS* ZG512	Embedded System Design #	4
SS* ZG553	Real Time Systems	5
SS* ZG579	Real Time Scheduling	4
SS* ZG626	Hardware Software Co-Design	5
SS* ZG656	Networked Embedded Applications	4
SS* ZG682	Embedded Middleware Design	5
SS* ZG683	Fault Tolerant Embedded System	4
SS* ZG684	Parallel Embedded Architectures	4

Requirements:

- 5 courses / 20 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

Semesterwise pattern

Year	Semester I		U	Semester II		U
I	SS* ZG519	Data Structures & Algorithms Design	5	SS* ZG653	Software Architectures	5
	SS* ZG518	Database Design & Applications	5	Elective 2		3(min)
	SS* ZG526	Distributed Computing	5	Elective 3		3(min)
	Elective 1		3(min)	Elective 4		4(min)
	Total		**18(min)**	**Total**		**15 (min)**
II	Elective 5		3(min)	SS* ZG628T	Dissertation	16
	Elective 6		3(min)			
	Elective 7		4(min)			
	Elective 8		4(min)			
	Total		**14(min)**	**Total**		**16**

Designed for the HRD requirements of a diverse spectrum of ITIndustries. Collaborative Organizations: Wipro Technologies, Bangalore; TCS, Hyderabad; Cisco, Bangalore; Samsung , Gurgaon

Integrated M.Tech. (Software Systems)

Curriculum Structure

Input Qualification

The students admitted to the **M.Tech. Software Systems (8 Semesters)** programme must:

i) hold a B.Sc. / BCA degree or its equivalent in relevant disciplines with adequate background in Mathematics, and

ii) be employed professionals with minimum one-year work experience in relevant domains.

Normal Duration: Eight semesters

Programme Structure

Foundation Courses

Category	Course No.	Course Title	Units
Mathematics Foundation	SS* ZC234	Linear Algebra & Optimization $	3
	SS* ZC111	Probability and Statistics $	3
	SS* ZC222	Discrete Structures for Computer Science $	3
Engineering Foundation	SS* ZC263	Digital Electronics and Microprocessors $	4
Technical Arts / Professional Courses	SS* ZC241	Principles of Management	3
	SS* ZC312	Technical Report Writing	3
	SS* ZC163	Computer Programming $	4

$ Mandatory Foundation Courses

Core courses (12)

Course No.	Course Title	Units
SS* ZC313	Object Oriented Programming & Design	4
SS* ZC327	Systems Programming	4
SS* ZC328	Software Testing	3
SS* ZC337	Database Systems & Applications	4
SS* ZC343	Software Engineering	4
SS* ZC353	Computer Organization & Architecture	4
SS* ZC363	Data Structures & Algorithms	4
SS* ZC364	Operating Systems	4
SS* ZC373	Compiler Design	4
SS* ZC467	Computer Networks	4
SS* ZG526	Distributed Computing	5
SS* ZG653	Software Architectures	5

General Pool of Electives

Course No.	Course Title	Units
SS* ZC444	Artificial Intelligence	3
SS* ZG514	Object Oriented Analysis & Design	4
SS* ZG516	Computer Organization and Software Systems	5
SS* ZG547	Usability Engineering	5
SS* ZG554	Distributed Data Systems	5
SS* ZG562	Software Engineering and Management	5
SS* ZG599	Natural Language Processing	4

Specialization for M.Tech. Software Systems (8 semesters)

i) Pool of courses for Specialization 1: Networks and Cloud

Course No.	Course Title	Units
SS* ZC447	Data Storage Technologies and Networks	4
SS* ZC462	Network Programming	3
SS* ZC467	Computer Networks #	4
SS* ZG513	Network Security	4
SS* ZG520	Wireless and Mobile Communication	5
SS* ZG522	Design and Operation of Data Centres	5
SS* ZG525	Advanced Computer Networks	5
SS* ZG527	Cloud Computing #	5
SS* ZG578	Mobile Networks	4
SS* ZG580	Software Defined Networks	5
SS* ZG586	Edge Computing	5
SS* ZG589	Middleware Technologies	4

Requirements:

- 5 courses / 19 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

ii) Pool of courses for Specialization 2: Security

Course No.	Course Title	Units
SS* ZC463	Cryptography	3
SS* ZG513	Network Security	4
SS* ZG566	Secure Software Engineering	5
SS* ZG567	AI and ML Techniques in Cyber Security	5

SS* ZG569	Blockchain Technologies & Systems	4
SS* ZG570	Cloud, IoT and Enterprise Security	5
SS* ZG575	Ethical Hacking	3
SS* ZG576	Identity and Access Management Technologies	4
SS* ZG588	Cyber Crimes, Forensics and Incident Handling	4
SS* ZG681	Cyber Security#	4

Requirements:

- 5 courses / 18 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

iii) Pool of courses for Specialization 3: Internet of Things

Course No.	Course Title	Units
SS* ZG512	Embedded Systems Design#	4
SS* ZG527	Cloud Computing	5
SS* ZG528	Cyber Physical Systems#	4
SS* ZG556	Stream Processing and Analytics	5
SS* ZG584	Data Management for IoT	5
SS* ZG574	Embedded Network Security	4
SS* ZG585	Cross Platform Application Development	4
SS* ZG656	Networked Embedded Applications	4

Requirements:

- 5 courses / 20 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

iv) Pool of courses for Specialization 4: Data Analytics

Course No.	Course Title	Units
SS* ZC416	Mathematical Foundations for Data Science #	4
SS* ZC425	Data Mining	3
SS* ZG515	Data Warehousing	5
SS* ZG529	Deep Learning	4
SS* ZG599	Natural Language Processing	4
SS* ZG536	Advanced Statistical Techniques for Analytics	4
SS* ZG537	Information Retrieval	4
SS* ZG568	Applied Machine Learning	4

SS* ZG577	Metaheuristics for Optimization	4

Requirements:

- 5 courses / 18 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

v) Pool of courses for Specialization 5: Embedded Systems

Course No.	Course Title	Units
SS* ZC427	Software for Embedded Systems	4
SS* ZG512	Embedded System Design #	4
SS* ZG553	Real Time Systems	5
SS* ZG579	Real Time Scheduling	4
SS* ZG626	Hardware Software Co-Design	5
SS* ZG656	Networked Embedded Applications	4
SS* ZG682	Embedded Middleware Design	5
SS* ZG683	Fault Tolerant Embedded System	4
SS* ZG684	Parallel Embedded Architectures	4

Requirements:

- 5 courses / 20 units (min) are to be chosen from the designated pool of courses for this specialization.
- # indicates mandatory course for this specialization. Other courses form the pool of electives.

Integrated M.Tech. (Software Systems)

Semesterwise Pattern

Year	First Semester		Units	Second Semester		Units
I	SS* ZC222	Discrete Structures for Computer Science	3	SS* ZC313	Object Oriented Programming & Design	4
	SS* ZC234	Linear Algebra & Optimization	3	SS* ZC327	Systems Programming	4
	SS* ZC163	Computer Programming	4	SS* ZC353	Computer Organization & Architecture	4
	SS* ZC263	Digital Electronics & Microprocessors	4	SS* ZC363	Data Structures & Algorithms	4
		Total	14		Total	16
II	SS* ZC111	Probability & Statistics	3	SS* ZC373	Complier Design	4
	SS* ZC337	Database Systems & Applications	4	SS* ZC343	Software Engineering	4
	SS* ZC364	Operating Systems	4	SS* ZC481	Computer Networks	4
		Elective	3 (Min)	SS*ZC328	Software Testing	3
		Total	14(Min)		Total	15
III	SS* ZG526	Distributed Computing	5	SS*ZG653	Software Architectures	5
		Elective	3(min)		Elective	3(min)
		Elective	4(min)		Elective	4(min)
		Elective	4(min)		Elective	4(min)
		Total	16(min)		Total	16(min)
IV		Elective	4(min)	SS* ZG628T	Dissertation	16
		Elective	4(min)			
		Elective	4(min)			
		Elective	4(min)			
		Total	16(min)		Total	16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

Designed for the HRD requirements of a diverse spectrum of IT Industries. Collaborative Organizations: Wipro Technologies, Bangalore; TCS, Hyderabad; Cisco, Bangalore; Samsung, Gurgaon

M.Tech. (Systems Engineering)

Curriculum Structure

Input Requirements

Employed professionals holding an Integrated First Degree of BITS or its equivalent in relevant disciplines, with minimum one-year work experience in relevant domains.

