YENEPOYA
(DEEMED TO BE UNIVERSITY)

REGULATIONS AND CURRICULUM GOVERNING

Bachelor of Technology (B.Tech.)

In

Artificial Intelligence
Artificial Intelligence & Machine Learning
Computer Science &Engineering
Computer Science &Engineering (Cyber Security)
Computer Science &Engineering (Data Science)
Computer Science &Engineering (Software Engineering)
Computer Science &Information Technology

(Effective from the academic year :2025-26)

YENEPOYA SCHOOL OF ENGINEERING & TECHNOLOGY (YSET)
MANGALORE



Yenepoya (Deemed to be University)
Deralakatte, Mangalore

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No.: 58-ACM/40/2024

OFFICE OF THE REGISTRAR
Date: 25.09.2024

NOTIFICATION

Sub: Approval for curriculum and regulations of Engineering programs – reg:.

Ref: 1. Resolution of the Academic Council at its 58th meeting held on 13.08.2024 vide agenda-40.

2. Resolution of the Executive Council at its 4th meeting held on 10.09.2024 vide agenda-03.

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Pursuant to the resolutions cited in the above references, the Yenepoya (Deemed to be University) hereby notifies the curriculum and regulations of following programs under the Faculty of Engineering and Technology from the academic year 2024-2025.

1. B.Tech Computer Science and Information Technology
2. B.Tech Computer Science (Artificial Intelligence and Machine Learning)
3. B.Tech Computer Science and Engineering (Data Science)
4. B.Tech Computer Science and Engineering (Cyber Security)
5. B.Tech Computer Science and Engineering
6. B.Tech Computer Science (Software Engineering)

REGISTRAR
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To:
PA to Vice Chancellor
Dean of Academics, Yenepoya (Deemed to be University)/Controller of Examinations/
Dean, Faculty of Engineering and Technology/File Copy

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OFFICE OF THE REGISTRAR

No.: 63-ACM/20/2025
Date:16.06.2025

NOTIFICATION

Sub: Enhancing intake in B.Tech Programs and approval for starting of new specializations - reg .:-

Ref: 1. Resolution of the Academic Council at its 63rd meeting held on 13.05.2025 vide agenda – 20.
2. Resolution of the Executive Council at its 8th meeting held on 10.06.2025 vide agenda - 3

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Pursuant to the resolutions cited in the above references, Yenepoya (Deemed to be University) hereby notifies of enhancing the intake of B.Tech programs and approval for starting new specializations from the academic year 2025-2026.

Program	Existing Intake	Increased Intake
B.Tech Artificial Intelligence and Machine Learning	60	120
B.Tech Computer Science and Engineering (Software Engineering)	60	60
B.Tech Computer Science and Engineering	60	60
B.Tech Computer Science and Engineering (Cyber Security)	60	60
B.Tech Computer Science and Engineering (Data Science)	60	120
B.Tech Computer Science and Information Technology	60	60
B.Tech Computer Science and Engineering (Artificial Intelligence) AI *(NEW SPECIALIZATION)*	-	120
Total	360	600

REGISTRAR

To:
PA to Vice Chancellor/Dean of Academics, Yenepoya (Deemed to be University)/ Controller of Examinations/Dean, Faculty of Engineering and Technology/File Copy

YENEPOYA
(DEEMED TO BE UNIVERSITY)

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Preamble

Technical education contributes a major share to the overall higher education system and plays a vital role in the social and economic development of our nation. The quality of Technical Education depends on many factors but largely on- the outcome-based and industrially relevant curriculum, qualified and experienced faculty, robust teaching learning process, effective internships through industry-institute linkages and assessment of students based on outcomes aligned with globally recognized graduate attributes. To maintain quality and regulate the enrolment process of students, conduct teaching-learning process , Assessment, Evaluation and progress towards the award of Bachelor of Technology degree from Yenepoya deemed to be University, Mangalore at the Yenepoya School of Engineering, Mangalore considering the guidelines of Outcome Based Education , Regulations of UGC and AICTE, in exercise of the powers conferred under Section 22 of UGC Act 1956 and notification of the academic council of Yenepoya deemed to be university the following regulations are framed

24YB 1.0 SHORT TITLE, APPLICATION AND COMMENCEMENT:

1.1. These Regulations may be called the Yenepoya deemed to be university -Award of Bachelor of Technology Degree Regulations, 2024

1.2. These Regulations shall apply to all the B.Tech. Programmes conducted at the Yenepoya deemed to be University(YU) at Yenepoya School of Engineering & Technology (YSET)

1.3. They shall come into force with effect from the date of their notification by the Yenepoya deemed to be University, Mangalore.

1.4. These Regulations shall be applicable to the batch of students admitted from the academic year 2024-25 and later and will be in force until revised or withdrawn by a notification.

24YB 2.0 DEFINITION OF KEY WORDS:

2.1. Academic Bank of Credits (ABC): The Academic Bank of Credits (ABC), is a National-level facility that will promote the flexibility of the curriculum framework and

interdisciplinary/multidisciplinary academic mobility of students across the Higher Educational Institutions in the country with an appropriate "credit transfer" mechanism.

2.2 Academic Year: Two consecutive semesters (odd followed by an even), including intervening periods constitute one Academic Year.

2.3. University Notification: The notification regarding Teaching and Examinations issued by the Yenepoya deemed to be University(YU) including the amendments regularly.

2.4. Choice-Based Credit System (CBCS): The CBCS provides students with choices from the prescribed set of courses viz. Engineering Sciences, Professional core and electives, Professional and Open Electives, Non-Credit Mandatory Courses, Internships and Skill Courses. Under the CBCS, the requirement for awarding a degree or certificate is prescribed in terms of number of credits to be earned by the students.

2.5. Constituent unit: A unit operating under the administrative, academic, and financial control of the University and declared as such under the University Notification. It is a school of departments maintained by the University as such and includes a school admitted to the privileges of the University as a constituent unit of the University in accordance with provisions granted by a notification.

2.6. Department: A sub-unit of the constituent unit and is read as Department of the constituent unit in the context of a programme offered by the Department of the constituent unit. i.e. Department of Computer Science & Engineering

2.7. Dean: Dean of Faculty of Engineering & Technology of Yenepoya deemed to be University.

2.8. Head of the department (HOD): The Head of the Department or a programme in the case of programmes offered at the School of Engineering & Technology shall be referred as Head of the Department of the programme (chairperson of the BOS)through which the programme is offered.

2.9. Course: Usually referred to as 'subject'/ 'paper' and is a component of a programme with defined learning objectives, course out comes and number of credits. The course credits vary depending on the required teaching-learning hours to accomplish the learning outcomes, specified

in the course syllabus. A Course may be designed to comprise lectures/ tutorials/ laboratory work/ fieldwork/outreach activities/project work/ vocational training/ viva-voce/ seminars/ term papers/ assignments/ presentations/ self-study components etc., or a combination of some of these.

2.10. Course Code: Courses shall be coded based on the learning outcomes, level of difficulty, and academic rigor. The coding structure is defined as follows: a) 0-99: Basic pre-requisite/ bridge/ introductory courses required to be undertaken, which will be a pass or fail course with no credits.

b) 100-199: Foundation or introductory courses that are intended for students to gain an understanding and basic knowledge about the subjects and help decide the subject or discipline of interest. These courses may also be prerequisites for courses in the major subject. These courses generally would focus on foundational theories, concepts, perspectives, principles, methods, and procedures of critical thinking to provide a broad basis for taking up more advanced courses. These courses seek to equip students with the general education needed for advanced study, expose students to the breadth of different fields of study; provide a foundation for specialized higher-level coursework; acquaint students with the breadth of (inter) disciplinary fields in the arts, humanities, social sciences, and natural sciences, and to the historical and contemporary assumptions and practices of vocational or professional fields; and to lay the foundation for higher-level coursework.

c) 200-299: Intermediate-level courses including subject-specific courses intended to meet the credit requirements for minor or major areas of learning. These courses can part level major courses. of a major and can be pre-requisite courses for advanced

d) 300-399: Higher-level courses which are required for majoring in a disciplinary / interdisciplinary area of study for the award of a degree.

e) 400-499: Advanced courses which would include lecture courses with practical, seminar based course, term papers, research methodology, advanced laboratory experiments / software training, research projects, hands-on-training, internship/ apprenticeship projects at the undergraduate level or First year Postgraduate theoretical and practical courses.

2.11. Credit: A unit or weightage by which the Coursework is measured. It represents the number of hours of instructions prescribed per week. One credit is equivalent to one hour of lecture or two hours of laboratory/practical Courses/ tutorials/ fieldwork etc., per week.

2.12. Credit Point: This is the product of grade point and the number of credits for a Course.

2.13. Credit Representation: Refers to the credit values for different academic activities considered, as per Table 1. Credits for the project phases, project viva–voce and internship shall be as specified in the Scheme of Teaching and Examinations.

Table-1 Credit Values

Theory / Lectures(L) (Hours/week/sem)	Tutorials (T) (Hours/week/sem)	Laboratory/Practical(P) (Hours/week/sem)	Credits (L:T:P)	Total Credits
4	0	0	4:0:0	4
3	0	2	3:0:1	4
2	2	2	2:1:1	4
3	0	0	3:0:0	3
2	2	0	2:1:0	3
2	0	2	2:0:1	3
0	0	6	0:0:3	3
2	0	0	2:0:0	2
1	0	0	1:0:0	1
0	0	2	0:0:1	1

2.14. Choice-Based Credit System (CBCS): The education model refers to customizing the Coursework, Core, Professional Elective, Open Electives, Skill-based Ability Enhancement Courses, Non-Credit Mandatory Courses, and Internships to provide the necessary support for the students to achieve their goals.

2.15. Continuous Internal Evaluation (CIE) (also known as Formative Assessment): Refers to the evaluation of student's performance in the course during the teaching learning process. CIE shall be done by the faculty teaching course and evaluation components may include tests, assignments, group discussion, quizzes, course-specific projects, field surveys, seminars, etc., conducted during the semester tenure with a weightage for different activities as specified by the BOS/University.

2.16. Course Evaluation: This represents the measurement of the impact of the teaching learning process and offers an opportunity for improving the quality of learning in courses and teaching

performance. Courses evaluation is done by adopting different methods such as tests, quizzes, assignments, etc., during the teaching-learning period at the end of some modules or chapters of syllabus contents and at the end of the semester. While the former part of the evaluation is called the Continuous Internal Evaluation (CIE) and the latter part of the evaluation is called Semester End Evaluation (SEE).

2.17. Course Registration: It is a formal registration to Courses of study every semester by every student under the supervision of a Mentor (also called Faculty Advisor, Academic Counselors) in the department to maintain proper records. Registration for the courses is mandatory at the beginning of each semester.

2.18. Cumulative Grade Point Average (CGPA): This is a measure of the cumulative performance of a student of all semesters and is computed from the 2nd semester onwards. It is a measure of the overall cumulative academic performance of a student over the entire span of the academic program. CGPA is not an arithmetic mean a but weighted mean. It is also a number that lies between 0 and 10.

2.19. First Attempt: A student who has studied in a semester and attended any one of the University examinations of that semester after satisfying attendance and CIE requirements of all the prescribed courses of that semester and has applied for SEE shall be considered as the first attempt. Even if the student is absent for all the semester exams after registering for SEE, such an attempt shall also be considered the first attempt.

2.20. Grade Card: Refers to the certificate showing the grades earned by a student. A grade card shall be issued to all the registered students after every Semester-End Examination. The grade card shall have the Program details (Course code, title, number of credits, grades secured, along with the SGPA of that semester and CGPA (except for the first semester) earned till that semester.

2.21. Grade Point (GP): Refers to a numerical weightage allotted to each letter grade on a 10-pointscale against a range of percentage of marks secured by students in a course.

2.22. Letter Grade: Course Letter Grade (or simply letter grade or grade) is an index of performance of a student in a said course and refers to a qualitative measure of achievement of a

student in each course, based on the percentage range of marks secured in CIE and SEE put together or CIE alone. Grades are denoted by letters O, A+, A, B+, B, C, P and F. The rubrics attached to letter grades are as follows: O: Outstanding, A+: Excellent, A: Very Good, B+: Good, B: Above Average, C: Average, P:Pass and F:Fail.Additional letter grades used under special circumstances are, DX: Attendance below 75%, AU: Satisfactory in an Audit course, AB: Absent for the Course, PP: Passed in Non-credit course, NP: Not Passed in Non-credit course, W Dropped/ withdrawn.

2.23. Non-Credit Mandatory Courses (NM): In the case of non-credit mandatory courses, students shall attend the classes during the respective semesters to satisfy the attendance requirements as well as CIE requirements. In case, any student fails to register for the said course/fails to secure the minimum 40% of the prescribed CIE marks, he/she shall be deemed to have not completed the course. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for CIE. These Courses shall not be considered for CGPA calculation and vertical progression, but completion of the courses shall be mandatory for the award of a degree.

2.24. Major Degree: A Major degree will be awarded along with “Honours” distinction if a student completes a specified additional number of credits related to his/her regular programme as per the Regulations governing Honours Programme. A student admitted to the Programme shall be eligible to register to “Honours” programme if he/she fulfils the conditions as per the Regulations.

2.25. Minor Degree: A Major degree along with Minors is awarded in a programme if a student completes the required number of credits of another programme as per the Regulations governing Minor Programme. A student shall be eligible to register to a Minor programme if he/she fulfills the conditions as per the Regulations

2.26. Passing Standards: Refers to passing a Course only when GP is greater than or equal to 04.

2.27. Programme: A planned series of events/activities comprising of a combination of courses leading to the award of degree.

2.28. Semester: One of the two sessions of an Academic Year, each session being of sixteen weeks' duration (with not less than 90 working days). The odd and even semesters shall be as per the University academic calendar.

2.29. Semester End Examinations (SEE) (also called Summative Assessment): Also called summative assessment, which refers to the examinations conducted by the University covering the entire course syllabus. For this purpose, syllabi shall be modularized, and SEE questions shall be set from each module as specified by the University.

2.30. Semester Grade Point Average (SGPA):It is a measure of academic performance of a student in a semester. It is the weighted average or weighted mean of the grade points obtained by a student in the various courses of any semester. It results in a number that lies between 0 and 10.It shall be expressed up to two decimal places.

2.31. Teacher/Faculty: A member of the regular faculty at the levels of Professor, or Associate Professor or Assistant Professor, and includes adjunct faculty and faculty on a long-term contract of not less than three years.

2.32. Transcript, Grade Certificate and Grade Card: Grade card shall be issued to candidates indicating the programme details (Course code, title, number of credits, grade secured and grade points) for all the registered courses after every semester. On successful completion of all courses/earning credits, specified in the Scheme of Teaching and Evaluation of a semester, the grade certificate is issued indicating the programme details along with SGPA of that semester and CGPA earned till that semester. Transcripts to the successful candidates shall be issued after completion of the programme.

2.33 University: Yenepoya (Deemed to be University) established in 2008 and recognized under Sec 3(A) of the UGC Act 1956 Deralakatte, Mangalore.

24YB 3.0 REGULATIONS

24YB3.1. TITLE AND DURATION OF THE PROGRAMME

24YB 3.1.1: The Programme of study, which is an undergraduate Programme, shall be called the degree of **Bachelor of Technology**, abbreviated as **B.Tech**., followed by specialization indicated within brackets.

24YB 3.1.2: The duration of the Programme for B.E./ B.Tech. degree shall be four academic years, organized in eight semesters, with each semester having duration of 16-18 weeks, having provision for award of Honours degree or Minor degrees.

24YB 3.1.3: The annual academic calendar of events in respect of the Programme of study approved by the Academic Council, shall be notified at least a month before the commencement of each academic year. It is mandatory for students / faculty members to strictly adhere to the Academic Calendar for completion of academic activities. Academic Calendar shall be displayed on the Academics Tab in homepage of the website(www.yset.yenepoya.edu.in).

24YB 3.2.0. ACADEMIC ELIGIBILITY FOR ADMISSION The rules specified in the following clauses shall be followed for admission to B.Tech. Programmes, but the orders issued from the Government/the regulatory bodies(AICTE) from time to time shall prevail.

24YB 3.2.1.

Admission to 1st year: Eligibility for candidates Passed in second PUC or equivalent,

1) Passed 10+2 examination with Physics, Mathematics, Chemistry / Computer Science/Electronics/Information Technology/ Biology/ Informatics Practices/ Biotechnology/ Technical Vocational subject/ Agriculture/ Engineering Graphics/ Business Studies/Entrepreneurship

2) Those students, who have passed a qualifying examination other than the PUC II examination of the Pre-University Education Board of Karnataka, have to obtain an eligibility certificate for seeking admission to I year B.Tech. Degree Programme from the University.

24YB 3.2.2. Admission to 2nd year (Lateral Entry):

Eligibility for candidates who have passed a 3-year Diploma in Engineering and B.Sc. Degree shall be,

1) Passed Minimum 3-years / 2-Years (Lateral Entry) Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category).

OR

Passed B.Sc. Degree from a recognized University as defined by UGC, with at least 45% marks (40% marks in case of candidates belonging to reserved category) and passed 10+2 examination with Mathematics as a subject

2) Those candidates who have completed an Engineering Diploma from States other than Karnataka shall submit the Equivalence/ Eligibility Certificate issued by YU

24YB 3.2.3. Qualification earned from foreign Countries: With regard to the qualification earned from foreign countries, an equivalence certificate from the Association of Indian Universities/ University is mandatory for admission to B.Tech. Programmes. In case of any dispute about the equivalence in qualification earned from foreign countries, the decision of the University in this regard shall be final and binding on all concerned.

24YB 3.2.4 Additional Requirements: 1) All the Diploma and B.Sc. degree holders seeking admission to lateral entry, shall also pass any deficit courses as specified by the University before the completion of the degree. 2) Further, all the Diploma and B.Sc. degree holder applicants shall also be required to register and pass the non-credit mandatory Mathematics bridge course(s) specified by the University, within two years of joining the programme. However, applicants with B.Sc. degree (with Mathematics major) may apply to the Dean seeking exemption from the bridge course.

24YB 3.3.0. CURRICULUM FRAMEWORK AND ACADEMIC PROCESSES

24YB 3.3.1. Semesters – Odd and Even: The University follows the Choice based credit system and the semester scheme. There are two regular semesters in an academic year. The semester that

begins in August (August to December) is known as the Odd Semester and the semester that begins in February (February to May) is known as the Even Semester.

24YB 3.3.2. Curriculum: Every Programme has a prescribed course structure which, in general terms, is known as the Curriculum or the Courses of Study or the Scheme of Teaching and Evaluation. It prescribes all the courses/ laboratory/ other requirements for the degree and sets out the nominal sequence semester wise. It provides the syllabus and a list of text/ reference books (or other learning material sources) for each course. The Courses of Study details are updated every semester and are made available at www.yset.yenepoya.edu.in. Curriculum shall also include some SWAYAM and Massive Open Online Courses (MOOCs), approved by the University. However, selection of such courses, if any, shall always be within prescribed guidelines of the relevant regulatory bodies.

24YB 3.3.3. Choice Based Credit System (CBCS): 1) A certain quantum of academic work, measured in terms of credits, is laid down as the requirement for completion of B. Tech. degree in the different available specialization areas. A student earns credits by satisfactorily completing courses/other academic activities every semester. 2) The credits are distributed semester wise, as prescribed in the Scheme of Teaching and Evaluation for each of the programmes. The courses generally progress in sequences, building competencies as per the course learning outcomes. The positioning of a course indicates certain academic maturity on the part of the students. 3) Some courses do, in addition, may specify a grade/pass/exposure for other courses, offered earlier in the programme, as pre-requisites for the course. 4) Since the University follows the CBCS system, the students shall be offered the courses as per the Scheme of Teaching and Evaluation, and the students are required to register for the courses of their choice before the beginning of every semester. 5) Students are required to follow the semester wise schedule of courses specified in Scheme of Teaching and Evaluation; they do, however, have freedom to follow alternative schedules to optimize their academic profile with additional courses, keeping the requirements for each course in mind. For students with backlog courses, such rescheduling may even become necessary. Such departures from suggested schedules need to be done very carefully, and always with guidance from the Mentor.

24YB 3.3.4. Types of Courses: There will be following types of courses in a B. Tech. programme, namely:

1) Humanities and Social Sciences (HS), including Management, Skill enhancement and Economics.

2) Basic Sciences (BS) including Mathematics, Physics, Biology and Chemistry.

3) Engineering Sciences (ES) including , Basics of Electronics / Mechanical Engineering Sciences/ Computer Engineering.

4) Professional Core Courses (PC): These are the courses to be compulsorily studied by a student as a core requirement to complete the requirements of a programme in a said discipline of study.

5) Professional Elective Courses (PE): These are the courses from which a student can choose and study as part of the requirement to complete the programme in a said discipline of study.

6) Open Elective Courses (OE): These courses are supportive to the discipline/ providing extended scope/enabling an exposure to some other discipline/ domain and they are chosen from the pool of courses

7) Skill development Courses (SD): These courses will be nurturing student proficiency skills. These courses are offered to achieve the programme outcomes not specifically covered by the other courses.

8) Ability Enhancement Courses (AE):These are the generic skill courses which are basic and needed to all to ensure progression across all careers.

9) Non-Credit Mandatory Courses (NM): These are courses on peripheral subjects in a programme, wherein familiarity is considered mandatory.

10) Project work (PW), Mini Project work (MP), and Internship (IS) are also considered as courses in the programme.

24YB 3.3.5. Offering Courses The above types of courses in a B. Tech. programme are offered as follows:

1) Humanities and Social Sciences (HS)courses will have 1 to 3 credits per course.

2) Basic Sciences (BS) courses will have 2 to 4 credits per course.

3) Engineering Sciences (ES) courses are common across all disciplines and will have 2 to 4 credits per course.

4) Professional Core Courses (PC) will have 2 to 4 credits per course.

5) Professional Elective Courses (PE) will have 2 to 4 credits per course.

6) Open Elective Courses (OE) may have 2 to 4 credits per course.

7) Skill development Courses (SD) and may have 1 to 3 credits per course.

8) Ability Enhancement Courses (AE)may have 1 to 2 credits per course

9) Non-Credit Mandatory Courses (NM) require only a pass in each of the specified courses to qualify for the award of the Degree. 10) Project work (PW), Mini Project work (MP) and Internship (IS) are offered which may have 10, 2, and 3credits respectively.

The courses in the above types may be a combination of Lectures, Tutorials and Practical in any combination with suitable credits assigned to them. All the courses registered by a student under any of the above types of courses as required for award of the degree shall be considered as heads of passing which shall be Graded according to his/her performance. However, the Non-Credit Mandatory Courses shall be passed by a student for which Grades are not assigned.

The following procedure shall be used for designing and offering the above courses: The courses for a programme under the following types from (a) to (m) shall be designed within the framework of UGC and AICTE guidelines by the concerned Board of Studies and approved by the Academic council of the University.

The details of Theory courses from (a) to (i) and Practicals from (j) to (l) are given below.

(a) Humanities and Social Sciences

(b) Basic Sciences

(c) Engineering Sciences

(d) Professional Core Courses

(e) Professional Elective Courses

(f) Open Elective Courses

(g) Skill development Courses

(h) Ability Enhancement Courses

(i) Non-Credit Mandatory Courses

(j) Project work: Based on the ability/abilities of the student/s and recommendations of the mentor, a disciplinary or an inter-disciplinary major project can be assigned to a group having not more than 4 students. The main project work needs to be taken up within the institute/ research laboratory/industry. It is desirable, that the outcome of the project work may be published/patented.

(k) Mini Project work: A Mini Project is a laboratory/ societal/ Industry-oriented work that will provide a platform for students to enhance their practical knowledge and skills through the development of small systems/ applications based on the ability/abilities of the student/s and recommendations of the mentor, a disciplinary or an inter disciplinary mini-project can be assigned to a group having not more than 4 students.

(l) Internship: The internship is an extended period of work experience undertaken by the students aspiring to supplement their degree with professional development. The students are allowed to prepare themselves for the workplace and develop practical skills.

The Internship shall be completed during the period specified in the Scheme of Teaching and Evaluation. The departments shall encourage students to take up, (i) an interdisciplinary Research Internship or Industry internship and (ii) a rural internship, a work-based activity carried out to learn practical experiences in rural areas, for the upliftment of living standards. With the consent of the internal guide and head of the department, students shall be allowed to carry out the

internship in their hometown (within or outside the state or abroad), provided favorable facilities are available for the internship and the student remains regularly in contact with the internal guide. University/departments shall not bear any cost involved in carrying out the internship by students. However, students can receive any financial assistance extended by the organization/company offering internship. The course viva-voce examination shall be conducted at the end of the internship period.

24YB 3.3.6. Audit Courses: A student desirous of additional exposure to a course, without the rigors of obtaining a good grade, 'audits' a course. The minimum requirement of attendance for an 'Audit Course' is 75%, with any additional requirements as set by the instructor such as submission of assignments and minimum performance in some of the in-semester evaluations. Auditing of courses during regular semesters from 3rd semester onwards is permitted under the following conditions: 1) Students with CGPA>6.0 will be permitted to 'Audit' a course. A course can be audited provided the course is offered in the semester as a credit course for others, and there is no slot clash. Prior permission of the Instructor is required. 2) Audit courses would be restricted to a maximum of two (2) courses per student in the entire period of the programme. 3) The Course Teacher would award the 'AU' grade, if the attendance is satisfactory and additional requirements, as set out by the Course Teacher, are met. If the attendance and performance in additional requirements is not satisfactory, the Course Teacher will award 'No Grade'. The grade 'AU' does not carry any grade points and therefore does not figure in SGPA/ CGPA calculations 4) The course successfully completed in Audit mode will be reflected in the Semester Grade card and the Transcript as Audit Course.

24YB 3.3.7 Prescribed Number of Credits for the Programme All courses prescribed by the University, except the Non-credit Mandatory courses, shall have credits and be considered as a head of passing for vertical progression. The credits fixed for the courses are awarded to the students on passing the courses registered by the student.

1) The total number of credits to be earned by students admitted to the first semester of the four year B.Tech. programme shall be 160.

2) The total number of credits to be earned by students admitted under lateral entry scheme to the third semester of the four year B.Tech. programme shall be 120.

3) A student shall be eligible to obtain an Undergraduate degree with Honours/ Minor, if he/she earns a minimum of additional 18 credits, as specified by the University.

24YB3.4. Curriculum Framework The structure of UG program in Engineering shall have essentially the following types of courses with the breakup of credits as given:

Table – 3.4 : Credit Breakup for a Programme

Sl. No.	Category	Credits	% of total Credits
1	Humanities and Social Sciences including Management courses, including AE	16	10.00
2	Basic Science courses	22	13.75
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer/PL/ET etc.	24	15.00
4	Professional Core courses relevant to chosen specialization/branch	59	36.88
5	Professional Elective courses relevant to chosen specialization/branch	12	7.50
6	Open subjects – Electives from other technical and /or emerging subjects	12	7.50
7	Project workand internship in industry or elsewhere	15	9.37
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	(non-credit)	0.00
	Total	**160***	**100.00**

*Minor variation is allowed as per need of the respective disciplines.

24YB3.5. SCHEME OF TEACHING AND EVALUATION

1) The Scheme of Teaching and Evaluation shall be framed by distributing the total credits over eight semesters as follows:

Table – 3.5 : Semester-wise Allocation of Credits

	Semester	Credits	Total	
			Credits	• Lecture(L): one hour/week : 1 credit • Tutorial(T): Two hours/week: 1 credit • Practical/ Lab/ Drawing (P): Two hours/ week: 1 credit • Project, Mini-project, Internship: credits as recommended by the University. • Credit for the Seminars shall be part of the courses.
I year	1	20	40	
	2	20		
II Year	3	20	40	
	4	20		
III Year	5	20	40	
	6	20		
IV Year	7	20	40	
	8	20		
Total:		**160**		

2) Course Load:

Every student should register for a set of Courses in each Semester, with the total number of their Credits being limited by considering the permissible weekly Contact Hours (typically: 30/Week); For this, an average Course Load of 18-22 Credits/Semester (e.g., 6-7 Courses) generally acceptable; to also include2 or 3 Units of Non-Credit Mandatory Courses in some Semesters.

3) Teaching-Learning Process:

The theory courses shall be designed to have the syllabus spanning over one semester depending on the credits allocated for them. That is, Four-credit theory courses shall be designed for 55-60 hours of Teaching-Learning process, Three credit theory courses shall be designed for 40-45 hours of Teaching-Learning process, Two-credit theory courses shall be designed for 25-30 hours of Teaching-Learning process and One credit theory course shall be designed for 15 hours of Teaching-Learning process.

4) The Scheme of Teaching and Evaluation provides the list of courses offered in a semester, their types, course credits in L-T-P format and the contact hours.

5) The Syllabus formulated shall be well structured and enable CBCS implementation and incorporate Outcome Based Education (OBE) framework.

24YB 3.6. Course Registration It is mandatory for every student to register for the semester to attend various courses/ earn credits, using the prescribed Course Registration Form (CRF), till he completes his programme. The registration is normally done on the last two working days of each semester upon completion of the SEE. In all circumstances, registration shall be completed on or before the prescribed last date for registration announced in the Academic Calendar. The registration of courses each semester is mandatory.

1) On joining the Programme, each student is assigned to a Mentor. A student shall register for required courses each semester with prior permission of the Mentor.

2) The student can register for courses he intends to take during a given semester on the basis of his plan for each Programme, as given in the Scheme of Teaching and Evaluation and as per the advice given by his Mentor.

3) The Mentor is expected to discuss with the student his academic performance during the previous semesters and then decide the number and nature of the courses for which the student can register during the semester within the framework of the Regulations.

4) The Mentor may advise the student to drop one or more courses/activities based on his academic performance. The Mentor may even advise a reduced load program over several semesters for students with poor performance at the end of the first semester/year.

5) Students are not permitted to reregister for course/(s), which they have already passed.

6) Students having outstanding dues to the University/ hostel may not be permitted to register.

7) The registration is deemed to be complete only on approval of the HOD.

8) Without registration, any academic activity (course/seminar etc.) undergone by a student will not be counted towards the requirements of his degree.

9)The minimum number of students registered to any Professional Elective Course / Open Elective Course/ Ability Enhancement course (from 3rd semester onward) offered by the Departments shall not be less than ten. In such cases, If the number of registrants for the elective course is less than 10, the department must seek permission from the Dean within 15 days from the date of commencement of the semester as per the academic calendar of the University ,if that Professional Elective Course /Open Elective Course/Ability Enhancement course is to be offered in that college.

10) A student shall exercise the option with respect to a higher semester Professional Elective Course/Open Elective Course /Ability Enhancement course and register for the same at the end of the previous semester. However, the student may be permitted to opt for a change of Elective Course/s preferably within 15 days from the date of commencement of the semester as per the academic calendar of the University.

11) Permitted Maximum credits for registration: The student shall be permitted to register in a semester for total courses not exceeding 30 credits. These 30 credits include the courses of the regular semester and backlogs. The registration of these additional credits includes the courses with a shortage of attendance and the courses with unfulfilled CIE requirements.

24YB 3.6.1. Procedure for Course Registration:

1) The procedure involves the following steps:

a) The students shall decide on the courses to be registered during the ensuing semester immediately after their SEE examinations as per the advice of their Mentor.

b) They shall fill up the CRF, stating the courses that they propose to complete during the ensuing semester as per the prescribed curriculum.

c) They shall take a printout of the completed CRF, take signature of the Mentor and submit to the HOD within the date notified by the Dean.

2) Registration for the Courses: The Registration is dependent on the academic standing of the student and his/ her interest. Every student however is permitted to register for a maximum of 28 credits in any semester excluding Minor/ Honours degree courses.

3) Late Registration: Registration beyond the last date may be permitted only in special cases till the date specified in the Academic Calendar, on payment of a late registration fee.

4) Registration for Non-credit Mandatory courses: Non-credit requirements are assessed as Pass (PP)/ Not Pass (NP) subject to the fulfillment of the minimum requirements of the specified activities and a minimum of 75% attendance.The award of degree is subject to successful completion of these requirements. Formal registration for these courses shall also be done along with other courses, at the beginning of the semesters. A student will be awarded PP (Pass) grade for the course he is registered for, in that semester, provided the minimum requirement is met during that semester together with attendance criteria. Not satisfying these requirements will result in a failure grade NP (Not Pass), and the student has to re-register for the coursewhen offered next in the subsequent semesters and pass within two years. The grades shall be submitted to the Dean before the commencement of the SEE.

5) Course substitution: In case a student obtains F grade four times in a course, other than the Professional core courses, the student is permitted to opt for an equivalent course substitution approved by the University and complete the course requirements within the stipulated duration. The student must re-register the specified equivalent course and complete it. A student shall be permitted to avail this option beyond a maximum of two courses.

24YB 3.7. Student Mentoring On joining the University or College, a student or a group of students' is/are assigned a Mentor from the concerned department offering the Programme. Students are advised to consult the Mentor on any matter relating to their academic performance and the courses they may take in various semesters. Mentor guides the students to complete their courses of study for the required degree in a smooth and satisfactory
manner.

24YB3.8. Attendance Requirement

1) Every prescribed course shall be considered as a unit for the calculation of attendance. All students are required to attend all the lectures, tutorials, practical, and other prescribed curricular and co-curricular activities, and earn full attendance. However, a student shall obtain a minimum attendance of 85% in each of the courses registered. However, if the attendance is below 85%, the

shortage upto a maximum of 10% of the attendance bay be condoned by the Dean on the specific recommendations of the HOD. This provision shall be utilised based on medical grounds, participation in NSS/NCC/Red cross/National level Republic Day and Independence Day Parade/ participation in University/State/National/ International level sports and cultural activities, seminars, workshops, paper presentation, etc., of significant value, supported by valid documents. The HOD may recommend for condoning the shortage of attendance and submit the application with documents to the office of the Dean before the last day of the semester.