Normal duration : Four Semesters

Programme Structure

Core Courses : None.

Pool of Electives

Course No.	Course Title	Units
SE* ZG527	Cloud Computing	5
SE* ZC425	Data Mining	3
SE*ZC447	Data Storage Technologies & Networks	4
SE*ZG514	Data Warehousing	5
SE* ZC451	Internetworking Technologies	3
SE*ZC473	Multimedia Computing	3
SE*ZC462	Network Programming	3
SE*ZG513	Network Security	4
SE* ZG512	Object Oriented Analysis & Design	4
SE* ZG531	Pervasive Computing	4
SE* ZG524	Real Time Operating Systems	5
SE* ZG548	Advanced Data Mining	4
SE* ZG553	Real Time Systems	5
SE* ZG622	Software Project Management	4
SE* ZG661	Software Quality Management	4
SE* ZG552	Software Testing Methodologies	4
SE* ZG582	Telecom Network Management	5
SE* ZG520	Wireless & Mobile Communication	5

Note: In the above programme, the symbol '*' in the course numbers, can be substituted by the letters representing the collaborating organization.

M.Tech. (Systems Engineering)

Semesterwise Pattern

Year	First Semester		U	Second Semester		U
I	SE* ZG514	Data Warehousing	5	SE* ZG661	Software Quality Management	4
	SE* ZG512	Object Oriented Analysis & Design	4	SE* ZG531	Pervasive Computing	4
				SE* ZC425	Data Mining	3
	SE* ZG524	Real Time Operating Systems	5	SE* ZG552	Software Testing Methodologies	4
	SE* ZG520	Wireless & Mobile Communication	5			
		Total	19		Total	15
II	SE* ZG622	Software Project Management	4	SE* ZG628T	Dissertation	16
	SE* ZG527	Cloud Computing	5			
	SE* ZG582	Telecom Network Management	5			
	SE* ZG513	Network Security	4			
		Total	18		Total	16

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

Collaborative Organizations: Wipro Infotech, Bangalore

MBA programmes

Input Qualification:

The students admitted to the proposed four-semester MBA programsmust:

(i) hold an Integrated First Degree of BITS or its equivalent and

(ii)be employed professionals with adequate work experience in relevant domains.

Curriculum Requirements for MBA programs

The nature of the input to these programs and the objectives / orientation of Work Integrated Learning Programs are different from those of the on-campus programs. Students interested in these programs are seeking continuing higher management education and focus in the chosen technical domain of study, which would enable their career progression within their industry. It is also to be observed that learning and coursework in these programs are integrated within a professional / technical environment.

Based on these facts and observations the curriculum has been designed to be in strong alignment with on-campus program at the core but with sufficient flexibility for customization to meet specific requirements of a target student population.

Completion of the program would require:

(i) At least 13 courses (totaling at least 52 units) towards coursework, and

(ii) Project (12 units).

The Department concerned may identify 4 to 8 courses out of the coursework requirement for each program as the **Management Core** requirement, and 4 to 6 courses of the coursework requirement for each program as the **Domain Core** requirement. The core requirements are mandatory for all students in a given program. However in certain highly specialized areas, some variation in the core requirements may be permitted. Rest of the coursework must be completed through elective courses.

The curriculum requirements common to all MBA programs is given below:

Category	No. of Units Required	No. of Courses Required
ManagementCore	24-40	6-8
Domain Core	16-25	4-6
Electives	3-15	1-3
Subtotal	52 (min)	13 (min)
Project	12	1
Total	64 (min)	14 (min)

Project: As Project is based on the work environment of the student, the number of units for Project may be kept as 12. Normally, the Project is to be undertaken in the final semester of the program.

MBA (Business Analytics)

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./ M.Sc. in relevant disciplines, with minimum one year work experience in relevant domains
(OR)
Employed professionals holding a three year undergraduate degree in such areas as Mathematics, Statistics, Science, Economics, Commerce, and Business Management, and having studied at least one course in mathematics or statistics at the high school or higher level, and with minimum two years of work experience in relevant business domains.

Nominal Duration: Four Semesters

Curriculum Requirements:

Completion of the programme would require:

(a) At least 14 courses (totaling minimum of 56 units) towards course work, and

(b) Project (8 Units)

Programme Structure:

Management Core (8 Courses)

Course No.	Course Title	Units
MBA* ZC411	Marketing	4
MBA* ZC415	Financial and Management Accounting	4
MBA* ZC416	Managerial Economics	4
MBA* ZC417	Quantitative Methods	4
MBA* ZG511	Managing People & Organizations	4
MBA* ZG521	Financial Management	4
MBA* ZG526	Operations Management	4
MBA* ZG611	Strategic Management and Business Policy	4

Business Analytics Core (4 Courses)

Course No.	Course Title	Units
MBA* ZC413	Analytics for Competitive Advantage	4
MBA* ZG512	Predictive Analytics	4
MBA* ZG536	Foundations of Data Science	4
MBA* ZG538	Advanced Statistical Methods	4

Pool of Electives

Course No.	Course Title	Units
MBA* ZG517	Financial Analytics	4
MBA* ZG523	Project Management	4
MBA* ZG539	Data Visualization and Communication	4
MBA* ZG563	Analytics for HR	4

MBA* ZG564	Models in Marketing	4
MBA* ZG565	Supply Chain Analytics	4
MBA* ZG566	Analytics for Marketing	4
MBA* ZG567	Analytics for Retail Industry	4
MBA* ZG568	Operations Research Models	4
MBA* ZG569	Analytics for Investment Banking	4
MBA* ZG570	Financial Risk Models	4
MBA* ZG571	Analytical Models in Finance	4

Project

Course No.	Course Title	Units
MBA* ZG622T	Project	8

Suggested Semesterwise pattern of courses

Year	First Semester			Second Semester		
	Course No.	Course Title	Units	Course No.	Course Title	Units
I	MBA* ZC415	Financial and Management Accounting	4	MBA* ZC411	Marketing	4
	MBA* ZC416	Managerial Economics	4	MBA* ZG538	Advanced Statistical Methods	4
	MBA* ZC417	Quantitative Methods	4	MBA* ZG536	Foundations of Data Science	4
	MBA* ZG511	Managing People & Organizations	4	MBA* ZG611	Strategic Management and Business Policy	4
		Total	**16**		**Total**	**16**
II	MBA* ZG512	Predictive Analytics	4		Elective 1	4
	MBA* ZC413	Analytics for Competitive Advantage	4		Elective 2	4
	MBA* ZG521	Financial Management	4	MBA* ZG622T	Project	8
	MBA* ZG526	Operations Management	4			
		Total	**16**		**Total**	**16**

MBA (Consultancy Management)

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./ M. Sc. in relevant disciplines, with minimum one year work experience in relevant business domains.
(OR)
Employed professionals holding a three year undergraduate degree in such areas as Mathematics, Statistics, Science, Economics, Commerce, and Business Management, and having studied at least one course in mathematics or statistics at the high school or higher level, and with minimum two years of work experience in relevant business domains.