2) The basis for the calculation of attendance shall be the period prescribed by the University by its academic calendar of events and as notified by the Registrar.

3) In case of late admissions, approved by competent authority of YU for admission to I semester and III semesters (for lateral entry scheme), the attendance shall be reckoned from the date of admission to the Programme.

4) The HOD shall also notify every month, the list of candidates who are falling short of required attendance. The Mentor/Class Advisor or the student welfare office shall inform the students as well as their parents/guardians about the attendance requirement and the attendance status every month. Students facing an attendance shortage shall be mentored to make up for the shortage.

5) A student who does not satisfy the attendance requirement in one or more Courses (including bridge courses for lateral entry students if any) shall not be eligible to appear for the Semester End Examinations (SEE) of that course(s). The grade card for such courses shall be marked as DX. The candidate shall be required to repeat that course/s whenever that course/s is offered next. However, the student will be allowed to appear for the SEE in other courses of the semester. 6) The student will repeat the course/s in which he/she falls short of attendance, whenever the course/s is offered next.

24YB 4.0. ASSESSMENT AND EVALUATION PROCEDURE:

Formative, Summative and other assessments shall be conducted in the courses offered to the registered students, within the framework of Scheme of Teaching and Evaluation approved by the University Statutory Academic Bodies, as per the University calendar of events.

24YB 4.1 Assessment and Evaluation Process: 1) CIE and SEE constitute the major evaluations prescribed for each course, with only those students maintaining a minimum standard(40%) in CIE are permitted to appear in SEE of the course. 2) In such cases where a laboratory is attached to the course, CIE marks shall be awarded separately for both theory and the laboratory. However, the laboratory may or may not have the SEE component in the evaluation. 3) CIE and SEE to carry 50% weightage each, to enable the course to be evaluated for a total of 100 marks, irrespective of its credits. 4) The evaluation system of the program is comprehensive and continuous during the entire period of Semester, by the faculty who is teaching the course. For a course, the evaluation and grading will be on the following parameters:

A	Continuous and Comprehensive Evaluation (CCE)	25 marks
B	Internal Assessment Tests (IAT)	25 marks
	Total of CIE (A+B)	50 marks
C	Semester End Examination (SEE)	50 marks
	Total of CIE and SEE (A + B + C)	100 marks

24YB4.2. Continuous Internal Evaluation (CIE) 1) The CIE will carry a maximum of 50% weightage of total marks of a course. Before the start of the Academic session of each semester, a faculty may choose for his course Internal Assessment Test and a minimum of two of the following assessment methods with suitable weightage for each.

i) Assignments (Individual and/or Group)
ii) Seminars,
iii) Oral/Online Quizzes
iv) Group Discussions
v) Case studies/Case lets
vi) Practical orientation on Design Thinking, Creativity & Innovation
vii) Participatory & Industry-integrated learning
viii) Practical activities / problem solving exercises
ix) Class presentations

x) Analysis of Industry/Technical/Business Reports

xi) Reports on Guest Lectures / Webinars / Industrial Visits xii) Industrial / Social / Rural projects xiii) Participation in Seminars/ Academic Events/Symposia, etc.

xiv) Any other academic activity

2) The faculty will submit the 'CCE Assessment Plan' to the Dean for approval and notify the same along with the course syllabus before the start of semester. The total marks of the above two assessment components shall be scaled down to 25 marks/ 25% of total marks of the respective course.

3) To assess the students in a course under IAT component, two tests will be conducted in a semester. Each test will be conducted for 25 marks. The average marks obtained in these two tests will be taken as IAT Marks. If a student fails to attend the IAT on the scheduled date, an additional test at the end of the semester would be conducted covering the syllabus of the test for which he was absent.

4) The CIE marks awarded to students at different stages during the course shall be displayed on the notice board of Department to enable the students to point out any discrepancies. After due corrections, if any, faculty shall upload the CIE marks in the University's ERP system and a hard copy of the same shall be submitted to the Controller of Examinations Office of the University duly signed by the concerned faculty and the Dean before the commencement of semester end examinations.

5) The student shall obtain a minimum of 40% of marks allotted for CIE in each course to be eligible to appear for the SEE in that course.

6) When laboratory is part of a theory course, the student shall obtain a minimum of 40% marks in CIE of the laboratory to be eligible to appear for SEE in that course. This is in addition to the requirement specified under

(5) above. The CIE marks obtained by a student in the laboratory, if it is equal to or greater than 40%, shall be retained until he passes in the SEE. Otherwise, he shall re-register for the course when offered next.

7) If a student is unable to secure a minimum of 40% in CIE marks in any course, he shall not be eligible to take up SEE/ viva-voce examination in that particular course. It shall be the

responsibility of Dean to scrutinize the list of candidates and permit only the eligible students to take up SEE. In the event of an ineligible student inadvertently being allowed to appear for the theory/viva voce examination, the result of the concerned student shall be withdrawn forthwith. 8) The list of such students, who have not secured the minimum in CIE marks, shall be sent to the COE along with the submission of CIE marks of the successful students.

9) After the submission of CIE marks to COE of the University, any request for changes in the marks by the Faculty shall be considered only after due approval of the Dean obtained through HOD

10) The students not obtaining 40% marks in CIE shall re-register for the course during the subsequent semester whenever it is offered.

24YB 4.3. Semester End Examination: 1) The Semester End Examination for all the courses offered during the semester shall be conducted at the end of each semester except when there are no students taking examination for any course as per the scheme of teaching and examinations.

2) Only those students who satisfy the attendance requirement as per 24YB3.8 and CIE requirement as per 24YB 4.2 shall be eligible to appear for SEE of that course.

3) University examination under for all Courses SEE shall be conducted for a maximum of 100 Marks. Marks secured by the students for100 marks shall be proportionately scaled down to a maximum of 50 marks to add the same with the CIE marks for the award of the letter grade.

4) The University examinations for all the Programmes of study shall be conducted at the end of each semester.

5) Students having no backlog course/s, may not have more than one examination on the same day. However, course/s may face a situation where they may have students having backlog

a) Two examinations scheduled at the same time of the day,

b) To take two examinations on the same day, one during the morning session and the other in the afternoon session, and

c) Examinations on consecutive days.

6) As changing the examination dates is not an option, the examination time table shall not be modified/ altered/ adjusted in any of the above three cases. In the first case, the students shall select any one of the clashing courses and in the second and third cases, the students shall manage the examinations as per their decision.

7) For all theory Courses /practical/field work, the maximum SEE marks shall be 50, the minimum SEE marks to be secured shall be 35 % of the maximum marks (18 marks).

8) Mini-Project is not having any SEE component.

9) Students who satisfy the conditions (6), (7), and (8) above, and obtain any grade from O to P in a course shall be considered to have passed that course.

10) A student shall be declared fail if he/she • Fails to satisfy the conditions under Section (9) above,

• Absents himself/herself from the University examinations,

• The course/s in which student/s fail to satisfy attendance and CIE requirement (AU courses) are also considered as F only.

11) If a student secures an 'F' grade in any of the Courses, he/she shall reappear for that Course(s) during the subsequent SEE. The CIE marks awarded to the student at the first attempt in the concerned Course (s) shall be carried forward. CIE marks are considered only in NE cases (not eligible to appear for SEE due to non-comply of attendance and CIE). The sum total of CIE and SEE marks must be 40% of the maximum marks prescribed for a course as per the teaching and examination scheme.

24YB 4.4.CIE Assessment in Specific Courses:

24YB 4.4.1. Practical Courses:

1) CIE for Practical Work Courses a) CIE marks for a practical course shall be 50 Marks. The split-up of CIE marks for record/ journal and test to be in the ratio 60:40. (i) Each experiment to be evaluated for conduction with observation sheet and record write-up. Spit up of marks for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and shall be made known to students at the beginning of the

practical session. (ii) Record shall contain all the specified experiments in the syllabus and each experiment write-up be evaluated for 10 marks. (iii) Total marks scored shall be scaled downed to 30 marks (60% of maximum marks). (iv) Weightage to be given for neatness and submission of record/write-up on time. (v) Department shall conduct one test for 100 marks, after the completion of the experiments. (vi) In test write-up, conduction of experiment, acceptable result, and procedural knowledge shall carry a weightage of 60% and the rest 40% for viva-voce. (vii) The suitable split up of marks can be designed to evaluate each student's performance and learning ability. (viii) The test marks out of 100 shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write- up/journal and marks of the test shall be the total CIE marks scored by the student. b) Internal tests for laboratory courses with software experiments shall be conducted for a total of 100 marks. In this evaluation, Observation, write-up of procedure/ Algorithm/ program, and execution of experiment shall be assessed for 80 marks and the Viva voce for 20 marks. Marks scored out of 100 shall be scaled down to 50 marks. 2) SEE for Practical Work Courses 1) The SEE marks for the practical courses shall be 50 Marks. 2) SEE shall be conducted jointly by the two examiners of the same institute appointed by the University. 3) All laboratory experiments are to be included for practical examination. 4) Breakup of marks and the instructions printed on the cover page of the answer script are to be strictly adhered to by the examiners. OR Based on the course requirement, a split-up of marks for evaluation shall be decided jointly by the examiners. 5) Students shall pick one question (experiment) from the questions pool prepared by the examiners jointly. 6) Evaluation of write-up/ conduction procedure and result/viva will be conducted jointly by the examiners. 7) The split-up of maximum allocated marks for SEE are: (i) procedure/ writeup- 20%, (ii) Conduction and result in 60%, (iii) Viva-voce 20% 8) SEE for the practical course shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks. 9) Change of experiment is allowed only once and 20% Marks allotted to the procedure/write-up part to be made zero (Evaluation is to be carried out for 80% of total maximum marks). 10) The duration of SEE shall bethree hours.

24YB 4.4.2. Internship

1) The Internship shall be taken up during the period specified in the Scheme of Teaching and Examinations. The Department/ College shall nominate faculty member/s to facilitate, Guide, and

supervise students under an internship. The students shall report the progress of the internship to the Guide in regular intervals and seek his/her advice. The Guide shall maintain the progress record of the candidates undergoing internship. Duration of the internship shall be as mentioned in the scheme of Teaching and Examination. 2) Report evaluation: Internship shall be evaluated for 50% maximum marks. split-up of marks suggested for report evaluation shall be based on, a) Report formatting (20% of marks of CIE for report) b) Presentation of the outcomes in the report (40% of marks for CIE for report) and c) Technical content of the report (40% of marks for CIE for report) Weightage shall be given for paper publication in reputed journals/refereed journals/ Conferences/Product developed/ Industry/Research Internship. Patent filed – only for 3) Viva-Voce shall be conducted for 50% of marks of CIE. The split-up of marks suggested are: a) For demonstration of (soft) skills/Engineering Knowledge gained (50% of marks of CIE for Viva-voce). b) The question-answer session will check for the understanding of the fundamentals and concepts (40% of CIE marks for Viva-voce) c) Clarity in answering the questions (10% of CIE marks for Viva-voce) Viva-voce shall be conducted by the Mentor/ Guide and Head of the department /one of the senior faculty assigned by the Head of the department. 4) Those who do not complete the internship shall be declared Fail and shall complete it during subsequent University examinations after satisfying the requirements during subsequent semesters.

24YB 4.4.3. Seminar

1) The maximum marks prescribed for the Seminar and the evaluation process shall be notified by the University/ College before offering the course. 2) The Seminar performance evaluation shall be a part of CIE only in a course where required. 3) The Seminar shall be assessed as indicated below. a) The Head of the Department shall make arrangements for the conduct of seminars through a committee of faculty members of the Department. The committee, constituted for the purpose by the Head of the Department, shall award the CIE marks for the seminar. The committee shall consist of three senior faculty members of the Department and the most senior among them shall be the Chairperson. b) The marks awarded for Seminar shall be based on the evaluation of the Seminar Report, Presentation skill, and Viva-voce (Question & Answer session) in the ratio of 50:25:25. c) Split up Marks to be assessed as follows: (i) Report marks to be allotted by the seminar guide/s(50% of the maximum marks) A). Formatting of the report (10% of maximum marks) B).

Literature survey (20% of maximum Marks) and C). Technical content of the report (20% of maximum marks) (ii) Seminar Presentation skill marks to be allotted by the committee: (25% of the maximum marks) (iii) Viva-Voce marks to be allotted by the committee: (25% of the maximum marks) A). Understanding of fundamentals and concepts (15%) B). Clarity in answering the questions (10%) 24YB 4.4.6. Mini-Project 1) The Mini-Project performance of a student shall be evaluated under CIE only. The maximum marks rescribed for CIE shall be as mentioned in the Scheme of Teaching and Evaluation. 2) The Head of the Department shall make arrangements for the conduct of viva voce evaluation of the mini-project. The committee shall consist of a Faculty guide/mentor and two senior faculty members of the Department and the most senior among them shall be the Chairperson. 3) The CIE marks awarded for Mini-Project, shall be based on the evaluation of the Mini-Project Report, Project Presentation skill, and Viva-Voce (Question and Answer session) in the ratio of 50:25:25. 4) The marks awarded for the Mini-Project report shall be the same for all the students of the batch.The faculty guide/ mentor guiding the Mini-project shall Evaluate the performance for 50% of the maximum marks of CIE for the report. 5) This committee shall evaluate Mini-project Work for the rest of 50% of the VTU, Belagavi - 31 - DRAFT COPY Visvesvaraya Technological University (Award of Bachelor of Engineering/Technology Degree) Regulations, 2022 maximum marks considering performance in project presentation and Viva-Voce (question-answer session. a) Project presentation: 25% of maximum marks b) Viva-Voce (Question and answer session) :25% of maximum marks 24YB 4.4.7. Project Work 1) The project work shall be evaluated considering both CIE and SEE; The CIE and SEE marks shall be as mentioned in the Scheme of Teaching and Evaluation. 2) The CIE marks awarded for Project Work shall be based on the evaluation of the Project Report, Project Presentation skill, and Viva-voce in the ratio of 50:25:25. 3) The marks awarded for the Project report shall be the same for all the students of the batch. 4) The Head of the Department shall make arrangements for the conduct of Viva Voce for evaluation of the project work. The committee shall consist of the faculty guide/mentor and two senior faculty members of the Department and the most senior among them shall be the Chairperson. 5) The faculty guide/ mentor guiding the project shall Evaluate the performance for 50% of the maximum marks of CIE for the report. 6) This committee shall evaluate Project Work for 50% of the maximum marks considering the project

presentation and question-answer session. a) Project presentation: 25% of maximum marks b) Question and answer session: 25% of maximum marks

24YB 4.5. SEE Assessment in Specific Courses:

24YB 4.5.1. Theory Course with 4, 3 and 2 Credits The SEE for theory courses shall be conducted by the University as per the scheduled timetable for all, with common question papers for the course. The duration of examination shall be three hours. 1) The question paper will have ten questions. Each question is set for 20 marks. The medium of the question paper shall be ENGLISH unless otherwise it is mentioned. 2) There will be 2 questions from each module. Each of the two questions a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. 3) The students have to answer 5 full questions, selecting one full question from each module. 4) Marks scored will be proportionally scaled down to 50 marks.

24YB 4.5.2. Integrated Course (I/C) /Integrated Professional Core Courses (IPCC) For a course where theory is integrated with Laboratory course, the SEE duration for the theory part shall be three hours, as specified in section 24YB 4.5.1. However, the question paper in the SEE examination shall include at least one question from the Laboratory component.

24YB 4.5.3. Theory Course with 1 Credit The SEE question paper shall have MCQ (multiple choice questions) set for 50 questions, each carrying one mark. The time duration for SEE is one hour.

24YB 4.5.6. Practical Work Courses

1) The SEE marks for the practical courses shall be 50 Marks. 2) SEE shall be conducted jointly by the two examiners of the University/ College appointed by the University. 3) All laboratory experiments are to be included for practical examination. 4) Breakup of marks and the instructions printed on the cover page of the answer script are to be strictly adhered to by the examiners. OR Based on the course requirement, a split-up of marks for evaluation shall be decided jointly by the examiners. 5) Students shall pick one question (experiment) from the questions pool prepared by

the examiners jointly. 6) Evaluation of write-up/ conduction procedure and result/viva will be conducted jointly by the examiners. 7) The split-up of maximum allocated marks for SEE are: a) procedure/ write up- 20%, b) Conduction and result in 60%, c) Viva-voce 20% 8) SEE for the practical course shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks. 9) Change of experiment is allowed only once and 20% Marks allotted to the procedure/write-up part to be made zero (Evaluation is to be carried out for 80% of total maximum marks). 10) The duration of SEE shall bethree hours.