Nominal Duration: Four Semesters

Curriculum Requirements

Completion of the programme would require:
(a) At least 14 courses (totaling at least 56 units) towards coursework; and
(b) Project (8 units)

Programme Structure:

Management Core (8 Courses)

Course No.	Course Title	Units
MBA* ZC411	Marketing	4
MBA* ZC415	Financial and Management Accounting	4
MBA* ZC416	Managerial Economics	4
MBA* ZC417	Quantitative Methods	4
MBA* ZG511	Managing People & Organizations	4
MBA* ZG521	Financial Management	4
MBA* ZG526	Operations Management	4
MBA* ZG611	Strategic Management and Business Policy	4

Consultancy Core (4 Courses)

Course No.	Course Title	Units
MBA* ZG515	Consulting and People Skills	4
MBA* ZG525	Business Process Analysis	4
MBA* ZG541	Consultancy Practice	4
MBA* ZG634	Strategic Change Management	4

Pool of Electives

Course No.	Course Title	Units
MBA* ZG513	Enterprise Resource Planning	4
MBA* ZG514	Leadership and Managing Change	4
MBA* ZG523	Project Management	4
MBA* ZG535	Decision Analysis	4
MBA* ZG540	International Business and Trade	4
MBA* ZG542	Entrepreneurship and New Ventures	4
MBA* ZG543	Family Business Management	4
MBA* ZG544	Mergers, Acquisitions, and Corporate Restructuring	4
MBA* ZG621	Supply Chain Management	4

Project

Course No.	Course Title	Units
MBA* ZG622T	Project	8

Suggested Semesterwise pattern of courses

Year	Semester I		U	Semester II		U
I	MBA* ZC415	Financial and Management Accounting	4	MBA* ZC411	Marketing	4
	MBA* ZC416	Managerial Economics	4	MBA* ZG521	Financial Management	4
	MBA* ZC417	Quantitative Methods	4	MBA* ZG526	Operations Management	4
	MBA* ZG511	Managing People & Organizations	4	MBA* ZG541	Consultancy Practice	4
		Total	**16**		**Total**	**16**
II	MBA* ZG515	Consulting and People Skills	4		Elective 1	4
	MBA* ZG525	Business Process Analysis	4		Elective 2	4
	MBA* ZG611	Strategic Management & Business Policy	4	MBA* ZG622T	Project	8
	MBA* ZG634	Strategic Change Management	4			
		Total	**16**		**Total**	**16**

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

MBA (Digital Business)

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E. / M. Sc. in relevant disciplines, with minimum one year work experience in relevant business domains.
(OR)
Employed professionals holding a three year undergraduate degree in such areas as Mathematics, Statistics, Science, Economics, Commerce, and Business Management, and having studied at least one course in mathematics or statistics at the high school or higher level, and with minimum two years of work experience in relevant business domains.

Nominal Duration: Four Semesters

Curriculum Requirements:

Completion of the programme would require:

(a) At least 14 courses (totaling minimum of 56 units) towards course work, and
(b) Project (8 Units)

Programme Structure:

Management Core (8 Courses)

Course No.	Course Title	Units
MBA* ZC411	Marketing	4
MBA* ZC415	Financial and Management Accounting	4
MBA* ZC416	Managerial Economics	4
MBA* ZC417	Quantitative Methods	4
MBA* ZG511	Managing People & Organizations	4
MBA* ZG521	Financial Management	4
MBA* ZG526	Operations Management	4
MBA* ZG611	Strategic Management & Business Policy	4

Digital Business Core (4 Courses)

Course No.	Course Title	Units
MBA* ZG572	Digital Business Design	4
MBA* ZG573	Digital Strategies for Business	4
MBA* ZG574	Digital Customer Experience Management	4
MBA* ZG575	Digital Technologies and Analytics	4

Pool of Electives

Course No.	Course Title	Units
MBA* ZG516	Introduction to Fintech	4
MBA* ZG517	Financial Analytics	4
MBA* ZG553	Blockchain and Applications	4
MBA* ZG565	Supply Chain Analytics	4
MBA* ZG566	Analytics for Marketing	4
MBA* ZG576	Digital Marketing	4
MBA* ZG577	Artificial Intelligence and Machine Learning	4

MBA* ZG578	Digital Manufacturing and Logistics	4
MBA* ZG579	Entrepreneurial Finance	4

Project

Course No.	Course Title	Units
MBA* ZG622T	Project	8

Suggested Semester-wise pattern of courses

Year	First Semester			Second Semester		
	Course No.	Course Title	Units	Course No.	Course Title	Units
I	MBA* ZC415	Financial and Management Accounting	4	MBA* ZC411	Marketing	4
	MBA* ZC416	Managerial Economics	4	MBA* ZG521	Financial Management	4
	MBA* ZC417	Quantitative Methods	4	MBA* ZG611	Strategic Management and Business Policy	4
	MBA* ZG511	Managing People & Organizations	4	MBA* ZG572	Digital Business Design	4
		Total	16		Total	16
II	MBA* ZG573	Digital Strategies for Business	4		Elective 1	4
	MBA* ZG575	Digital Technologies and Analytics	4		Elective 2	4
	MBA* ZG574	Digital Customer Experience Management	4	MBA* ZG622T	Project	8
	MBA* ZG526	Operations Management	4			
		Total	16		Total	16

MBA in Finance

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./ M. Sc. in relevant disciplines, with minimum one year work experience in relevant business domains.
(OR)
Employed professionals holding a three year undergraduate degree in such areas as Mathematics, Statistics, Science, Economics, Commerce, and Business Management, and having studied at least one course in mathematics or statistics at the high school or higher level, and with minimum two years of work experience in relevant business domains.

Nominal Duration: Four Semesters

Curriculum Requirements

Completion of the programme would require:
(a) At least 14 courses (totaling at least 56 units) towards coursework; and
(b) Project (8 units)

Programme Structure:

Management Core (8 Courses)

Course No.	Course Title	Units
MBA* ZC411	Marketing	4
MBA* ZC415	Financial and Management Accounting	4
MBA* ZC416	Managerial Economics	4
MBA* ZC417	Quantitative Methods	4
MBA* ZG511	Managing People & Organizations	4
MBA* ZG521	Financial Management	4
MBA* ZG526	Operations Management	4
MBA* ZG611	Strategic Management and Business Policy	4

Finance Core (4 Courses)

Course No.	Course Title	Units
MBA* ZG517	Financial Analytics	4
MBA* ZG518	Multinational Finance	4
MBA* ZG520	Security Analysis & Portfolio Management	4
MBA* ZG560	Global Financial Markets and Products	4

Pool of Electives

Course No.	Course Title	Units
MBA* ZG516	Introduction to FinTech	4
MBA* ZG519	Business Analysis and Valuation	4
MBA* ZG528	Venture Capital and Private Equity	4

MBA* ZG544	Mergers, Acquisitions, and Corporate Restructuring	4
MBA* ZG556	Advanced Risk Models	4
MBA* ZG558	Financial Risk Management	4
MBA* ZG559	Management of Banks & Financial Institutions	4
MBA* ZG561	Behavioural Finance	4
MBA* ZG562	Derivatives & Financial Engineering	4

Project

Course No.	Course Title	Units
MBA* ZG622T	Project	8

Suggested Semesterwise pattern of courses

Year	Semester I		U	Semester II		U
I	MBA* ZC415	Financial and Management Accounting	4	MBA* ZC411	Marketing	4
	MBA* ZC416	Managerial Economics	4	MBA* ZG521	Financial Management	4
	MBA* ZC417	Quantitative Methods	4	MBA* ZG526	Operations Management	4
	MBA* ZG511	Managing People & Organizations	4	MBA* ZG560	Global Financial Markets and Products	4
		Total	**16**		**Total**	**16**
II	MBA* ZG518	Multinational Finance	4		Elective 1	4
	MBA* ZG520	Security Analysis and Portfolio Management	4		Elective 2	4
	MBA* ZG517	Financial Analytics	4	MBA* ZG622T	Project	8
	MBA* ZG611	Strategic Management & Business Policy	4			
		Total	**16**		**Total**	**16**

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

MBA in FinTech

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./ M.Sc. in relevant disciplines, with minimum one year work experience in relevant domains
(OR)
Employed professionals holding a three year undergraduate degree in such areas as Mathematics, Statistics, Science, Economics, Commerce, and Business Management, and having studied at least one course in mathematics or statistics at the high school or higher level, and with minimum two years of work experience in relevant business domains.

Nominal Duration: Four Semesters

Curriculum Requirements:

Completion of the programme would require:
(c) At least 14 courses (totaling minimum of 56 units) towards course work, and
(d) Project (8 Units)

Programme Structure:

Management Core (8 Courses)

Course No.	Course Title	Units
MBA* ZC411	Marketing	4
MBA* ZC415	Financial and Management Accounting	4
MBA* ZC417	Quantitative Methods	4
MBA* ZG416	Managerial Economics	4
MBA* ZG511	Managing People & Organizations	4
MBA* ZG521	Financial Management	4
MBA* ZG526	Operations Management	4
MBA* ZG611	Strategic Management & Business Policy	4

FinTech Core (4 Courses)

Course No.	Course Title	Units
MBA* ZG516	Introduction to FinTech	4
MBA* ZG517	Financial Analytics	4
MBA* ZG553	Block Chain and Applications	4
MBA* ZG560	Global Financial Markets and Products	4

Pool of Electives

Course No.	Course Title	Units
MBA* ZC419	Financial Risk Analytics	4
MBA* ZG527	Entrepreneurship in FinTech	4
MBA* ZG529	Machine Learning for Finance	4
MBA* ZG530	InsurTech	4

MBA* ZG532	Deep Learning Application in Finance	4
MBA* ZG533	Technology Disruptions in FinTech	4
MBA* ZG554	Digital Banking and Beyond	4
MBA* ZG555	Algorithmic and High Frequency Trading	4
MBA* ZG557	FinTech in Wealth Management	4

Project

Course No.	Course Title	Units
MBA* ZG622T	Project	8

Suggested Semesterwise pattern of courses

Year	First Semester			Second Semester		
	Course No.	Course Title	Units	Course No.	Course Title	Units
I	MBA* ZC415	Financial and Management Accounting	4	MBA* ZC411	Marketing	4
	MBA* ZC416	Managerial Economics	4	MBA* ZG521	Financial Management	4
	MBA* ZC417	Quantitative Methods	4	MBA* ZG526	Operations Management	4
	MBA* ZG511	Managing People & Organizations	4	MBA* ZG516	Introduction to FinTech	4
		Total	16		Total	16
II	MBA* ZG517	Financial Analytics	4		Elective 1	4
	MBA* ZG560	Global Financial Markets and Products	4		Elective 2	4
	MBA* ZG553	Block Chain and Applications	4	MBA* ZG622T	Project	8
	MBA* ZG611	Strategic Management & Business Policy	4			
		Total	16		Total	16

MBA in Hospital & Health Systems Management

Input criteria: Employed professionals in the healthcare industry, holding an Integrated **First Degree of BITS** or its equivalent / MBBS or its equivalent, with at least one year of relevant work experience.

Nominal Duration: Four semesters

Curriculum requirements:
Completion of the programme would require:
(a) Atleast 13 courses (totaling atleast 52 units) towards coursework; and
(b) Project (12 units)

Programme Structure

MANAGEMENT CORE(5 Courses)

Course No.	Course Title	Units
MBA ZC415	Financial and Management Accounting	4
MBA ZG521	Financial Management	4
MBA ZC416	Managerial Economics	4
MBA ZC411	Marketing	4
MBA ZC417	Quantitative Methods	4

DOMAIN CORE(7 Courses)

Course No.	Course Title	Units
HHSM ZG513	Biostatistics & Epidemiology	4
HHSM ZG516	Epidemic & Disaster Management	4
HHSM ZG517	Healthcare Management	4
HHSM ZG614	Hospital Operations Management	4
HHSM ZG631	Introduction to Health Systems & Environmental Health	4
HHSM ZG615	Service Quality Excellence in Healthcare	4
HHSM ZG617	Strategic Management of Healthcare Organizations	4

ELECTIVES(1 course to be chosen from the pool of electives)

Course No.	Course Title	Units
MBA ZG535	Decision Analysis	4
MBA ZG514	Leadership & Managing Change	4
MBA ZG523	Project Management	4

PROJECT

Course No.	Course Title	Units
MBA ZG623T	Project	12

MBA in Hospital & Health Systems Management

Semesterwise pattern

Year	First Semester		U	Second Semester		U
I	MBA ZC415	Financial and Management Accounting	4	MBA ZG521	Financial Management	4
	MBA ZC416	Managerial Economics	4	HHSM ZG516	Epidemic & Disaster Management	4
	MBA ZC411	Marketing	4	HHSM ZG631	Introduction to Health Systems & Environmental Health	4
	MBA ZC417	Quantitative Methods	4	HHSM ZG615	Service Quality Excellence in Healthcare	4
	Total		**16**	**Total**		**16**
II	HHSM ZG513	Biostatistics & Epidemiology	4	MBA ZG623T	Project	12
	HHSM ZG517	Healthcare Management	4		Elective 1	4
	HHSM ZG614	Hospital Operations Management	4			
	HHSM ZG617	Strategic Management of HealthcareOrganizations	4			
	Total		**16**	**Total**		**16**

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.
In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing the collaborating organization.

MBA in Manufacturing Management
Curriculum Structure

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./ M.Sc. in relevant disciplines, with minimum one year work experience in relevant business domains.

Nominal Duration: Four Semesters

Curriculum Requirements

Completion of the programme would require:
(a) At least 14 courses (totaling at least 56 units) towards coursework; and
(b) Project (8 units)

Programme Structure:

Management Core (8 Courses)

Course No.	Course Title	Units
MBA* ZC411	Marketing	4
MBA* ZC415	Financial and Management Accounting	4
MBA* ZC416	Managerial Economics	4
MBA* ZC417	Quantitative Methods	4
MBA* ZG511	Managing People & Organizations	4
MBA* ZG521	Financial Management	4
MBA* ZG526	Operations Management	4
MBA* ZG611	Strategic Management and Business Policy	4

Manufacturing Core (4 Courses)

Course No.	Course Title	Units
MBA* ZG522	Total Quality Management	4
MBA* ZG537	Lean Manufacturing	5
MBA* ZG545	Product Design and Development	4
MBA* ZG621	Supply Chain Management	4

Pool of Electives

Course No.	Course Title	Units
MBA* ZG514	Leadership and Managing Change	4
MBA* ZG523	Project Management	4
MBA* ZG534	Sustainable Manufacturing	4
MBA* ZG547	Modern Manufacturing	4
MBA* ZG548	Manufacturing Strategy	4
MBA* ZG565	Supply Chain Analytics	4

Project

Course No.	Course Title	Units
MBA* ZG622T	Project	8

Suggested Semesterwise pattern of courses

Year	Semester I		U	Semester II		U
I	MBA* ZC415	Financial and Management Accounting	4	MBA* ZC411	Marketing	4
	MBA* ZC416	Managerial Economics	4	MBA* ZG521	Financial Management	4
	MBA* ZC417	Quantitative Methods	4	MBA* ZG545	Product Design and Development	4
	MBA* ZG511	Managing People & Organizations	4	MBA* ZG526	Operations Management	4
		Total	**16**		**Total**	**16**
II	MBA* ZG522	Total Quality Management	4		Elective 1	4
	MBA* ZG621	Supply Chain Management	4		Elective 2	4
	MBA* ZG537	Lean Manufacturing	5	MBA* ZG622T	Project	8
	MBA* ZG611	Strategic Management and Business Policy	4			
		Total	**17**		**Total**	**16**

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

MBA in Quality Management
Curriculum Structure

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./ M.Sc. in relevant disciplines, with minimum one year work experience in relevant business domains.