24YB 4.5.7. Internship

1) SEE shall be conducted by the Internal and external examiners approved by the University. The internal examiner shall be the guide for SEE. The external Guide for the Internship shall be the external examiner for SEE. 2) Examination for internship shall be conducted at the college and the date shall be fixed in consultation with the external Guide. The Examiners shall jointly award the SEE marks. 3) In case the external Guide expresses his inability to conduct the Examination at the last moment, the Principal /Chief Superintendent appointed by the University for the concerned examination of the Institute shall appoint a senior faculty of the Department to conduct the Examination along with the internal Guide. 4) Split up of marks for evaluation may be the same as suggested for CIE or Internal and external examiners shall devise split up of marks for SEE and the same may be submitted to the University along with evaluation marks.

24YB 4.5.8. Project Work 1) The project work shall be evaluated for 200 marks with CIE of 100 marks and SEE of 100 marks. 2) The Project Work will be conducted by the two examiners one internal and one external examiner appointed by university. 3) SEE marks for the project shall be awarded using appropriate Rubrics based on the quality of work& report, presentation skills, and viva- voce in the ratio 50:25:25 respectively.

24YB4.6. Maintenance of Examination Records

1) The candidate shall write tests, assignments/unit-tests /written quizzes in IA Books(supplied by the examination section) , which shall be preserved by the Head of the Department for at least 3

years after the announcement of University results and shall be made available for verification as per the direction of the COE.

2) Any corrections or overwriting of CIE marks on the IAT book/laboratory record etc., where CIE marks are awarded, shall bear the signature(s) of the concerned Teacher(s) and the Head of the Department.

3) CIE marks shall reach the COE of the University before the commencement of examinations as per the notification from the office of the COE from time to time. After submission of CIE marks to the University, any request under any circumstances for a change of CIE marks shall not be considered.

4) Students satisfying the attendance requirement but failing to secure the minimum percentage of CIE marks, in any course/s, shall not be eligible for the SEE, conducted by the University and they shall be considered as fail in that Course /those Courses and marked as NE in the grade cards against this course/s. However, they can appear for University examinations conducted for other Courses of the same semester and backlog course/s if any.

5) Students who have satisfied the attendance requirement but not the CIE requirements can be permitted to register afresh and appear for SEE after satisfying the CIE requirements in the same Course(s) when offered during the next immediate semester/s or later.

6) Each appearance to SEE or absence after completing CIE and attendance requirements to complete a course shall be treated as an attempt.

7) The student shall be permitted to register for total courses not exceeding 30 credits. These 30 credits include the courses of the regular semester and backlogs. The registration of these additional credits includes the courses with a shortage of attendance and the courses with unfulfilled CIE requirements.

8) CIE marks of those students, who come under 24YB4.6(4) and (5), shall also be sent to the COE along with other course CIE Marks.

9) The final list, incorporating corrections (if any), of CIE marks awarded to the students in the Theory/Practical/Internship/ Technical Seminar/ Mini – Project Work/Major-Project Work shall be displayed on the notice board of the Department much before the closure of the semester.

10) The Department shall enter the CIE marks of each semester in the format of the University's online CIE marks portal and submit a certified copy of the same to the University Examination

Section within the stipulated date notified by University. Every page of the CIE marks sheet (hardcopy) shall bear the signatures of the concerned Teacher/Teachers & Head of the Department,

24YB4.7. Review Committee for CIE

1) Review of assessment is an organized procedure that ensures the use of valid assessment methods and consistent application of criteria, to provide fair academic judgment and reliable outcomes in the form of marks or grades. It assures appropriate designing and implementation of assessment activities along with the generation of valid and reliable results.

2) There shall be a reviewing Committee for Internal Assessments in the Department, which shall be chaired by the Head of Department and two senior faculty members to be nominated by the Dean. This Committees hall be responsible for the entire process of Internal Assessment in the Department, including redressal of grievances if any.

3) Guideline for the Review Committee: Review may be conducted after each test or after the tests in case there is a large number of fail grades or higher letter grades, or when large numbers of students who have received the same grade or clustering of students on letter grades, or when there are discrepancies between marks allocated to individual students in different courses,

a) Split-up of marks used for each of the different types of assessment in the course to be checked

b) Checking of the questions whether it maps with course outcomes.

c) Checking of the level of difficulty of questions paper i.e is difficulty level on the extremes, very easy or otherwise.

d) Whether the assessment modes are used to cover the entire syllabus or not.

e) Checking the manner of awarding the marks, i.e has correction been at the extremes, liberal or tough

f) Moderation should not be restricted to just assessment but also includes the assessment design (scheme of evaluation).

g)Department has to submit the moderation committee report to Dean with the CIE marks.

24YB4.8. Rejection of Result

1) A student may, at his/her desire, can reject the total performance of a semester (including CIE marks) or reject only the result of his/her performance in university examinations(SEE) of a semester. The rejection is permitted only once during the entire Program of study.

2) Students who desire to reject the SEE results of a semester shall reject the total performance(irrespective of the earned Course grades) in all the Courses of the semester either rejecting or retaining the CIE marks. However, rejection of the performance of the VIII semester project shall not be permitted.

3) Students who desire to reject the total SEE performance of an odd or even semester including CIE marks, have to repeat that odd or even semester of the prevailing scheme by taking readmission during the subsequent academic year/s. They shall also be governed by readmission and Maximum duration clauses.

a) If the rejection of SEE results excluding CIE marks is of the odd semester, students shall be allowed to take admission to the

immediate next even semester. b) If the rejection of SEE results excluding CIE marks is of an even semester, then students shall be allowed to take admission to the next odd semester.

c) Readmission to odd/even semesters shall not be considered as fresh admission and therefore students shall continue to have the same University Seat Number, which was allotted earlier.

The maximum duration of the Program shall be counted with reference to the University Seat Number (USN).

d) Applications for rejection of results excluding CIE and approval to reappear for University examinations shall be sent to the COE through the Dean within 30 days from the date of announcement of the results, with prescribed fee as notified by the university from time to time. Late submission of applications shall not be accepted for any reason.

e) Application for rejection of results including CIE and approval for readmission shall be sent to the Registrar through the Principal of the College within 30 days from the date of the announcement of the results with prescribed fee as notified by the university from time to time. Late submission of application shall not be accepted for any reason.

4) Registration for SEE is compulsory if the student/s has satisfied the attendance and CIE requirement of ODD /EVEN semester. In case, the students fail to register for SEE of the odd

semester after satisfying the attendance and CIE requirements of the semester, they shall be permitted to move to an even semester of that academic year. However, such students have to register for odd semester examinations conducted at the end of the academic year for all the semesters and registration shall be considered for the first attempt. In case, students fail to register for the odd semester SEE after completing successfully the even semester, they shall not be permitted to move to the higher odd semester of the subsequent academic year. Irrespective of a student appearing for SEE, he/she has to register for SEE for odd and even semesters before completing the academic year.

5) Students who opt for rejection of results of the University examination shall be eligible for the award of the degree and Minor Degree but not for the award of ranks and Honors degree.

24YB4.9. Academic Malpractice Academic malpractices shall be seriously viewed, and appropriate action taken. In case of malpractice during any of the examinations like assignments, quizzes, tests, and SEE, the Faculty /Invigilator shall report the matter to the Dean. If the Dean finds that the offence is serious enough or the candidate appeals in writing to the University, then the matter shall be further referred to the Academic Malpractice Committee/COE of the University.

24YB 5.0. MAXIMUM DURATION FOR PROGRAMME COMPLETION

Students admitted to first-semester B.Tech., shall complete the program within eight academic years from the year of the first admission, failing which they will not be eligible for the award of a degree Students admitted to third semester B.Tech., under the lateral entry category shall complete the program within six academic years from the year of the first admission, failing which they will not be eligible for the award of degree.

24YB5.1. Readmission

1) Students who are temporarily discontinuing the program and getting readmitted or rejoin to the eligible semester are subject to a maximum duration of eight (for Regular students) / six (for lateral Entry students) years as applicable.

2) The permission for readmission is only on request through the principal and is not treated as a matter of right. Such students shall not claim any benefits based on the readmission.

3) Students who take re-admission to any semester of the existing scheme from another scheme, as a repeater/fresher because of various reasons, shall attend and complete all the remaining semester/s of the program adhering to the regulations of the prevailing scheme and shall complete additional Course/s, if any, as per the decision of equivalence committee in concurrence with concerned Board of Studies on establishing the equivalence between two schemes. Such a candidate shall not be eligible for the award of rank.

4) Readmission to odd/even semester shall not be considered as fresh admission and therefore students shall continue to have the same University Seat Number, which was allotted at the time of admission to the program. The maximum duration of the Program shall be counted with reference to the USN (University Seat Number) allotted during admission to the program.

5) A student who has not obtained the eligibility for III semester even after three academic years from the date of admission to I semester shall discontinue the Programme or get readmitted to I semester of first year B.Tech., with a new University Seat Number(USN) but retaining the same year of admission.

24YB 6.0. AWARD OF GRADES:

1) The University adopts absolute grading system wherein the marks are converted to grades, and every semester result will be declared with semester grade point average (SGPA) on successful completion of all courses of that semester.

2) The total marks obtained by the student in CIE and SEE of a course is expressed as a percentage to compute the grade points and the letter grade is awarded as indicated in the table below:

Letter Grade and corresponding Grade Points on a typical 10 – Point scale								
Letter Grade	O	A+	A	B+	B	C	P	F
	Outstanding	Excellent	Very Good	Good	Above Average	Average	Pass	Fail
Grade Point	10	9	8	7	6	5	4	0

% of Marks Secured	90-100	80-89	70-79	60-69	55-59	50-54	40-49	0-39

3) If there is no SEE for a course, then the CIE marks alone will be the basis for the determination of letter grade.

24YB6.1. Other Letter Grades: The letter grades specified in 24YB 6.1 are used as student performance measures in all kinds of assessments. However, the following letter grades are also awarded under the circumstances defined below

(Letter Grade: Grade Point - Circumstances).

1) NE: 0 - Credits are not included in CGPA, Attendance below 75%, hence Repeat the course (In case of electives, course change is permitted)

2) AU: 0 - Satisfactory in an Audit course

3) AB: Absent for the Course

4) PP: 0 – Passed in Non-credit course

5) NP: 0 - Not Passed in Non-credit course

6) IC: No credits - Incomplete (a place holder; gets converted to an appropriate grade after clearing SEE examination else converted to “F”) else automatically converted to “F”.

7) W: No credits – Dropped/ withdrawn (W is not a grade but only a place holder indicating that the course has been dropped/withdrawn and it must be cleared in subsequent semesters).

8) DX: Attendance below 75%

24YB 6.2. Passing Standards

1) Maximum and Minimum CIE Marks: The maximum weightage of CIE mark shall be 50. To appear for the SEE, the minimum CIE marks to be secured in each of the courses shall be 40 % of the maximum marks of CIE.

2) Maximum and Minimum SEE Marks: The maximum weightage of SEE marks shall be 50 and marks to be secured for passing shall be 35 % of the maximum marks of SEE.

3) Eligibility for Passing a Course: The overall passing marks shall be 40% of the maximum marks (the sum of the CIE and SEE should be 40% of the maximum marks) of the course. That is, Minimum passing grade in a course (head of passing) shall be "E".

4) Semester Passing Standards:

a) A student shall be declared successful or 'passed' in the entire Undergraduate Programme, only when he secures a Grade Point of 4 ("E" Grade) or above in every registered Course in each Semester during the entire programme for the Degree Award, as required.

b) A Student shall be declared successful or 'passed' in any Non-Credit Course if he secures a 'Satisfactory Grade (PP)' for that Mandatory Course.

24YB 6.3. Vertical Progression

1) All the below clauses are subject to a maximum duration of eight years (six years for Lateral Entry Students) of the programme.

2) A theory, standalone practical or Theory with practical shall be treated as a head of passing.

3) The Non–credit Mandatory courses (NMCs) shall not be considered for the eligibility criterion prescribed for promotion, award of Class, calculation of SGPA and CGPA. However, a pass in these courses is mandatory before the completion of Degree.

4) There shall be no restriction for promotion to 2nd semester from 1st semester.

5) Third semester onwards, a student is permitted to register for higher semester/level courses

6) In the case of students admitted to the first semester (First year):

a) Students shall fulfill the attendance and CIE requirements to appear for SEE of 1st year courses.

b) Students having F grades for the courses totaling to more than 16 credits (credits for theory and practical are to be treated separately for vertical progression) in the 1st and 2nd semesters of the first year of the programme shall not be eligible to move to the 3rd semester (Second year) of the

programme. These courses include courses marked as NE. c) The students who fail to satisfy CIE and attendance requirements shall repeat the courses whenever offered next and become eligible for the 2nd year.

d) Obtaining CIE: From the 3rd semester (Second year) onwards the student who obtains the required attendance for the course, but not the required CIE marks is allowed to move forward to the next semester. However, the student shall obtain the required CIE by registering to the course in the subsequent semester. Obtaining minimum CIE marks in a course registered is mandatory. It may also be noted that the student shall not be permitted to appear for SEE in such courses until he/she obtains the required CIE.

e) Carryover of backlog courses: From 3rd semester onwards the students who obtain the required attendance& CIE in a course and appears for University examinations but fails (F Grade) is allowed to register for the next semester (odd /even) irrespective of a number of F grades. However, for the award of degree, the student has to pass in all courses as per applicable Scheme &Regulations and earn the prescribed number of credits within the permitted maximum duration of the Programme. It mandatory fora student to pass all the courses of 1st and 2nd semesters as per the Scheme of Teaching and Evaluation to Register for the 7th semester (IV year).

f) From the second year onwards there shall be no restriction for promotion from an even to next odd semester (or odd to next even semester) even if the student has not satisfied the attendance requirement in one or more courses (including bridge courses for lateral entry students) shall not be eligible to appear for the Semester End Examination (SEE) of that course(s). The student shall be required to repeat that course whenever offered next. g) Permitted Maximum credits for Registration: The student shall be permitted to register for total courses not exceeding 30 credits. These 30 credits include the courses of the regular semester and backlogs. The registration of these additional credits includes the courses having a shortage of attendance and the courses whose CIE requirements are not fulfilled.

h) Successive Failures and alternate course selection:

(i) If a student fails in a course other than the professional core course even after four attempts, he may drop that course but shall choose an alternate course of his/ her choice with the same number of credits from the pool of courses suggested by the concerned Board of Studies.

(ii) The course so selected should not have been studied by the student or to be studied in future at higher semesters.

(iii)The faculty advisor shall guide/advise the student in this regard.

(iv) The college shall make arrangements for the registration and conduction of CIE for the alternate course selected. This provision is given only for two courses (one at a time) during the entire maximum duration of the programme.

(v) This provision is optional; the student/s can continue registering for the same course without opting for a change of course.

24YB6.4. Condition for Re-Registering a Course:

1) Students who do not pass the course as per Section 24YB 6.3(3) and awarded "F" Grade may Re-Register and improve their performance.

2) Such student, after passing the failed course in subsequent examination/s, will be awarded letter grade based on the marks he scores in the subsequent examination/s.

24YB6.5 .Computation of SGPA and CGPA:

1) Semester Grade Point Average (SGPA) will be awarded at the end of each Semester and Cumulative Grade Point Average (CGPA) will be awarded at the end of the program. However, CGPA is calculated at the end of each semester from the second semester onwards and reflected in the grade card for indicating the progress of the student.

2) Each course in a program is associated with number of credits (C). Based on the number of Credits for a course and obtained Grade Point (GP) for that course in a Semester, the GPA is calculated as given below: a) The SGPA is the ratio of sum of the product of the number of credits with the grade points secured by a student in all the courses taken by him and the sum of the number of credits of all the courses undergone by a student, i.e., SGPA = $\sum$ (Ci x Gi) / $\sum$ Ci Where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

b) The CGPA is also calculated in the same manner considering all the courses undergone by a student over all the semesters of a programme, i.e., CGPA = $\sum$ (Ci x Si) / $\sum$ Ci Where Si is the

SGPA of the ith semester and Ci is the total number of credits in that semester. Finally, the SGPA and CGPA shall be rounded off to 2 decimal points and reported in the grade cards.

24YB6.6. Conversions of CGPA into Percentage of marks and Class Equivalence

There is no formula for the conversion of CGPA into the percentage of marks. However, the following formula for conversion of the CGPA on a10-point scale into the percentage of marks (M) for employment / higher studies, etc may be used; Percentage of marks secured, M = CGPA Earned x 10 Illustration for a CGPA of 8.20; Percentage of marks secured M = 8.20× 10= 82.0 %

24YB6.7. Class Equivalence Subsequent to the conversion of final CGPA, after successful completion of the Program, into the percentage of marks (M), a graduating student is reckoned to have passed in

(i). First Class with Distinction (FCD) if M≥ 70

(ii). First Class (FC) if 60 ≤M<70

(iii). Second Class (SC) if 50 ≤M<60

(iv). Pass Class (P) if 40≤ M ≤ 50

24YB 6.8. Award of Grade Cards, Certificates and Transcripts:

(1) Grade Cards: At the end of each semester, a Grade Card shall be issued to all the registered students of that semester, indicating the Course code, Title, Number of credits, Letter grade awarded, and Credits earned, for all the Courses as specified in the scheme of teaching and evaluation, along with total credits earned, SGPA, and CGPA as applicable. This may have F grades and other temporary grades awarded to the student.