Nominal Duration: Four Semesters

Curriculum Requirements

Completion of the programme would require:
(a) At least 14 courses (totaling at least 56 units) towards coursework; and
(b) Project (8 units)

Programme Structure:

Management Core (8 Courses)

Course No.	Course Title	Units
MBA* ZC411	Marketing	4
MBA* ZC415	Financial and Management Accounting	4
MBA* ZC416	Managerial Economics	4
MBA* ZC417	Quantitative Methods	4
MBA* ZG511	Managing People & Organizations	4
MBA* ZG521	Financial Management	4
MBA* ZG526	Operations Management	4
MBA* ZG611	Strategic Management and Business Policy	4

Quality Core (4 Courses)

Course No.	Course Title	Units
MBA* ZG522	Total Quality Management	4
MBA* ZG531	Statistical Quality Control	5
MBA* ZG549	Managing Quality in Services Industry	4
MBA* ZG550	Quality Management Systems	4

Pool of Electives

Course No.	Course Title	Units
MBA* ZG514	Leadership and Managing Change	4
MBA* ZG523	Project Management	4
MBA* ZG621	Supply Chain Management	4
MBA* ZG661	Software Quality Management	4
MBA* ZG551	Quality Analytics	4
MBA* ZG552	Business Acumen for Managing Quality	4

Project

Course No.	Course Title	Units
MBA* ZG622T	Project	8

Suggested Semesterwise Pattern of Courses

Year	Semester I		U	Semester II		U
I	MBA* ZC415	Financial and Management Accounting	4	MBA* ZC411	Marketing	4
	MBA* ZC416	Managerial Economics	4	MBA* ZG521	Financial Management	4
	MBA* ZC417	Quantitative Methods	4	MBA* ZG522	Total Quality Management	4
	MBA* ZG511	Managing People & Organizations	4	MBA* ZG526	Operations Management	4
		Total	**16**		**Total**	**16**
II	MBA* ZG549	Managing Quality in Services Industry	4		Elective 1	4
	MBA* ZG550	Quality Management Systems	4		Elective 2	4
	MBA* ZG531	Statistical Quality Control	5	MBA* ZG622T	Project	8
	MBA* ZG611	Strategic Management and Business Policy	4			
		Total	**17**		**Total**	**16**

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

POST GRADUATE DIPLOMA

Curriculum Structure:

Normal Input: Three-year undergraduate degree in relevant disciplines. with adequate work experience in relevant domains.

Nominal duration: Two semesters.

Curriculum Structure for Post-graduate Diploma programme:

Category	Number of Courses Required	Number of Units Required
Core	4-8	14-36
Electives	0-4	0-18
Total	**8 courses (min)**	**28 to 36 units**

Post Graduate Diploma
(Automotive Cyber Security)

Type of Input:
Candidates holding an Integrated First degree of BITS or its equivalent such as B.E./B.Tech in relevant disciplines.

Nominal Duration: Two semesters

List of Courses:

Course No.	Course Title	Units
PDACS ZC435	Introduction to Autotronics	3
PDACS ZC436	Automotive Networks and Communications	4
PDACS ZG574	Embedded Network Security	4
PDACS ZG519	Automotive Security	4
PDACS ZG575	Ethical Hacking	3
PDACS ZC437	Cyber Security and Cyber Laws	3
PDACS ZG513	Network Security	4
	Elective	3-4
	Elective	3-4
	Elective	3-4
	Total	**36 max.**

List of elective courses:

Course No.	Course Title	Units
PDACS ZC438	Software Engineering for Secure Systems	3
PDACS ZC439	Cloud and IoT Security	4
PDACS ZC440	AI and ML for Cyber Security	3
PDACS ZC463	Cryptography	3
PDACS ZC445	Information Security Project	3
PDACS ZG501	Network Security Project	3
PDACS ZC450	Cyber Forensics and Incident Handling	3
PDACS ZC454	Blockchain Technology	3

Semester-wise pattern of courses

Year	First Semester			Second Semester		
	Course No.	Course Title	U	Course No.	Course Title	U
I	PDACS ZC435	Introduction to Autotronics	3	PDACS ZC437	Cyber Security and Cyber Laws	3
	PDACS ZC436	Automotive Networks and Communications	4	PDACS ZG513	Network Security	4
	PDACS ZG574	Embedded Network Security	4		Elective 1	3-4
	PDACS ZG519	Automotive Security	4		Elective 2	3-4
	PDACS ZG575	Ethical Hacking	3		Elective 3	3
	Total		18	Total		18

Post Graduate Diploma
(Business Analytics)

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./ M.Sc. in relevant disciplines, with minimum one year work experience in relevant business domains
(OR)
Employed professionals holding a three year undergraduate degree in such areas as Mathematics, Statistics, Science, Economics, Commerce, and Business Management, and having studied at least one course in mathematics or statistics at the high school or higher level, and with minimum two years of work experience in relevant business domains.

Nominal Duration: Two Semesters

Programme Structure:

Core Courses

Course No.	Course Title	Units
PDBA* ZC413	Analytics for Competitive Advantage	4
PDBA* ZC417	Quantitative Methods	4
PDBA* ZG512	Predictive Analytics	4
PDBA* ZG536	Foundations of Data Science	4
PDBA* ZG538	Advanced Statistical Methods	4
PDBA* ZG539	Data Visualization and Communication	4

Pool of Electives

Course No.	Course Title	Units
PDBA* ZG517	Financial Analytics	4
PDBA* ZG523	Project Management	4
PDBA* ZG563	Analytics for HR	4
PDBA* ZG564	Models in Marketing	4
PDBA* ZG565	Supply Chain Analytics	4
PDBA* ZG566	Analytics for Marketing	4
PDBA* ZG567	Analytics for Retail Industry	4
PDBA* ZG568	Operations Research Models	4
PDBA* ZG569	Analytics for Investment Banking	4
PDBA* ZG570	Financial Risk Models	4
PDBA* ZG571	Analytical Models in Finance	4

Post Graduate Diploma
(Business Analytics)

Semesterwise pattern

Year	First Semester			Second Semester		
	Course No.	**Course Title**	**Units**	**Course No.**	**Course Title**	**Units**
I	PDBA* ZC417	Quantitative Methods	4	PDBA* ZG512	Predictive Analytics	4
	PDBA* ZG539	Data Visualization and Communication	4	PDBA* ZC413	Analytics for Competitive Advantage	4
	PDBA* ZG538	Advanced Statistical Methods	4		Elective 1	4
	PDBA* ZG536	Foundations of Data Science	4		Elective 2	4
		Total	16		Total	16