(2) Grade Certificate: The Grade Certificate, having the same format of Grade card but indicating the month and year of clearing a course, is issued to the student on demand only on clearing all the temporary grades specified in the Grade Card.

(3) Transcripts: Transcript is the consolidated statement of a student's academic performance for all the semesters since joining the programme and is generally given to a student on successful completion of the programme along with the degree certificate.

(4) For those students who have taken multiple attempts to clear a course, the transcript given on successful completion of the programme will only contain earned pass grade ('O' to 'E', AU and PP); the courses cleared subsequently will however be shown in the respective semester with Month and Year in which the student has finally cleared the course. The transcript will show only the overall CGPA based on all the courses taken by the student. Credits earned beyond the requirement for the award of the degree shall be shown as additional courses separately, indicating the grade earned by the student. Additional copies of the transcript can be obtained if needed, on request submitted along with payment of applicable fee.

(5) Students who have not yet completed the programme can obtain an interim Transcript at the end of any semester, if needed, on request and upon payment of applicable fee. The interim Transcript includes failed courses, which have not been cleared at the time of issue.

24YB 7.0. ELIGIBILITY FOR AWARD OF DEGREE, PRIZES, MEDALS, AND RANKS

24YB7.1. B.Tech. degree

(a) Students shall be declared to have completed the Program of B.Tech. degree and is eligible for the award of degree provided the students have undergone the stipulated Course work of all the semesters under the Scheme of Teaching and Examinations and have earned the prescribed number of credits within the permitted maximum duration.

(b) For the award of degree, completion of bridge courses, if any as applicable is compulsory.

(c) Mandatory Earning of Activity points:

Sl. No.	Student Category	Activity Points prescribed by AICTE
1	Regular Students admitted to the 4 year Degree Programme	100
2	Students entering 4 year Degree Programme through lateral entry	75

The Activity Points earned shall be reflected on the student's eighth semester Grade Card.AICTE Activity Points (non-credit) have no effect on SGPA/CGPA. In case a student fails to earn the prescribed activity Points before the commencement of 8th semester examinations, the Eighth Semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth Semester Grade Card.

24YB7.2. B.Tech. (Honors) Degree

(a) A student shall be declared to have completed the Program of B.Tech., degree and shall be eligible to get undergraduate B.Tech., degree with Honours, provided,

(i) the student has undergone the stipulated Course work of all the semesters under the same Scheme of Teaching and Examinations and has earned the prescribed number of credits, i.e.160 credits for I semester admitted students and 120 for III semester admitted students.

(ii) has earned additional 18 or more credits through University-approved online courses. (iii) satisfied the Regulations Governing the Award of Honors at B.Tech. Degree Programs

24YB7.3. B.Tech. with Minor Degree

a) A student shall be declared to have completed the Program of B.Tech. Degree and shall be eligible to get an undergraduate B.Tech, degree with minors, provided,

(i) The student has undergone the stipulated Course work of all the semesters under the same Scheme of Teaching and Examinations and has earned the prescribed number of credits, i.e.160 credits for the I semester admitted student and 120 for III semesters admitted student.

(ii) Has earned additional 18 or more credits through a University-approved online courses list submitted by the board of studies.

24YB7.3. Noncompliance Cases

(1) Noncompliance of Mini-project The mini-project shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the mini-project shall be declared fail in that course and shall have to complete the same during subsequent University examinations after satisfying the Mini-project requirements.

(2) Noncompliance of Major-project The Project Work shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the Major-project shall be declared fail in that course and shall have to

(3) Noncompliance of Internship All the students of B.Tech. shall have to undergo mandatory internship The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up /complete the internship shall be declared fail in that Course and shall have to complete the same during subsequent University examinations after satisfying the internship requirements.

(4) Non compliance to earn credits in Honours and Minors In case a student registers for minor or honours degree and is unable to complete all the required courses or earn the required credits within the maximum programme duration, he/she may withdraw from these additional degree programmes and request for the award of certificates for those courses passed by considering them as Value Added courses by the University

24YB7.4. Award of Prizes, Medals, and Ranks For the award of Prizes and Medals, the conditions stipulated by the Donor shall be considered subject to the provisions of the statutes framed by the University for such awards

(1) For the award of rank in a Specialization of Bachelor of Technology, the CGPA secured by the students from III to VIII semesters shall be considered.

(2) The additional credits earned for the award of Honours/ Minors degree shall not have any bearing for the Rank declaration.

(3) A student shall be eligible for a rank at the time of award of the degree of Bachelor of Technology, provided that the student,

a) (i) Has passed all the Courses of I to VIII semester in the first attempt only in case of Candidates admitted to I year.

(ii) Has passed all the Courses (including bridge courses) of III to VIII semester in the first attempt only in case of Candidates admitted under lateral entry scheme.

b) Is not a repeater in any semester because of rejection of result of a semester/ shortage of attendance /temporarily discontinued and rejoined/readmitted etc.

(4) The total number of ranks awarded shall be 10% of the total number of students who appeared in the VIII semester subject to a maximum of 10 ranks in a specialization.

(5) For an award of ranks in a specialization, a minimum of 10 students should have appeared in the VIII semester examination. when the first decimal place is greater than or equal to 5.

24YB7.5. Ranks shall be awarded based on the merit of the students as determined by CGPA. If two or more students get the same CGPA, the tie shall be resolved by considering the number of times a student has obtained a higher SGPA. If it is not resolved even at this stage, the number of times a student has obtained higher grades like S, A, B, etc., shall be taken into account to decide the order of the rank.

24YB 8.0 APPLICABILITY AND POWER TO MODIFY

i) The regulations governing the degree of Bachelor of Technology of Yenepoya deemed to be University shall be binding on all concerned. ii) Notwithstanding anything contained in the foregoing, the University shall have the power to issue directions/ orders to address and removal of any difficulty.

(ii) Nothing in the foregoing may be construed as limiting the power of the University to amend, modify or repeal any or all of the above.

24YB 9.0 PROGRAM STRUCTURE & SYLLABUS

9.1 Program Educational Objectives (PEOs)

- Graduates will be competent to practise principles of Computer Science & Engineering, computational Mathematics and technology based analysis to solve the problems that are appropriate to the specialisation of the program.
- Graduates will be employed in the computing profession or pursuing higher education.
- Graduates will be capable to contribute to computing profession and society.

9.2 Program Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, basic sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
P04: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

P09: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

9.3 Program Specific Outcomes (PSOs)

- Foundations of Mathematical Concepts: Apply the knowledge of engineering science and computational mathematics in solving problems that are appropriate to the Engineering specialisation.
- Foundations of Computing: Apply the knowledge of computing both hardware and software aspects to the solution of real-world engineering problems in the Engineering specialisation
- Foundations of Software Design & Development: Design & develop algorithms, programs, and projects using various software and emerging technology tools appropriate to the computing field or Research & Development activities in the Engineering specialisation.

9.4 PROGRAM STRUCTURE: (Effective from the academic year 2024-25)

(I&II common for first year CSE stream all specializations)

Outcome-Based Education (OBE)and Choice Based Credit System(CBCS)

I SEMESTER (Physics Group)												
SI No.	**Course and Course code**		**Course Title**	**Teaching Department**	**Teaching hours/Week**			**Examination**				**Credits**
					Theory	**Tutorial**	**Practical/**	**Duration in**	**CI**	**SE**	**Total**	
					L	**T**	**P**					
1	BSC	BMAT1001	Computational Mathematics – I	MAT	3	0	2	3	50	50	100	4
2	BSC	BPHY1002	Quantum Computing and Modern Physics	PHY	3	0	2	3	50	50	100	4
3	PLC	BPLC1003	Introduction to C Programming	CS	3	0	2	3	50	50	100	4
4	ESC	BESC1004A	Basic Electronics	EC	3	0	0	3	50	50	100	3
5	ETC	BETC1005*	Emerging Technology Course-I	CS	3	0	0	3	50	50	100	3
6	AEC	BAEC1006A	Innovation and Design Thinking	Any Dept.	2	0	0	3	50	50	100	1
7	MNC	BMNC1007A	Environmental Studies	CHE	1	0	0	-	50	-	50	0
8	AEC	BAEC1008A	Communicative English	HU	0	0	2	-	50	-	50	1
TOTAL					**18**	**0**	**08**	**18**	**400**	**300**	**700**	**20**

Note:
BSC: Basic Science Course, **ESC**: Engineering Science Course, **HSMC**: Humanity and Social Science & Management
Courses, **AEC** –Ability Enhancement Courses, **MNC**: Mandatory Non credited course **UM**: University Mandatory

I SEMESTER (Chemistry Group)												
SI No.	Course and Course code		Course Title	Teaching Department	Teaching hours/Week			Examination				Credits
					Theory	Tutorial	Practical/	Duration in	CIE	SEE	Total Marks	
					L	T	P					
1	BSC	BMAT1001	Computational Mathematics – I	MAT	3	0	2	3	50	50	100	4
2	BSC	BCHE1002	Materials Chemistry for Computer Systems	CHE	3	0	2	3	50	50	100	4
3	PLC	BPLC1003	Introduction to C Programming	CS	2	0	2	3	50	50	100	3
4	ESC	BESC1004B	Databases for computer science	CS	3	0	0	2	50	50	100	4
5	ETC	BETC1005*	Emerging Technology Course-I	Any Dept.	3	0	0	3	50	50	100	3
6	AEC	BAEC1006B	UI/UX Design	CS	1	0	2	3	50	50	100	2
7	MNC	BMNC1007B	Constitution of India	HU	1	0	0	-	50	-	50	0
8	AEC	BAEC1008B	Professional Writing Skills in English	HU	1	0	0	-	50	-	50	1
TOTAL					**15**	**0**	**10**	**18**	**400**	**300**	**700**	**21**

II SEMESTER (Physics Group)												
SI No.	Course and Course code		Course Title	Teaching Department	Teaching hours/Week			Examination				Credits
					Theory	Tutorial	Practical/	Duration in	CIE	SEE	Total Marks	
					L	T	P					

1	BSC	BMAT2001	Computational Mathematics - II	MAT	3	0	2	3	50	50	100	4
2	BSC	BPHY2001	Quantum Computing and Modern Physics	PHY	3	0	2	3	50	50	100	4
3	PLC	BPLC2003	Object oriented Programming using C++	CS	3	0	2	3	50	50	100	4
4	ESC	BESC2004A	Basic Electronics	EC	3	0	0	3	50	50	100	3
5	ETC	BETC2005*	Emerging Technology Course-II	CS	3	0	0	3	50	50	100	3
6	AEC	BAEC2006A	Innovation and Design Thinking	Any Dept.	2	0	0	3	50	50	100	1
7	MNC	BMNC2007A	Environmental Studies	CHE	1	0	0	-	50	-	50	0
8	AEC	BAEC2008A	Communicative English	HU	0	0	2	-	50	-	50	1
TOTAL					**18**	**0**	**10**	**18**	**400**	**300**	**700**	**20**

Note:
BSC: Basic Science Course, **ESC**: Engineering Science Course, **HSMC**: Humanity and Social Science & Management
Courses, **AEC** –Ability Enhancement Courses, **MNC**: Mandatory Non credited course **UM**: University Mandatory

II SEMESTER (Chemistry Group)

SI No.	Course and Course code		Course Title	Teaching Department	Teaching hours/Week			Examination				Credits
					Theory	Tutorial	Practical/	Duration in	CIE	SEE	Total	
					L	T	P					
1	BSC	BMAT2001	Computational Mathematics - II	MAT	3	0	2	3	50	50	100	4
2	BSC	BCHE2002	Materials Chemistry for Computer Systems	CHE	3	0	2	3	50	50	100	4
3	PLC	BPLC2003	Object oriented Programming using C++	CS	2	0	2	3	50	50	100	3
4	ESC	BESC1004B	Databases for computer science	CS	3	0	2	3	50	50	100	4

5	ETC	BETC2005*	Emerging Technology Course-II	Any Dept.	3	0	0	3	50	50	100	3
6	AEC	BAEC2006B	UI/UX Design	CS	1	0	2	3	50	50	100	2
7	MNC	BMNC2007B	Constitution of India	HU	1	0	0	-	50	-	50	0
8	AEC	BAEC2008B	Professional Writing Skills in English	HU	1	0	0	-	50	-	50	1
TOTAL					**15**	**0**	**10**	**18**	**400**	**300**	**700**	**21**

Emerging Technology Courses	
BETC2005 A	Introduction to Sustainable Engineering
BETC2005 B	E - Waste Management
BETC2005 C	Frontend Web Development
BETC2005 D	Backend Web Development
BETC2005 E	Full stack web Development
BETC2005 F	Fundamentals of Cyber Security
BETC2005 G	Introduction to Embedded System
BETC2005 I	Smart materials and Systems
BETC2005 J	Emerging Applications of Biosensors

9.4.1 SYLLABUS

COMPUTATIONAL MATHEMATICS -1			
Semester	**BMAT1001**	**CIE Marks**	**50**
Course Code		**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:2:0**	**Exam Hrs**	**3**
Total Hours		**Credits**	**4**
Course objectives: The goal of the course Mathematics-I for Computer Science and Engineering stream(22MATS11) is to • Familiarize the importance of calculus associated with one variable and multivariable for computer science and engineering. • Analyze Computer science and engineering problems by applying Ordinary Differential Equations. • Apply the knowledge of modular arithmetic to computer algorithms.			

• Develop the knowledge of Linear Algebra to solve the system of equations.
Teaching-Learning Process Pedagogy (General Instructions): These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. 1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills. 2. State the need for Mathematics with Engineering Studies and Provide real-life examples. 3. Support and guide the students for self–study. 4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress. 5. Encourage the students to group learning to improve their creative and analytical skills. 6. Show short related video lectures in the following ways: ● As an introduction to new topics (pre-lecture activity). ● As a revision of topics (post-lecture activity). ● As additional examples (post-lecture activity). ● As an additional material of challenging topics (pre-and post-lecture activity). ● As a model solution of some exercises (post-lecture activity).
Module 1 : Ordinary Differential Equations — **No. of Hrs:14**
Ordinary differential equations: First-order first-degree ordinary differential equations-application to solve simple engineering and scientific problems. **Numerical solution of Ordinary differential equations:** Errors and approximations, order of convergence, Modified Euler's method, and Runge - Kutta method of fourth order to solve simple engineering and scientific problems.
Module 2 : Partial Differentiation — **No. of Hrs:14**
Partial differentiation in Computer Science & Engineering applications. Indeterminate forms - L'Hospital's rule-Problems. Partial differentiation, total derivative - differentiation of composite functions. Euler's theorem and problems. Jacobian and problems. Maxima and minima for a function of two variables. Problems.
Module 3 : Matrix Algebra — **No. of Hrs:14**
Matrix Algebra: Solution to system of linear equations. Elementary row transformation of a matrix, Rank of a matrix. Gauss-Elimination method. Approximate solution by Gauss-Seidel method. Solution of system of Ordinary Differential equations by Matrix method.
Module 4 : Vector Space — **No. of Hrs:14**
Vector Space: Definition and examples, subspace, Linearly independent and dependent sets, linear span, Basis and dimension, Inner product spaces, Projection and orthogonality.
Module 5 : Linear Transformation — **No. of Hrs:14**
Linear Transformation: Definition and examples, Matrix representations of a linear transformation. Change of coordinates and change of basis, Rank and nullity of a linear

transformation, Rank-nullity theorem, eigenvalues and eigenvectors, diagonalization of a matrix.

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CO1	analyze the solution of first order ordinary differential equations
CO2	Apply the fundamental concepts of partial differentiation to test the maxima and minima of multivariate function and Jacobians
CO3	get acquainted and to apply modular arithmetic to computer algorithms
CO4	make use of matrix theory for solving the system of linear equations and compute eigenvalues and eigenvectors
CO5	Demonstrate the idea of Linear dependence and independence of sets in the vector space, and linear transformation

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year) Text Books

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna Publishers, 44thEd., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10thEd., 2018.
3. **David M Burton:** "Elementary Number Theory" Mc Graw Hill, 7th Ed.,2017.

Reference Books

4. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
5. **Srimanta Pal & Subodh C.Bhunia**: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
6. **N.P Bali and Manish Goyal**: "A Textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
7. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Ed., 2017.
8. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.
9. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
10. **James Stewart: "**Calculus" Cengage Publications, 7thEd., 2019.
11. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
12. **Gareth Williams:** "Linear Algebra with Applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

13. **Gilbert Strang:** "Linear Algebra and its Applications", Cengage Publications, 4th Ed. 2022.
14. **William Stallings:** "Cryptography and Network Security" Pearson Prentice Hall, 6th Ed., 2013.
15. **Kenneth H Rosen:** "Discrete Mathematics and its Applications" McGraw-Hill, 8th Ed. 2019.
16. **Ajay Kumar Chaudhuri:** "Introduction to Number Theory"NCBA Publications, 2nd Ed., 2009.
17. **Thomas Koshy:** "Elementary Number Theory with Applications"Harcourt Academic Press, 2nd Ed., 2008.