Post Graduate Diploma
(Electric Vehicles)

Type of input:
Candidates holding an integrated first degree of BITS Pilani or its equivalent such as B.E./B. Tech in relevant disciplines

Nominal duration: Two semesters

Program structure:
Core courses: (5)

Course No.	Course Title	Units
PDEV ZC411	Principles, Analysis and Design of Electric Vehicles	4
PDEV ZC412	Sensors, Communication and Signal Processing	4
PDEV ZG521	Power Electronics and Drives	4
PDEV ZG511	Battery Management Systems	4
PDEV ZG513	Model Based System Development	4

Pool of electives: (5)

Course No.	Course Title	Units
PDEV ZG514	Vehicle Diagnostics and Reliability	4
PDEV ZC442	Advanced Driver Assistance Systems	4
PDEV ZG519	Automotive Security	4
PDEV ZG621	Safety Critical Advanced Automotive Systems	4
PDEV ZG512	Machine Intelligence in Autonomous Vehicles	4

Semester-wise pattern

Year	First Semester			Second Semester		
	Course #	Course Title	Units	Course #	Course Title	Units
I	PDEV ZC411	Principles, Analysis and Design of Electric Vehicles	4	PDEV ZG513	Model Based System Development	4
	PDEV ZC412	Sensors, Communication and Signal Processing	4		Elective I	4
	PDEV ZG521	Power Electronics and Drives	4		Elective II	4
	PDEV ZG511	Battery Management Systems	4		Elective III	4
		Total	16		Total	16

Post Graduate Diploma
(Finance)

Type of Input: Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./ M.Sc. in relevant disciplines, with minimum one year work experience in relevant business domains.
(OR)
Employed professionals holding a three year undergraduate degree in such areas as Mathematics, Statistics, Science, Economics, Commerce, and Business Management, and having studied at least one course in mathematics or statistics at the high school or higher level, and with minimum two years of work experience in relevant business domains.

Nominal Duration: Two Semesters

Curriculum Requirements

Completion of the programme would require:

- At least 8 courses (totaling at least 32 units) towards coursework

Programme Structure:

Core Courses

Course No.	Course Title	Units
PDFI* ZC415	Financial and Management Accounting	4
PDFI* ZG517	Financial Analytics	4
PDFI* ZG518	Multinational Finance	4
PDFI* ZG520	Security Analysis & Portfolio Management	4
PDFI* ZG521	Financial Management	4
PDFI* ZG560	Global Financial Markets and Products	4

Pool of Electives

Course No.	Course Title	Units
PDFI* ZG559	Management of Banks & Financial Institutions	4
PDFI* ZG516	Introduction to FinTech	4
PDFI* ZG519	Business Analysis and Valuation	4
PDFI* ZG528	Venture Capital and Private Equity	4
PDFI* ZG544	Mergers, Acquisitions, and Corporate Restructuring	4
PDFI* ZG556	Advanced Risk Models	4
PDFI* ZG558	Financial Risk Management	4
PDFI* ZG561	Behavioural Finance	4
PDFI* ZG562	Derivatives & Financial Engineering	4

Post Graduate Diploma
(Finance)

Semesterwise pattern

Year	First Semester		U	Second Semester		U
	Course No.	**Course Title**		**Course No.**	**Course Title**	
I	PDFI* ZC415	Financial and Management Accounting	4	PDFI* ZG518	Multinational Finance	4
	PDFI* ZG521	Financial Management	4	PDFI* ZG517	Financial Analytics	4
	PDFI* ZG560	Global Financial Markets and Products	4		Elective 1	4
	PDFI* ZG520	Security Analysis and Portfolio Management	4		Elective 2	4
	Total		**16**	**Total**		**16**

Note: This is the currently operative pattern as approved by the Senate-appointed committee, subject to change if the situation warrants.

Post Graduate Diploma
(FinTech)

Type of Input:	Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./M.Sc. in relevant disciplines, with minimum one-year work experience in relevant domains (OR) Employed professionals holding a three year undergraduate degree in such areas as Mathematics, Statistics, Science, Economics, Commerce, and Business Management, and having studied at least one course in mathematics or statistics at the high school or higher level, and with minimum two years of work experience in relevant business domains.
Nominal Duration:	Two Semesters

Programme Structure:

Core Courses

Course No.	Course Title	Units
PDFT* ZC417	Quantitative Methods	4
PDFT* ZG516	Introduction to FinTech	4
PDFT* ZG517	Financial Analytics	4
PDFT* ZG521	Financial Management	4
PDFT* ZG553	Block Chain and Applications	4
PDFT* ZG560	Global Financial Markets and Products	4

Pool of Electives

Course No.	Course Title	Units
PDFT* ZC419	Financial Risk Analytics	4
PDFT* ZG527	Entrepreneurship in FinTech	4
PDFT* ZG529	Machine Learning for Finance	4
PDFT* ZG530	InsurTech	4
PDFT* ZG532	Deep Learning Application in Finance	4
PDFT* ZG533	Technology Disruptions in FinTech	4
PDFT* ZG554	Digital Banking and Beyond	4
PDFT* ZG555	Algorithmic and High Frequency Trading	4
PDFT* ZG557	FinTech in Wealth Management	4

Post Graduate Diploma
(FinTech)

Semesterwise pattern

Year	First Semester			Second Semester		
	Course No.	**Course Title**	**Units**	**Course No.**	**Course Title**	**Units**
I	PDFT* ZC417	Quantitative Methods	4	PDFT* ZG517	Financial Analytics	4
	PDFT* ZG521	Financial Management	4	PDFT* ZG553	Block Chain and Applications	4
	PDFT* ZG560	Global Financial Markets and Products	4		Elective 1	4
	PDFT* ZG516	Introduction to FinTech	4		Elective 2	4
	Total		16	Total		16

Post Graduate Diploma
(Manufacturing Management)

Type of Input:

1. Employed professionals holding a three-year undergraduate degree or its equivalent in relevant disciplines, with adequate work experience in relevant domains.
2. Employed professionals holding a three-year undergraduate degree or its equivalent in relevant disciplines, and a Post-graduate Certificate in Manufacturing Practice, with adequate work experience in relevant domains, for admission into the second semester of the programme with a credit transfer of up to 16 units from the said certificate.

Nominal Duration: Two Semesters

Programme Structure

Core courses

Course No.	Course Title	Units
PDMM*ZC415	Financial and Management Accounting	4
PDMM*ZG537	Lean Manufacturing	5
PDMM*ZC416	Managerial Economics	4
PDMM*ZG511	Managing People & Organizations	4
PDMM*ZC411	Marketing	4
PDMM*ZG526	Operations Management	4
PDMM*ZC417	Quantitative Methods	4
PDMM*ZG522	Total Quality Management	4

Semesterwise pattern

Course No.	Course Title	Units
First Semester		
PDMM*ZG511	Managing People & Organizations	4
PDMM*ZG522	Total Quality Management	4
PDMM*ZG526	Operations Management	4
PDMM*ZG537	Lean Manufacturing	5
Second Semester		
PDMM*ZC411	Marketing	4
PDMM*ZC415	Financial and Management Accounting	4
PDMM*ZC416	Managerial Economics	4
PDMM*ZC417	Quantitative Methods	4

Post Graduate Diploma
(Smart Manufacturing)

Type of Input:
Candidates holding an integrated first degree of BITS Pilani or its equivalent such as B.E./B. Tech in relevant disciplines
Nominal Duration: Two semesters

Program Structure:
Core Courses: (5)

Course No.	Course Title	Units
PDSM ZG511	Mechatronics	5
PDSM ZG622	Industrial Internet of Things	4
PDSM ZG532	Big Data Analytics in Manufacturing	4
PDSM ZG535	Cyber Security in Manufacturing	4
PDSM ZG515	Connected Manufacturing	4

Pool of electives: (5)

Course No.	Course Title	Units
PDSM ZG561	Mechanisms & Robotics	5
PDSM ZG516	Microfabrication Technologies	4
PDSM ZG565	Machine Learning	4
PDSM ZG569	Blockchain Technologies and Systems	4
PDSM ZG527	Cloud Computing	5

Semester-wise pattern of courses

Year	First Semester			Second Semester		
	Course #	**Course Title**	**Units**	**Course #**	**Course Title**	**Units**
I	PDSM ZG511	Mechatronics	5	PDSM ZG515	Connected Manufacturing	4
	PDSM ZG622	Industrial Internet of Things	4		Elective I	4
	PDSM ZG532	Big Data Analytics in Manufacturing	4		Elective II	4 (min)
	PDSM ZG535	Cyber Security in Manufacturing	4		Elective III	4 (min)
		Total	17		Total	16-18

Post Graduate Diploma
(Smart Mobility)

Type of Input:
Candidates holding an Integrated First degree of BITS Pilani or its equivalent such as B.E./B. Tech in relevant disciplines.

Nominal Duration: Two semesters

Program structure:

Core courses: (4)

Course No.	Course Title	Units
PDSMO ZC411	Introduction to Autotronics and Control	4
PDSMO ZC412	Automotive Networks & Communications	4
PDSMO ZG512	Embedded System Design	4
PDSMO ZC442	Advanced Driver Assistance Systems	4

Pool of electives: (6)

Course No.	Course Title	Units
PDSMO ZG519	Automotive Security	4
PDSMO ZG621	Safety Critical Advanced Automotive Systems	4
PDSMO ZG524	Vehicle Dynamics	4
PDSMO ZG513	Model Based System Development	4
PDSMO ZG517	Machine Intelligence in Autonomous Vehicles	4
PDSMO ZG514	Vehicle Diagnostics and Reliability	4

Semester-wise Pattern

Year	First Semester			Second Semester		
	Course #	Course Title	Units	Course #	Course Title	Units
I	PDSMO ZC411	Introduction to Autotronics and Control	4		Elective 1	4
	PDSMO ZC412	Automotive Networks & Communications	4		Elective 2	4
	PDSMO ZG512	Embedded System Design	4		Elective 3	4
	PDSMO ZC442	Advanced Driver Assistance Systems	4		Elective 4	4
		Total	16		Total	16

Structure for Diploma Programme

Category	**Number Of Courses**	**Number Of Units**
Foundation Courses	6-10	20-40
Discipline Core	10-14	32-56
Electives	1-2	3-8
Coursework Sub-Total	**20 courses (min)**	**67 units (Min)**
Project	1-2	5-10
Total	**21 courses (min)**	**72 Units (Min)**

Diploma in Software Development

An intermediate exit option for the students admitted to the B.Sc. Computer Science Programme with a Diploma in Software Development having completed the requirements as per proposed structure. The students will have gained the knowledge/skills in the following areas.

- Foundation courses necessary to advance the learners knowledge in domains in computer science
- Understanding of computer systems and systems programming
- Programming and Problem solving skills
- Programming Languages at different levels of abstraction
- Application Development

Semester-wise Pattern for Diploma in Software Development.

Year	First Semester		U		Second Semester	U
I	BCS ZC313	Introduction to Programming	4	BCS ZC311	Data Structures and Algorithms	4
	BCS ZC219	Discrete Mathematics	3	BCS ZC316	Object Oriented Programming	4
	BCS ZC230	Linear Algebra and Optimization	3	BCS ZC215	Command Line Interfaces and Scripting	3
	BCS ZC228	Introduction to Computing Systems	3	BCS ZC233	Probability and Statistics	3
	BCS ZC111	Basic Electronics	2	BCS ZC112	Introduction to Logic	2
	BCS ZC239	Writing Practice	3		Foundation Option 1	3
	Units		18	Units		19
II	BCS ZC212	Algorithm Design	3	BCS ZC232	Operating Systems	3
	BCS ZC317	Relational Databases	4	BCS ZC214	Building Database Applications	3
	BCS ZC238	Web Programming	3	BCS ZC234	Programming Mobile Devices	3
	BCS ZC236	Software Design Principles	4	BCS ZC220	Environmental Studies	3
	BCS ZC216	Computer Systems and Performance	3	BCS ZC222	Formal Languages and Applications	3
		Foundation Option 2	2		Discipline Elective #1	3
	Units		19	Min Units		18
Summer Term						
BCS ZC242T Project 5 Units						

Post Graduate Certificate Programme
(Artificial Intelligence and Machine Learning)

Type of Input:	Employed professionals holding a M.Sc. degree with mathematics/statistics with adequate work experience in relevant domains or Employed professionals holding a four-year B.Tech. degree or its equivalent in relevant disciplines.
Expected Learning Hours:	~440 hours
Minimum Requirement for Certification	Successful completion of the certificate programme would require completion of all the courses with a minimum C- grade in each course
Marginal Deficiency	Students without sufficient exposure to Python programming language will have to complete the deficiency course/module on Python before the start of the certificate programme. However, the performance in the deficiency course/module will not be accounted in the calculation of CGPA and will not be part of the requirement for certification.

List of Courses

Course No.	Course Title	Units
PCAM* ZC211	Regression	2
PCAM* ZC111	Feature Engineering	1
PCAM* ZC311	Classification	3
PCAM* ZC221	Unsupervised Learning and Association Rule Mining	2
PCAM* ZC231	Text Mining	2
PCAM* ZC241	Deep Learning and Artificial Neural Networks	2
PCAM* ZC321	Capstone Project	3
	Total	15

Note: In the above programme structure, the symbol * in the course numbers can be substituted by the letters representing collaborating organization.

Post Graduate Certificate Programme
(Big Data & Analytics)

Type of Input	Employed professionals holding a three-year undergraduate degree in relevant disciplines, with adequate preparation in Mathematics and Computer Programming, as well as adequate work experience in relevant domains.
(Expected) Learning Hours	~ 230 hours
Minimum Requirement for Certification	Successful completion of the Certificate Programme would require: 1. Completion of all courses with a minimum C- grade in each course. 2. Obtaining a minimum CGPA of 5.00
Marginal Deficiency	Students without sufficient exposure to courses like Data Structures & Algorithms, Database Systems, and Object Oriented Programming using Java would be prescribed deficiency modules. While the student must complete the deficiency modules before start of the program, the performance in the deficiency modules will not be accounted in the calculation of CGPA and will not be part of the requirement for certification.

List of Courses

Course No.	Course Title	Units
CBDA ZG511	The Hadoop Framework	1
CBDA ZG521	ETL & Batch Processing with Hadoop	2
CBDA ZG531	Big Data Analytics with Spark	3
CBDA ZG541	Capstone Project	2
	Total	**8**

Post Graduate Certificate Programme
(Big Data Engineering)

Type of Input:	Employed professionals holding a three-year undergraduate degree in relevant discipline, with adequate preparation in Mathematics and Computer Programming, as well as adequate work experience in relevant domains.
(Expected) Learning Hours	~ 315 hours
Minimum Requirement for Certification	Successful completion of the Certificate Programme would require: 1. Completion of all courses with a minimum C- grade in each course. 2. Obtaining a minimum CGPA of 5.00
Marginal Deficiency	Students without sufficient exposure to courses like Data Structures & Algorithms and Database Systems would be prescribed deficiency modules. While the student must complete the deficiency modules before start of the program, the performance in the deficiency modules will not be accounted in the calculation of CGPA and will not be part of the requirement for certification.