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Quizzes
- Assignments
- Seminar

DISCRETE MATHEMATICAL STRUCTURES			
Semester	**II**	**CIE Marks**	**50**
Course Code	**BMAT2001**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:2:0**	**Exam Hrs**	**3**
Total Hours		**Credits**	**4**

Course objectives:

1. To help students to understand discrete and continuous mathematical structures.
2. To impart basics of relations and functions.
3. To facilitate students in applying principles of Recurrence Relations to find the generatingfunctions and solve the Recurrence relations.
4. To have the knowledge of groups and their properties to understand the importance ofalgebraic properties relative to various number systems.

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies, teachers can use to accelerate the attainment of the various courseoutcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will assign homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution for some exercises (post-lecture activity).

Module 1 : Fundamentals of Logic	**No. of Hrs:8**
Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference. The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.	
Module 2 : Properties of the Integers	**No. of Hrs:14**
Mathematical Induction, The Well Ordering Principle – Mathematical Induction, Recursive Definitions. **Fundamental Principles of Counting:** The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition..	
Module 3 : Relations and Functions	**No. of Hrs:14**
Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. **Properties of Relations**, Computer Recognition – Zero-One Matrices and Directed Graphs, PartialOrders – Hasse Diagrams, Equivalence Relations and Partitions.	
Module 4 : The Principle of Inclusion and Exclusion	**No. of Hrs:14**
The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing isin its Right Place, Rook Polynomials.	
Module 5 : Recurrence Relations	**No. of Hrs:14**
Recurrence Relations: First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients.	

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Apply concepts of logical reasoning and mathematical proof techniques in proving theoremsand statements.
2. Demonstrate the application of discrete structures in different fields of computer science.

3. Apply the basic concepts of relations, functions and partially ordered sets for computerrepresentations.
4. Solve problems involving recurrence relations and generating functions.
5. Illustrate the fundamental principles of Algebraic structures with the problems related tocomputer science & engineering.

Assessment Details (both CIE and SEE)

Suggested Learning Resources:
Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year)Text Books:

1. **Ralph P. Grimaldi, B V Ramana: "Discrete Mathematical Structures an AppliedIntroduction",** 5th Edition, Pearson Education, 2004.
2. **Ralph P. Grimaldi: "Discrete and Combinatorial Mathematics"**, 5th Edition, PearsonEducation. 2004.

Reference Books:

1. **Basavaraj S Anami and Venakanna S Madalli: "Discrete Mathematics – A Concept-basedapproach"**, Universities Press, 2016
2. **Kenneth H. Rosen: "Discrete Mathematics and its Applications"**, 6th Edition, McGraw Hill,2007.
3. **Jayant Ganguly: "A Treatise on Discrete Mathematical Structures",** Sanguine-Pearson,2010.
4. **D.S. Malik and M.K. Sen: "Discrete Mathematical Structures Theory and Applications,** Latest Edition, Thomson, 2004.
5. **Thomas Koshy: "Discrete Mathematics with Applications"**, Elsevier, 2005, Reprint 2008.

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program.
- **http://www.themathpage.com/**
- **http://www.abstractmath.org/**
- **http://www.ocw.mit.edu/courses/mathematics/**

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Seminar

QUANTUM COMPUTING AND MODERN PHYSICS			
Course Type : Integrated (Theory and Lab)			
Semester: I and II			
Course Name	**Quantum Computing and Modern Physics**	**CIE Marks**	**50**
Course Code	**BPHY1002/BPHY2002**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:2**	**Exam Hrs**	**3**
Total Hours	**40 Hrs (T) and 10 lab slots**	**Credits**	**4**

Course objectives

The objectives of the course is to

1. Study the basic and relevant concepts of Physics for computational aspects
2. Develop problem solving skills and implementation in quantum computing.
3. Develop team spirit and experimentation skills in Physics

Teaching-Learning Process

For more effective Teaching –Learning:

1. Student Centric Discussion
2. Flipped Classroom
3. Chalk and Talk interactions
4. Simulations, Interactive Simulations and Animations
5. NPTEL and Other Videos for theory topics
6. Smart Class Room
7. Lab Experiment Videos

Module-1 (8 Hours)

Semiconductors:

Introduction to semiconductors- types of semiconductors, Fermi energy-Fermi level in semiconductors, Expression (derivation). for electrical conductivity in a semiconductor (intrinsic, p and n type) Numerical Problems

LASER: Characteristic properties of a LASER beam, Interaction of radiation with matter (absorption, spontaneous, stimulated), Laser action (population inversion, metastable state, photon density) Requisites of a laser system (active medium, pumping mechanism-3 types, laser cavity-3 types) Semiconductor diode laser, Numerical Problems-laser cavity, diode laser.

Optical Fiber: Principle and structure, Propagation of light, Acceptance angle and Numerical Aperture (NA) with derivation. Modes of propagation, RI profile, Classification of optical fibers

by RI profile, Attenuation – fiber loss, Applications: Fiber optic communication. Numerical Problems

Pre requisite: Solids, Properties of light

Self-learning: Total Internal Reflection

Module-2 (8 Hours)

Quantum Mechanics:

de Broglie Hypothesis- matter waves - derivation (for mass, kinetic energy, potential), Mention Phase velocity and group velocity, Heisenberg's Uncertainty principle and its application (Non-existence of electron inside the nucleus - Non relativistic), Principle of complementarity, Wave function (property- physical significance), Time independent Schrödinger wave equation (Derivation), Eigen functions and Eigen values - particle inside one dimensional infinite potential well, Quantization of energy states, Waveforms and probabilities. Numerical Problems.

Pre requisite: Wave–Particle dualism
Self-learning: de Broglie Hypothesis.

Module-3 (8 Hours)

Quantum Computing:

Principles of Quantum Information & Quantum Computing:
Introduction to quantum computing, Moore's law & its end, Differences between classical & quantum computing. Concept of qubit and its properties. Representation of qubit by Bloch sphere.

Dirac representation and matrix operations:
Matrix representation of 0 and 1 states, Identity and Pauli matrices- matrix represtation-operating on $|0\rangle$and $|1\rangle$ states, Mention on matrices of conjugate, transpose, unitary with examples. Row and Column matrices and their multiplication (Inner Product), Probability, and Quantum Superposition. Numerical Problems

Quantum Gates:
Single Qubit Gates: Quantum Not gate, Pauli – X, Y and Z Gates, Hadamard Gate, Phase Gate (or S Gate), T Gate (Operating on o and 1 state-schematic representation-truth table)

Multiple Qubit Gates: Controlled gate, CNOT Gate, (Discussion for 4 different input states). Representation of Swap gate, Controlled -Z gate (Matrix representation, circuit symbol, truth table)

Pre requisites: Matrices

1. **Self-learning: Moore's law**

Module-4 (8 Hours)

Quantum free electron theory of metals

Review of classical free electron theory and explain its major failures. Assumptions of quantum free electron theory and explain its major success. Fermi energy, Derivation of the expression for Fermi energy at 0 K, Density of states, Fermi factor, Variation of Fermi factor with temperature and energy. Numerical Problems.

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Superconductivity

Introduction to super conductors, Temperature dependence of resistivity, Meissner's effect-no experimental demonstration , Critical field, Temperature dependence of critical field, Types of super conductors, BCS theory (Qualitative), Quantum tunneling, High temperature superconductivity, Josephson junctions (Qualitative), DC and RF SQUIDs (Qualitative), Applications in quantum computing: Charge, Phase and Flux qubits, Numerical Problems.

Pre requisites: Basics of Electrical conductivity

Self-learning: Resistivity and Mobility

Module-5 (8 Hours)

Applications of Physics in computing:

Physics of Animation:

Taxonomy of physics based animation methods, Frames, Frames per second, Size and scale, Weight and strength, Motion and Timing in animations, Constant force and acceleration, The Odd rule, Odd-rule scenarios, Motion graphs, Examples of character animation: Jumping, parts of jump, Jump magnification, Stop time, Walking: Strides and steps, Walk timing. Numerical Problems

Statistical Physics for Computing: Descriptive statistics and inferential statistics, Poisson distribution and modeling, the probability of proton decay, Normal distributions (Bell Curves). Numerical Problems.

Pre requisites: Motion in one dimension, Probability

Self-learning: Frames, Frames per Second

Laboratory Component:

Any Ten Experiments have to be completed from the list of experiments. Based on the convenience, classify the following experiments into above categories. Select at least one simulation/spreadsheet activity.

Note: The experiments have to be classified into

A. Exercise

1. Study the I-V Characteristics of the Given Bipolar Junction Transistor.
2. Determination of dielectric constant of the material of capacitor by Charging and Dis charging method.
3. Study the frequency response of Series & Parallel LCR circuits.
4. Determination of Fermi Energy of Copper.

5. Determination of Planck's constant using LEDs.
6. Study the Characteristics of a Photo-Diode and to determine the power responsivity / Verification of Inverse Square Law of Intensity of Light.

B. Demonstration

7. Determination of resistivity of a semiconductor by Four Probe Method
8. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
9. Identification of circuit elements in a Black Box and determination of values of the components.
10. Determination of Energy gap of the given Semiconductor.

C. Structured Inquiry

11. Determination of wavelength of LASER using Diffraction Grating.
12. Determination of acceptance angle and numerical aperture of the given Optical Fiber

D. Open Ended

13. PHET Interactive (Simulations(https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)
14. Step Interactive Physical Simulations
15. Study of motion using spread Sheets
16. Study of Application of Statistics using spread sheets

PROFESSIONAL WRITING SKILLS IN ENGLISH			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1008B/2008B**	**SEE Marks**	**0**
Teaching Hours/Week (L:T:P)	**1:0:0**	**Exam Hrs**	**0**
Total Hours		**Credits**	**1**

Course objectives:

The course Professional Writing Skills in English (22PWS26) will enable the students,

1. To Identify the Common Errors in Writing and Speaking of English.
2. To Achieve better Technical writing and Presentation skills for employment.
3. To read Technical proposals properly and make them to write good technical reports.
4. To Acquire Employment and Workplace communication skills.

To learn about Techniques of Information Transfer through presentation in different level.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogyshall involve the combination of different methodologies which suit modern technological tools and

software's to meet the present requirements of the Global employment market.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blendedlearning (Combination of both), (iv) Enquiry and evaluation based learning,

(v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learningTools and techniques, (viii) Use of audio visual methods through language Labs in teaching of of LSRW skills.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.

Language Lab : To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systemscan be referred as per the AICTE guidelines.

Module 1 :	**No. of Hrs:03**

Identifying Common Errors in Writing and Speaking English : Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors in Subject-verb agreement, Sequence of Tenses and errors identification in Tenses. Words Confused/Misused.

Module 2 :	**No. of Hrs:03**

Nature and Style of sensible writing: Organizing Principles of Paragraphs in Documents, Writing Introduction andConclusion, Importance of Proper Punctuation, Precise writing and Techniques in Essay writing, Sentence arrangements and Corrections activities. Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words.

Module 3 :	**No. of Hrs: 03**

Technical Reading and Writing Practices: Technical writing process, Introduction to Technical Reports writing, Significance of Reports, Types of Reports. Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process. Grammar – Voices and Reported Speech, Spotting Error& Sentence Improvement, Cloze Test and Theme Detection Exercises.

Module 4 :	**No. of Hrs: 03**

Professional Communication for Employment: Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. Reading Comprehension, Tips for effective reading. Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. Writing effective resume for employment, Emails, Blog Writing and Memos.

Module 5 :	**No. of Hrs:03**

Professional Communication at Workplace: Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and PI's, Intra and Interpersonal Communication

Skills at workplace, Non-Verbal Communication Skills and itsimportance in GD and Interview. Presentation skills and Formal Presentations by Students, Strategies of Presentation Skills.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1	To understand and identify the Common Errors in Writing and Speaking.
CO2	To Achieve better Technical writing and Presentation skills.
CO3	To read Technical proposals properly and make them to Write good technical reports.
CO4	Acquire Employment and Workplace communication skills.
CO5	To learn about Techniques of Information Transfer through presentation in different level.

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Textbook:

1) **"Professional Writing Skills in English"** published by Fillip Learning – Education (ILS), Bangalore – 2022.
2) **"Functional English"** (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learningIndia Pvt Limited [Latest Edition 2019].

Reference Books:

1) **English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
2) **Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learningIndia Pvt Limited [Latest Revised Edition] - 2019.
3) **Technical Communication** – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma,Oxford University Press 2017.
4) **High School English Grammar & Composition** by Wren and Martin, S Chandh & Company Ltd – 2015.

Effective Technical Communication – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments

COMMUNICATIVE ENGLISH			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1008B/2008B**	**SEE Marks**	**0**

Teaching Hours/Week (L:T:P)	1:0:0	Exam Hrs	0
Total Hours		Credits	1

Course objectives: The course Communicative English (22ENG16) will enable the students,

1. To know about Fundamentals of Communicative English and Communication Skills in general.
2. To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
3. To impart basic English grammar and essentials of important language skills.
4. To enhance with English vocabulary and language proficiency for better communication skills.
5. To learn about Techniques of Information Transfer through presentation.

Teaching-Learning Process :

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective:

Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning,
(v) Personalized learning, (vi) Problems based learning through discussion,
(vii) Following the method of expeditionary learning Tools and techniques,
(viii) Use of audio visual methods through language Labs in teaching of of LSRW skills.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.

Language Lab : To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE guidelines.

Module 1 :	No. of Hrs:03

Introduction to Communicative English : Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English.

Interpersonal and Intrapersonal Communication Skills.

Module 2 :	No. of Hrs:03

Introduction to Phonetics : Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non silent Letters,

Syllables and Structure. Word Accent, Stress Shift and Intonation, Spelling Rules and Words often Misspelt. Common Errors in Pronunciation.

Module 3 :	**No. of Hrs: 03**

Basic English Communicative Grammar and Vocabulary PART - I : Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words,Introduction to Vocabulary, All Types of Vocabulary – Exercises on it.

Module 4 :	**No. of Hrs: 03**

Basic English Communicative Grammar and Vocabulary PART - II: Words formation - Prefixes and Suffixes, Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence ofTenses (Rules in use of Tenses) and Exercises on it.

Module 5 :	**No. of Hrs:03**

Communication Skills for Employment : Information Transfer:Oral Presentation and its Practice. Difference betweenExtempore/Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions – Exercises.

Course outcome (Course Skill Set)

At the end of the course Communicative English (22ENG16) the student will be able to:

CO1	Understand and apply the Fundamentals of Communication Skills in their communication skills.
CO2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.
CO3	To impart basic English grammar and essentials of language skills as per present requirement.
CO4	Understand and use all types of English vocabulary and language proficiency.
CO5	Adopt the Techniques of Information Transfer through presentation.

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Textbook:

1) **Communication Skills** by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt Ltd - 2019.
2) **A Textbook of English Language Communication Skills,** (ISBN-978-81-955465-2-7), Published by InfiniteLearning Solutions, Bengaluru - 2022.

Reference Books:

1. **Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learningIndia Pvt Limited [Latest Revised Edition] - 2019.
2. **English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
3. **English Language Communication Skills – Lab Manual cum Workbook,** Cengage learning India Pvt Limited[Latest Revised Edition] – (ISBN-978-93-

86668-45-5), 2019.
4. **A Course in Technical English – D Praveen Sam, KN Shoba,** Cambridge University Press – 2020.
5. **Practical English Usage** by Michael Swan, Oxford University Press – 2016.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions)
- For active participation of students instruct the students to prepare Flowcharts and Handouts
- Organising Group wise discussions Connecting to placement activities
- Quizzes and Discussions, Seminars and assignments

INNOVATION AND DESIGN THINKING			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1006B/2006B**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**1:0:0**	**Exam Hrs**	**0**
Total Hours		**Credits**	**1**

Course Category: Foundation

Preamble: This course provides an introduction to the basic concepts and techniques of engineering and reverses engineering, the process of design, analytical thinking and ideas, basics and development of engineering drawing, application of engineering drawing with computer aide.