List of courses

Course No.	Course Title	Units
CBDE ZG511	Foundations of Big Data Systems	2
CBDE ZG521	Platforms for Big Data	2
CBDE ZG531	Processing Big Data - ETL & Batch Processing	2
CBDE ZG541	Processing of Real-Time Data and Streaming Data	1
CBDE ZG551	Big Data Analytics	1
CBDE ZG571	Capstone Project	3
	Total	**11**

Post Graduate Certificate Programme
Data Science for Climate and Health

Programme Structure:

Type of Input:	Employed professionals holding a M.Sc. degree with mathematics/statistics with adequate work experience in relevant domains or Employed professionals holding a four-year B.Tech. degree or its equivalent in relevant disciplines.
(Expected) Learning Hours	~440 hours
Minimum Requirement for Certification	Successful completion of the certificate programme would require completion of all the courses with a minimum C- grade in each course
Marginal Deficiency	Students without sufficient exposure to Python programming language will have to complete the deficiency course/module on Python before the start of the certificate programme. However, the performance in the deficiency course/module will not be accounted in the calculation of CGPA and will not be part of the requirement for certification.

List of courses:

Course No.	Course Title	Units
DSCH* ZC211	Regression	2
DSCH* ZC111	Feature Engineering	1
DSCH* ZC311	Classification	3
DSCH* ZC214	Unsupervised Learning and Association Rule Mining	2
DSCH* ZC215	Data Science for Climate Change	2
DSCH* ZC216	Data Science for Health	2
DSCH* ZC312	Capstone Project	3
	Total	15

Students who have successfully completed the above mentionedprogrammes and the corresponding courses listed with at least a C- grade, are considered for admission to PG certificate programme in Data Science for Climate and Health with the following 4 courses (and the 8 credit units corresponding to these courses) waived from their requirement for successful completion of the programme:

Course No.	Course Title	Units
DSCH* ZC211	Regression	2
DSCH* ZC111	Feature Engineering	1
DSCH* ZC311	Classification	3
DSCH* ZC214	Unsupervised Learning and Association Rule Mining	2

The waiver of the courses (and the corresponding credits) may be depicted in the transcript (as credits transferred into the PG certificate programme in Data Science for Climate and Health.

Post Graduate Certificate Programme
(Full Stack Engineering)

Type of Input:	Employed professionals holding an Integrated First Degree of BITS or its equivalent such as B.E./B.Tech/M.Sc./MCA. Degree or its equivalent in relevant disciplines and adequate work experience in the software industry.
Expected Learning Hours and Units	~630 hours(21 Units)
Minimum Requirement for Certification	1. Successful completion of the certificate programme would require completion of all the courses with a minimum C- grade in each course 2. Obtaining a minimum CGPA of 5.00
Marginal Deficiency	Students without sufficient exposure to courses like Python Programming and Database Systems (SQL) would be prescribed deficiency modules. The performance in the deficiency modules will not be accounted in the calculation of CGPA and will not be part of the requirement for certification.

List of Courses

Course No.	Course Title	Units
CFSE ZG511	Overview of Full Stack Engineering	2
CFSE ZG521	Web Development	5
CFSE ZG531	Mobile Application Development	2
CFSE ZG541	Cloud Native Development	3
CFSE ZG551	Agile and DevOps	3
CFSE ZG561	Deployment of Microservices	2
CFSE ZG571	Capstone Project	4
	Total	21

Post Graduate Certificate Programme
(General Management)

Type of Input: Employed professionals holding a three-year undergraduate degree or its equivalent in relevant disciplines, with adequate work experience in relevant domains.

Expected Learning Hours: ~480 hours

Minimum Requirement for Certification : Successful completion of the Certificate Programme would require: Obtaining a minimumCGPA of 5.50

Semesterwise Pattern

Course No.	Course Title	Units
PCGM* ZC411	Marketing	4
PCGM* ZC415	Financial and Management Accounting	4
PCGM* ZC417	Quantitative Methods	4
PCGM* ZC416	Managerial Economics	4

Post Graduate Certificate Programme
(Internet of Things)

Type of Input:	Employed professionals holding an Integrated First Degree of BITS or its equivalent in Electrical & Electronics Engineering or Computer Science or other relevant discipline with adequate work experience in relevant domains.
(Expected) Learning Hours	~ 650 hours
Minimum Requirement for Certification	Successful completion of the Certificate Programme would require: 1. Completion of all courses with a minimum C- grade in each course. 2. Obtaining a minimum CGPA of 5.00

List of courses

Course No.	Course Title	Units
CIOT ZG511	IoT Technology and Applications	3
CIOT ZG521	Hardware Architectures for IoT	4
CIOT ZG531	Communication and Networking Technologies in IoT	3
CIOT ZG541	Sensors, Actuators, and Signal Processing	3
CIOT ZG551	Software and Programming in IoT	4
CIOT ZG561	Data Management in IoT	2
CIOT ZG571	Capstone Project	3
	Total	22

Post Graduate Certificate Programme
(Manufacturing Practice)

Type of Input: Employed professionals holding a three-year undergraduate degree or its equivalent in relevant disciplines, with adequate work experience in relevant domains.

Expected Learning Hours: ~510 hours

Minimum Requirement for Certification : Successful completion of the Certificate Programme would require:
Obtaining a minimumCGPA of 5.50

Semesterwise Pattern

Course No.	Course Title	Units
PCMP* ZG511	Managing People & Organizations	4
PCMP* ZG526	Operations Management	4
PCMP* ZG537	Lean Manufacturing	5
PCMP* ZG522	Total Quality Management	4

Post Graduate Certificate Programme
(Non-sewered Sanitation)

Type of Input:	Employed professionals holding an Integrated First Degree of BITS or its equivalent in the areas of Civil, Chemical Engineering, Chemistry, Biology or other relevant discipline with adequate work experience in relevant domains.
(Expected) Learning Hours	~ 600 hours
Minimum Requirement for Certification	Successful completion of the Certificate Programme would require: Obtaining a minimum CGPA of 5.00

List of courses

Course No.	Course Title	Units
CNSS ZG511	Sanitation Technology	5
CNSS ZG512	Sanitation and Public Health	5
CNSS ZG513	Sanitation Governance, Behavioral Change and Advocacy	5
CNSS ZG515	Emergency Sanitation and Leadership	5
	Total	20

Certificate in Manufacturing Practice

Type of Input: Employed professionals holding a Technical Diploma or its equivalent, with adequate work experience in relevant domains.

Expected Learning Hours: ~390 hours

Minimum Requirement for Certification: Successful completion of the Certificate Programme would require:
Obtaining a minimumCGPA of 4.50

Semester wise pattern

Course No.	Course Title	Units
CMP* ZC411	Managing People & Organizations	3
CMP* ZC426	Operations Management	3
CMP* ZC437	Lean Manufacturing	4
CMP* ZC422	Total Quality Management	3

Certificate in General Management

Type of Input: Employed professionals holding a Technical Diploma or its equivalent, with adequate work experience in relevant domains.

Expected Learning hours: ~360 hours

Minimum Requirement for Certification: Successful completion of the Certificate Programme would require:
Obtaining a minimumCGPA of 4.50

Semesterwise Pattern

Course No.	Course Title	Units
CGM* ZC411	Marketing	3
CGM* ZC421	Financial and Management Accounting	3
CGM* ZC431	Quantitative Methods	3
CGM* ZC414	Managerial Economics	3