Course objectives:

- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of innovation and design thinking
  To discuss the methods of implementing design thinking in the real world.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain concepts
3. Encourage collaborative (Group Learning) Learning in the class
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develops thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recallit.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.	
Module 1 :	**No. of Hrs:03**
PROCESS OF DESIGN **Understanding Design thinking** Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping	
Teaching-Learning Process Introduction about the design thinking: Chalk and Talk method Theory and practice through presentation MVP and Prototyping through live examples and videos	
Module 2 :	**No. of Hrs:03**
Tools for Design Thinking Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design	
Teaching-Learning Process Case studies on design thinking for real-time interaction and analysis Simulation exercises for collaborated enabled design thinking Live examples on the success of collaborated design thinking	
Module 3 :	**No. of Hrs: 03**
Design Thinking in IT Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenariobased Prototyping	
Teaching-Learning Process Case studies on design thinking and business acceptance of the design Simulation on the role of virtual eco-system for collaborated prototyping	
Module 4 :	**No. of Hrs: 03**
DT For strategic innovations Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	
Teaching-Learning Process Business model examples of successful designs Presentation by the students on the success of design Live project on design thinking in a group of 4 students	
Module 5 :	**No. of Hrs:03**
Design thinking workshop Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test	

Teaching-Learning Process

8 hours design thinking workshop from the expect and then presentation by the studentson the learning from the workshop

Course Outcomes:

Upon the successful completion of the course, students will be able to:

CO1	Appreciate various design process procedure
CO2	Generate and develop design ideas through different technique
CO3	Identify the significance of reverse Engineering toUnderstand Products
CO4	Draw technical drawing for design ideas

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Text Books :

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design",Cengagelearning (International edition) Second Edition, 2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage",Harvard Business Press , 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Businessor Design School", John Wiley & Sons 2013.

References:

5. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", CengageLearning, Second Edition, 2011.
6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

Web links and Video Lectures (e-Resources):

1. www.tutor2u.net/business/presentations/. /**productlifecycle**/default.html
2. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
3. www.bizfilings.com › Home › Marketing › Product Developmen
4. https://www.mindtools.com/brainstm.html
5. https://www.quicksprout.com/. /how-to-**reverse-engineer**-your-competit
6. www.vertabelo.com/blog/documentation/**reverse-engineering** https://support.microsoft.com/en-us/kb/273814

7. https://support.google.com/docs/answer/179740?hl=en
8. https://www.youtube.com/watch?v=2mjSDIBaUlM
thevirtualinstructor.com/foreshortening.html
9. https://dschool.stanford.edu/.../designresources/.../ModeGuide BOOTCAMP2010L.pdf
10. https://dschool.stanford.edu/use-our-methods/ 6.
11. https://www.interaction- design.org/literature/article/5-stages-in-the-design-thinking-process
12. http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49
13. https://www.nngroup.com/articles/design-thinking/
14. https://designthinkingforeducators.com/design-thinking/
15. www.designthinkingformobility.org/wp-content/...//NapkinPitch_Worksheet.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

http://dschool.stanford.edu/dgift/

https://onlinecourses.nptel.ac.in/noc19_mg60/preview

Basic Electronics			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1004A/2004A**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**Exam Hrs**	**3**
Total Hours		**Credits**	**3**

Course objectives

1. To prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering.
2. To equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.
3. Professionalism & Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby PSUs such as BHEL, BEL, ISRO, etc., and small-scale hardware Industries to give brief information about the electronics manufacturing industry.
3. Show Video/animation films to explain the functioning of various analog and digital circuits.
4. Encourage collaborative (Group) Learning in the class
5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it help simprove the students' understanding

Module 1 :	**No. of Hrs:03**

Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers.

Amplifiers – Types of amplifiers, Gain, Input and output resistance, Frequency response, Bandwidth,
Phase shift, Negative feedback, multi-stage amplifiers

Module 2 :	**No. of Hrs:03**

Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Ladder network oscillator, We in bridge oscillator, Multi vibrators, Single-stage as table oscillator, Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations)

Operational amplifiers -Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits.

Module 3 :	**No. of Hrs: 03**

Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text 2: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7) **Combinational logic**: Introduction, Design procedure, Adders- Half adder, Full adder

Module 4 :	**No. of Hrs: 03**

Embedded Systems – Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC **Sensors and Interfacing** – Instrumentation and control systems, Transducers, Sensors, Actuators, LED, 7-Segment LED Display. (Text 3)	
Module 5 :	**No. of Hrs:03**
Analog Communication Schemes – Modern communication system scheme, Information source, andinput transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems.Types of modulation (only concepts) – AM , FM, Concept of Radio wave propagation (Ground, space, sky) **Digital Modulation Schemes**: Advantages of digital communication over analog communication, ASK, FSK, PSK, Radio signal transmission Multiple access techniques.	
Assessment Details (both CIE and SEE)	
Suggested Learning Resources: **Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)** 1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications',4thEdition, Elsevier, 2015. DOI https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980 2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203- 0417-84. 3. K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2016 4. S L Kakani and Priyanka Punglia, 'Communication Systems', New Age International Publisher, 2017.	

OBJECT ORIENTED PROGRAMMING with C++			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1003/2003**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:2**	**Exam Hrs**	**03**
Total Hours		**Credits**	**4**

Course objectives:

- To understand object-oriented programming using C++and Gain knowledge about the capability to store information together in an object.
- To illustrate the capability of a class to rely upon another class and functions.

- To Create and process data in files using file I/O functions
- To understand the generic programming features of C++ including Exception handling

Teaching-Learning Process (General Instructions)
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Chalk and board, power point presentations
2. Online material (Tutorials) and video lectures.
3. Demonstration of programing examples.

Module 1 :	**No. of Hrs:08**

An overview of C++: What is object-Oriented Programming? Introducing C++ Classes, The General Form of a C++ Program.

Classes and Objects: Classes, Friend Functions, Friend Classes, Inline Functions, Parameterized Constructors, Static Class Members, When Constructors and Destructors areExecuted, The Scope Resolution Operator, Passing Objects to functions, Returning Objects,Object Assignment

Module 2 :	**No. of Hrs:08**

Arrays, Pointers, References, and the Dynamic Allocation Operators: Arrays of Objects, Pointers to Objects, The this Pointer, Pointers to derived types, Pointers to class members.

Functions Overloading, Copy Constructors: Functions Overloading, Overloading Constructor Functions. Copy Constructors, Default Function Arguments, Function Overloading and Ambiguity.

Module 3 :	**No. of Hrs: 08**

Operator Overloading: Creating a Member Operator Function, Operator Overloading Using a Friend Function, Overloading new and delete

Inheritance: Base-Class Access Control, Inheritance and Protected Members, Inheriting Multiple Base Classes , Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes

Module 4 :	**No. of Hrs: 08**

Virtual Functions and Polymorphism: Virtual Functions, The Virtual Attribute isInherited, Virtual Functions are Hierarchical,

Pure Virtual Functions, Using Virtual Functions, Early vs Late Binding.

Templates: Generic Functions, Applying Generic Functions, Generic Classes. The typename and export Keywords. The Power of Templates

Module 5 :	**No. of Hrs:08**

Exception Handling: Exception Handling Fundamentals, Handling Derived-Class Exceptions, Exception Handling Options, Applying Exception Handling.

The C++ I/O System Basics: C++ Streams, The C++ Classes, Formatted I/O

File I/O: <fstream> and File Classes, Opening and Closing a File, Reading and Writing TextFiles, Detecting EOF.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :
1 Illustrate the basic concepts of object-oriented programming.2
Design appropriate classes for the given real world scenario.
3 Apply the knowledge of compile-time / run-time polymorphism to solve the given problem4
Use the knowledge of inheritance for developing optimized solutions
5 Apply the concepts of templates and exception handling for the given problem6 Use the concepts of input output streams for file operations

Suggested Learning Resources:

Books

1. Herbert schildt, The Complete Reference C++, 4th edition, TMH, 2005

Reference Books

1. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd., Sixth Edition 2016.
2. Bhave , " Object Oriented Programming With C++", Pearson Education , 2004.
3. A K Sharma , "Object Oriented Programming with C++", Pearson Education, 2014

Web links and Video Lectures (e-Resources):

1. Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
2. Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw

Tutorial Link:

1. https://www.w3schools.com/cpp/cpp_intro.asp
2. https://www.edx.org/course/introduction-to-c-3
3.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843642506788864433 75_shared/overview

Practical Component

Sl.NO	Experiments
1	Develop a C++ program to find the largest of three numbers
2	Develop a C++ program to sort the elements in ascending and descending order.
3	Develop a C++ program using classes to display student name, roll number, marks obtained in two subjects and total score of student
4	Develop a C++ program for a bank empolyee to print name of the employee, account_no. & balance.Print invalid balance if amount<500, Display the same, also display the balance after withdraw and deposit.
5	Develop a C++ program to demonstrate function overloading for the following prototypes.add(int a, int b) add(double a, double b
6	Develop a C++ program using Operator Overloading for overloading Unary minus operator.
7	Develop a C++ program to implement Multiple inheritance for performing arithmetic operation oftwo numbers

8	Develop a C++ program using Constructor in Derived classes to initialize alpha, beta and gamma anddisplay corresponding values.
9	Develop a C++ program to create a text file, check file created or not, if created it will write sometext into the file and then read the text from the file.
10	Develop a C++ program to write and read time in/from binary file using fstream
11	Develop a function which throws a division by zero exception and catch it in catch block. Write aC++ program to demonstrate usage of try, catch and throw to handle exception.
12	Develop a C++ program that handles array out of bounds exception using C++.
Assessment Details (both CIE and SEE)	

DATABASES FOR COMPUTER SCIENCE			
Course Type : Theory & lab			
Semester:	**I/II**	**CIE Marks**	**50**
Course Code	**BESC1004B**	Databases for computer science	**50**
Teaching Hours/Week (L:T:P)	**(3:0:2)**	**Exam Hrs**	**3**
Total Hours		**Credits**	**4**

Course objectives: This course covers the essential concepts of database systems, focusing on NoSQL databases, Redis, and vector databases. Students will learn to design, implement, and manage non-relational databases, using technologies like MongoDB, Cassandra, Redis, and emerging vector databases.

Teaching-Learning Process

For more effective Teaching –Learning:

1. Student Centric Discussion
2. Flipped Classroom
3. Chalk and Talk interactions
4. Simulations, Interactive Simulations and Animations
5. NPTEL and Other Videos for theory topics
6. Smart Class Room

Module-1 (8 Hours)
Unit 1: Introduction to NoSQL Databases Overview of NoSQL databases, Types of NoSQL databases: Key-Value, Document, Column-Family, Graph, Comparison with relational databases, Use cases and application
Module-2 (8 Hours)
MongoDB Basics Introduction to MongoDB, Installation and setup, MongoDB architecture, Data models: documents, collections, and databases
Module-3 (8 Hours)
CRUD Operations in MongoDB Creating databases and collections, Inserting, updating, and deleting documents, Querying documents using MongoDB query language, Working with BSON
Module-4 (8 Hours)
Indexing and Aggregation Understanding indexing in MongoDB, Creating and managing indexes, Aggregation framework: pipelines, stages, and operators, Examples of aggregation queries
Module-5 (8 Hours)
Advanced MongoDB Features Data replication and sharding, Transactions in MongoDB, MongoDB Atlas and cloud services, Security and authentication **Performance and Scalability** Performance tuning techniques, Monitoring and profiling MongoDB, Scaling MongoDB applications, Case studies and real-world examples
Course Outcome At the end of the course the student will be able to:

Module 1	Describe fundamental concepts of NoSQL databases and their differences from traditional relational databases.
Module 2	Explain the architecture and data models used in MongoDB and other NoSQL databases.
Module 3	Develop basic CRUD operations and queries using MongoDB.
Module 4	Analyze use cases to determine the suitability of NoSQL databases over relational databases for specific scenarios.
Module 5	Assess the performance and scalability of MongoDB in various application contexts and design a complete application using MongoDB, incorporating advanced features such as indexing, aggregation, and replication.

Text book(s)

NoSQL with MongoDB in 24 Hours, Sams Teach Yourself; Brad Dayley; Pearson Publication; 2015 edition

Reference book(s)

1. NoSQL: Database for Storage and Retrieval of Data in Cloud; Ganesh Chandra Deka; CRC Press; 2017 edition
2. Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems; Martin Kleppmann; Shroff/O'Reilly; 2017 edition

UI/UX DESIGN			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1006/2006**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**1:0:2**	**Exam Hrs**	**3**
Total Hours		**Credits**	**2**

Course objectives:

- Understand user experience design requirements, with design goals, metrics andtargets.
- Explore different prototyping methods, UX design principles with case examples.
- Understand the role of design thinking concepts and mental models in UX design.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes Criticalthinking.
5. Adopt Case study Based Learning (CBL), which fosters students' analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather thansimply recall it.
6. Discuss how every concept can be applied to the real world - and when that's possible, it helps
improve the students' understanding.

Module 1 :	**No. of Hrs:06**
Introduction: Usability to user experience, Emotional impact as part of user experience, User experience needs a business case. Extracting Interaction Design Requirements: Needs & Requirements, Formal requirement extraction, Methods for requirement extraction.	
Module 2 :	**No. of Hrs:06**
Design Thinking, Ideation, and Sketching: Design Thinking, Design Perspectives, User Personas, Ideation, Sketching. Mental Models and Conceptual Design: Storyboards, Design influencing user behaviour.	
Module 3 :	**No. of Hrs: 06**
Design Production: Detailed Design, Wireframes. UX Goals, Metrics and Targets: UX Goals, UX Measures, Measurement instruments, UX Metrics.	
Module 4 :	**No. of Hrs: 06**
Prototyping: Depth & breadth of a prototype, Fidelity of prototypes, Paper prototypes. Connections with Software Engineering: Foundations for success in SE-UX development, The challenge of connecting SE and UX.	
Module 5 :	**No. of Hrs:06**
UX Design Guidelines: Using and interpreting design guidelines, Human memory limitations, UX design guidelines & examples, Planning, Translation, Physical action, Outcomes, Assessment, Overall.	
Course outcome (Course Skill Set) At the end of the course the student will be able to: 1. Explain the user experience design requirements. 2. Relate design thinking concepts and mental models to UX design. 3. Illustrate UX design in line with design goals, metrics and targets. 4. Demonstrate different prototyping in relation with software engineering. 5. Explain UX design principles with case examples.	
Assessment Details (both CIE and SEE)	
Suggested Learning Resources: **Books** 1. REX HARTSON and PARDHA S. PYLA, The UX Book-Process and Guidelines for Ensuring a Quality User Experience, Morgan Kaufmann, Elsevier, 2012.	
Web links and Video Lectures (e-Resources): • https://www.freecodecamp.org/news/ui-ux-design-tutorial-from-zero-to-hero-with- wireframe-prototype-figma/ • https://www.edureka.co/blog/ui-ux-design-tutorial/ • https://www.udemy.com/course/introtoux/	
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning UI design demonstrations covering different UX design principles/concepts (specified in the syllabus) using UI/UX tools like Lunacy, framer, penpot, visily etc.	

INTRODUCTION TO CYBER SECURITY			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BETC1005*/BECT20005***	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**Exam Hrs**	**03**
Total Hours		**Credits**	**3**

Course objectives

- To familiarize cybercrime terminologies and perspectives
- To understand Cyber Offenses and Botnets
- To gain knowledge on tools and methods used in cybercrimes
- To understand phishing and computer forensics

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Chalk and Board
2. Demonstration
3. Interactive learning
4. Videos and online material

Module 1 :	**No. of Hrs:06**

Introduction to Cybercrime:

Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives

Module 2 :	**No. of Hrs:06**

Cyber Offenses:

How Criminals Plan Them: Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercaafe & cybercrimes.

Botnets: The fuel for cybercrime, Attack Vector.

Module 3 :	**No. of Hrs: 06**

Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and

Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attackes, Attacks on Wireless networks.

Module 4 :	**No. of Hrs: 06**

Phishing and Identity Theft: Introduction, methods of phishing, phishing,phising techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft

Module 5 :	**No. of Hrs:06**

Understnading Computer Forensics: Introdcution, Historical Background of Cyberforensics, Digital Foresics Science, Need for Computer Foresics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1	Explain the cybercrime terminologies
CO2	Describe Cyber offenses and Botnets
CO3	Illustrate Tools and Methods used on Cybercrime
CO4	Explain Phishing and Identity Theft
CO5	Justify the need of computer forensics

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=yC_hFm0BX28&list=PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu
- https://www.youtube.com/watch?v=nzZkKoREEGo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_
- https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJlB8XQBxU3z_hDwT95xlk
- https://www.youtube.com/watch?v=KqSqyKwVuA8

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Illustration of standard case study of cyber crime
- Setup a cyber court at Institute level

INDIAN CONSTITUTION			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BMNC1007B/2007B**	**SEE Marks**	**0**
Teaching Hours/Week (L:T:P)	**1:0:0**	**Exam Hrs**	**0**
Total Hours		**Credits**	**1**

Course objectives :

The course **INDIAN CONSTITUTION** will enable the students,

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes andmake Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools),

(iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalizedlearning, (vi) Problems based learning through discussion.

(ii) Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.

Module 1 :	**No. of Hrs:03**

Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to theIndian constitution, Making of the Constitution, Role of the Constituent Assembly.

Module 2 :	**No. of Hrs:03**

Salient features of India Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. FundamentalRights (FR's) and its Restriction and limitations in different Complex Situations. building.

Module 3 :	**No. of Hrs: 03**

Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties

and its Scope and significance in Nation, Union Executive : Parliamentary System, Union Executive – President, PrimeMinister, Union Cabinet.

Module 4 :	**No. of Hrs: 03**

Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India,Supreme Court of India and other Courts, Judicial

Reviews and Judicial Activism.

Module 5 :	**No. of Hrs:03**

State Executive and Governer, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral
Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1	Analyse the basic structure of Indian Constitution.
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Textbook:

1. **"Constitution of India" (for Competitive Exams)** - Published by Naidhruva Edutech Learning Solutions,Bengaluru. – 2022.
2. "**Introduction to the Constitution of India**", (Students Edition.) by Durga Das Basu (**DD Basu**):Prentice –Hall, 2008.

Reference Books:

1. **"Constitution of India, Professional Ethics and Human Rights"** by Shubham Singles, Charles E. Haries, andet al: published by Cengage Learning India, Latest Edition – 2019.
2. **"The Constitution of India"** by Merunandan K B: published by Merugu Publication, Second Edition,Bengaluru.
3. **"Samvidhana Odu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.**

M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "**Engineering Ethics**", Prentice –Hall, 2004.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities

Quizzes and Discussions

- ✓ Seminars and assignments

INTRODUCTION TO C PROGRAMMING			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1008B/2008B**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:2**	**Exam Hrs**	**3**
Total Hours		**Credits**	**4**

Course objectives:

1. Elucidate the basic architecture and functionalities of a Computer
2. Apply programming constructs of C language to solve the real-worldproblems
3. Explore user-defined data structures like arrays, structures and pointers inimplementing solutions to problems
4. Design and Develop Solutions to problems using structured programmingconstructs such as functions and procedures

Teaching-Learning Process(General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative(Group Learning)Learning in the class.
4. Ask at least three HOT(Higher order Thinking)questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning(PBL),which fosters students' Analytical skills, developde sign thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topic sin manifold representations.
7. Showthedifferentwaystosolvethesameproblemandencouragethestudentstocome up with thei rown creative waystosolve them.
8. Discusshoweveryconceptcanbeappliedtotherealworld-andwhenthat'spossible,ithelps to improvethestudents'understanding.

Use https://pythontutor.com/visualize.html#mode=edit in order to visualize the operations of C Programs

Module 1 :	**No. of Hrs:08**

Introduction to C: Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C,

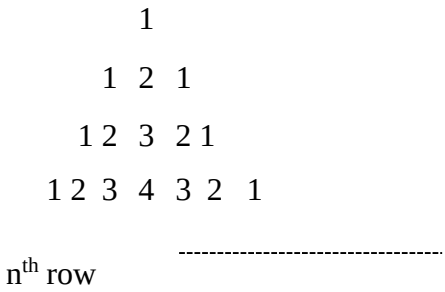
Module 2 :	**No. of Hrs:08**

Operators in C, Type conversion and typecasting.

Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement.	
Module 3 :	**No. of Hrs: 08**
Functions: Introduction using functions, Function definition, function declaration, function call, returnstatement, passing parameters to functions, scope of variables, storage classes, recursive functions. Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations onarrays, Passing arrays to functions, two dimensional arrays, operations on two-dimensional arrays, two- dimensional arrays to functions, multidimensional arrays, applications of arrays.	
Module 4 :	**No. of Hrs: 08**
Strings and Pointers: Introduction, string taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings. Pointers: Introduction to pointers, declaring pointer variables, Types of pointers, Passing arguments to functions using pointers	
Module 5 :	**No. of Hrs:08**
Structure, Union, and Enumerated Data Type: Introduction, structures and functions, Unions, unionsinside structures, Enumerated data type. **Files:** Introduction to files, using files in C, reading and writing data files. , Detecting end of file	
CourseOutcomes(CourseSkillSet) Attheendofthecoursethestudentwillbeableto: CO1. Elucidate the basic architecture and functionalities of a computer and also recognizethe hardware parts. CO 2. Apply programming constructs of C language to solve the real world problemCO 3.Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting CO 4.Explore user-defined data structures like structures, unions and pointers inimplementing solutions CO5.Design and Develop Solutions to problems using modular programming constructs using functions	
Programming Assignments 1 Simulation of a Simple Calculator. 2 Compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages. 3 An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit:for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of	

15% of total amountis charged. Write a program to read the name of the user, number of units consumed and print out the charges.

4. Write a C Program to display the following by reading the number of rows as input,



5 Implement Binary Search on Integers.

6 Implement Matrix multiplication and validate the rules of multiplication.

7 Compute sin(x)/cos(x) using Taylor series approximation. Compare your result with the built-in library function.Print both the results with appropriate inferences.

8 Sort the given set of N numbers using Bubble sort.

9 Write functions to implement string operations such as compare, concatenate, and find string length. Use theparameter passing techniques.

10 Implement structures to read, write and compute average- marks of the students, list the students scoring aboveand below the average marks for a class of N students.

11 Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored inan array of N real numbers.

12. Write a C program to copy a text file to another, read both the input file name and target file name.

Assessment Details (both CIE and SEE)

Textbooks

Computer fundamentals and programming in c, “Reema Thareja”, Oxford University, Second edition,2017.

Reference Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
   Brian W. Kernighan and Dennis M. Ritchie, The ‘C’ Programming Language, Prentice Hall of India.

Web links and Video Lectures (e-Resources):

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity inunderstanding the topics and verities of problem solving methods.

3. https://tinyurl.com/4xmrexre

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars

ENVIRONMENTAL STUDIES			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1007A/2007A**	**SEE Marks**	**0**
Teaching Hours/Week (L:T:P)	**1:0:0**	**Exam Hrs**	**0**
Total Hours		**Credits**	**1**

Course objectives:
To create environmental and sustainbility awareness among the students.

- To gain knowledge on different types of pollution in the environment, waste management and Environmental legislation.

Teaching-Learning Process (General Instructions)
These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, and animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Environmental awareness program for the in house campus
3. Encourage collaborative (Group Learning) Learning in the class.
4. Seminars, surprise tests and Quizzes may be arranged for students in respective subjects to develop skills

Module 1 :	**No. of Hrs:03**

ECOSYSTEM AND SUSTAINABILITY
Ecosystems (Structure and Function): Forest, Desert, Wetlands, River, Oceanic and Lake.
Sustainability: 17 SDGs- History, targets, implementation , Capacity Development

Module 2 :	**No. of Hrs:03**

NATURAL RESOURCE MANAGEMENT
Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind.
Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable

Mining - case studies and Carbon Trading.	
Module 3 :	**No. of Hrs: 03**
ENVIRONMENTAL POLLUTION & WASTE MANAGEMENT **Environmental Pollution** (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. **Waste Management:** Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.	
Module 4 :	**No. of Hrs: 03**
GLOBAL ENVIRONMENTAL ISSUES **Global Environmental Concerns** (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.	
Module 5 :	**No. of Hrs:03**
ENVIRONMENTAL LEGISLATION **Environmental Legislation :** Water Act 1974, Air Act 1981, Environmental Protection Act 1984, Solid Waste Management Rules-2016, E- Waste management Rule - 2022, Biomedical Waste management- 2016.	
Course outcome (Course Skill Set) At the end of the course the student will be able to : • CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, • CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment as legislation. • CO3: Apply their ecological knowledge to illustrate and grasp the problem and describe the realities that managers face when dealing with complex issues.	
Assessment Details (both CIE and SEE)	
Suggested Learning Resources: **Books** • Environmental studies, Benny Joseph, Tata Mcgraw-Hill 2nd edition 2012 • Environmental studies, S M Prakash, pristine publishing house, Mangalore 3rd edition-2018 **Reference Books: -** • Benny Joseph, Environmental studies, Tata Mcgraw-Hill 2nd edition 2009 • M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007 • Dr. B.S Chauhan, Environmental studies, university of science press 1st edition	

Web links and Video Lectures (e-Resources):
Weblink: • https://sdgs.un.org/goals/Video Lectures • https://archive.nptel.ac.in/courses/109/105/109105190/ .
Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning • **Field work:** Visit to Zero Waste Management Plant / Solid waste management plant.

INTRODUCTION TO SUSTAINABLE ENGINEERING			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BETC1005A/2005A**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**Exam Hrs**	**3**
Total Hours		**Credits**	**3**

Course Learning Objectives:

- To familiarize the students to the area of sustainability and concepts of sustainability engineering
- To enable students with an understanding of principles and frame work of sustainable engineering
- To provide students with an understanding of Life Cycle Assessment tool in sustainable engineering
- To provide students with understanding of integration of sustainability with design.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Explanation via real life problem, deliberate on solution and inquiry type teaching
2. Instructions with interactions in class room lectures (physical/hybrid)
3. Use of ICT Tools including You Tube videos and related MOOCs, AR/VR/MR tools
4. Flipped Classroom session (approx. 10% of classes)
5. Guest talks and competitions for learning beyond the syllabus
6. Students oral presentation of case studies

Module 1 :	**No. of Hrs:06**
Sustainable Development and Role of Engineers: Introduction, Why and What is Sustainable Development, THE SDFs, Paris Agreement and Role of Engineering, Sustainable Development and the Engineering Profession, Key attributes of the Graduate Engineering **Sustainable Engineering Concepts**: Key concepts – Factor 4 and Factor 10: Goals of sustainability, System Thinking, Life Cycle Thinking and Circular Economy	
Module 2 :	**No. of Hrs:06**
Sustainable Engineering and Concepts, Principles and Frame Work: Green Economy and Low Carbon Economy, Eco Efficiency, Triple bottom Line, Guiding principles of sustainable engineering, Frameworks for sustainable Engineering.	

Tools for sustainability Assessment: Environmental Management System, Environmental Auditing, Cleaner Production Assessment, Environmental Impact Assessment, Strategic Environmental

Module 3 :	**No. of Hrs: 06**

Fundamentals of Life Cycle Assessment

Why and What is LCA, LCA Goal and Scope, Life cycle inventory, Life Cycle Impact Assessment, Interpretation and presentation of Results, Iterative Nature of LCA, Methodological Choices, LCI Databases and LCA Softwares, Strength and Limitations of LCA.

Module 4 :	**No. of Hrs: 06**

Environmental Life Cycle Costing, Social Life Cycle Assessment, and Life Cycle Sustainability Assessment: Introduction, Environmental Life Cycle Costing, Social Life Cycle Assessment, Life Cycle Sustainability, LCA Applications in Engineering: Environmental Product Declarations and Product Category Rules, Carbon and Water Foot Printing, Energy systems, Buildings and the Built Environment**,** Chemical and Chemical Production Food and Agriculture

Introduction to Environmental Economics: Introduction – What Is Environmental Economics?, Valuing the Environment, Market-based Incentives (or Economic Instruments) for Sustainability,

Command-and-Control versus Economic Instruments, A Simple Model of Pollution Control

Module 5 :	**No. of Hrs:06**

Integrating Sustainability in Engineering Design: Problems Solving in Engineering, conventional to Sustainable Engineering Design Process, Design for Life Guidelines and Strategies, Measuring Sustainability, Sustainable Design through sustainable procurement criteria, Case studies on sustainable Engineering Design Process – Sustainable Process Design, Sustainable Production Design Sustainable product design in Electronic Engineering,

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1	Elucidate the basics of sustainable development, sustainable engineering and its role in engineering
CO2	Application of Sustainable Engineering Concepts and Principles in Engineering
CO3	Apply the Principle, and methodology of Life Cycle Assessment Tool to engineering systems
CO4	Understand integration methods of sustainability to Engineering Design

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Introduction to Sustainability for Engineers, ToolseeramRamjeawon, CRC Press, 1stEdn., 2020
2. Sustainability Engineering: Concepts, Design and Case studies, Prentice Hall, 1stEdn, 2015
3. System Analysis for sustainable Engineering: Theory and applications, Ni bin Chang, McGraw Hill Publications, 1stEdn., 2010
4. Engineering for Sustainable development: Delivery a sustainable development goals, UNESCO, International Centre for Engineering Education, France, 1stEdn., 2021

Introduction to Sustainable Engineering, Rag. R.L. and Ramesh Lakshmi Dinachandran, PHI Learning Pvt. Ltd., 2ndEdn, 2016

Web links and Video Lectures (e-Resources):

- VTU/EDUSAT/SWAYAM/NPTEL/MOOC.
- https://nptel.ac.in/courses/127105018
- https:/https://nptel.ac.in/courses/107103081/www.macfound.org
- https://unesdoc.unesco.org/
- https://unesdoc.unesco.org/ark:/48223/pf0000375644.locale=en
- https://engineeringforoneplanet.org/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Group Discussion of case studies.
- Solutions to real time case studies
- Seminar/Poster Presentation

INTRODUCTION TO EMBEDDED SYSTEMS			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BETC1005G/2005G**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**Exam Hrs**	**03**
Total Hours		**Credits**	**3**

Course objectives: To teach students

- Introductory topics of Embedded System design
- Characteristics & attributes of Embedded System
- Introduction of Embedded System Software and Hardware development
- RTOS based Embedded system design

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various courseoutcomes and make Teaching –Learning more effective

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various analog and digital circuits.
3. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse

information rather thansimply recall it.

4. Show the different ways to solve the same problem and encourage the students to come upwith their own creative ways to solve them.
5. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module 1 :	**No. of Hrs:06**
Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems **Core of Embedded Systems :** Microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components	
Module 2 :	**No. of Hrs:06**
Characteristics and quality attributes of embedded systems: Characteristics, Operational and nonoperational quality attributes, application specific embedded system - washing machine, domainspecific – automotive	
Module 3 :	**No. of Hrs: 06**
Hardware Software Co design and Program Modelling : Fundamental issues in Hardware Software Co-design, Computational models in Embedded System Design **Embedded Hardware Design and Development:** Analog Electronic Components, Digital ElectronicComponents, VLSI & Integrated Circuit Design, Electronic Design Automation Tools	
Module 4 :	**No. of Hrs: 06**
Embedded Firmware Design and Development: Embedded Firmware Design Approaches,Embedded Firmware Development Languages **Embedded System Development Environments:** Types of files generated on cross compilation (only explanation – programming codes need not be dealt), disassemble/decompliler, Simulators, Emulators and Debugging	
Module 5 :	**No. of Hrs:06**
Real-time Operating System(RTOS) based Embedded System Design: Operating System basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessingand Multitasking, Task Scheduling	

Course outcome (Course Skill Set)

At the end of the course the student will be able to

CO1	Explain characteristics of Embedded System design
CO2	Acquire knowledge about basic concepts of circuit emulators,

	debugging and RTOS
CO3	Analyse embedded system software and hardware requirements
CO4	Develop programming skills in embedded systems for various applications.
CO5	Design basic embedded system for real time applications

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Shibu K V, "Introduction to Embedded Systems", Second Edition, McGraw Hill Educatiion

Web links and Video Lectures (e-Resources):

NPTL Lectures:

https://nptel.ac.in/courses/108102045

Embedded Systems, IIT Delhi, Prof. Santanu Chaudhary

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- To design a simple Embedded System like simple remote
- To demonstrate simple microcontroller based experiments like LED interfacing, LCDinterfacing, DAC etc

SMART MATERIALS AND SYSTEMS

Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BETC1005I/2005I**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**Exam Hrs**	**03**
Total Hours		**Credits**	**3**

Course objectives

- To develop the students ability to learn emerging materials.
- To make students to learn prefabricated building components
- To understand the sensors deployed in smart buildings
- To learn building information modelling for building design
- To learn the concepts of 3-D printing

Teaching-Learning Process

These are sample Strategies; which teachers can use to accelerate the attainment of the variouscourse outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Civil Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in theprinciple.
4. Encourage collaborative (Group) Learning in the class.
5. Ask at least three HOT (Higher-order Thinking) questions in the class, which

promotes criticalthinking.

6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather thansimply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up withtheir own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helpsimprove the students' understanding.
10. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module 1 :	**No. of Hrs:06**
Emerging Materials Honey comb structure (Carbon composites), Nano-materials, engineered polymers, emerging sustainable by products (Fly ash and GGBS) and construction chemicals	
Module 2 :	**No. of Hrs:06**
Prefabricated/ Manufactured building components Definition, types of prefabricated/ manufactured building components and infrastructure, modularcoordination, standardization, materials, systems, production, transportation and installation	
Module 3 :	**No. of Hrs: 06**
Smart Materials Definition, Principles of Piezo-electricity, materials (Polymers and Ceramics), sensors (Piezo-electricsensor, strain gauge, shear sensor, in-plane and out of plane sensor, accelerometer), smart composites	
Module 4 :	**No. of Hrs: 06**
BIM and IBMS BIM: Definition, Necessity, advantages, BIM in building design, infrastructure design and constructionIBMS – Definition, Necessity, advantages, Types of IBMS	
Module 5 :	**No. of Hrs:06**
3-D Printing Importance, Historic development, advantages, common terminologies, classification, Process chain, 3– D modelling, Data conversion and transmission, checking and preparation, Building, Post processing,Applications	
Course outcome (Course Skill Set) At the end of the course the student will be able to:	

CO1	Make use emerging materials for construction
CO2	Decide the proper prefabricated building component
CO3	Use smart materials and methods in building construction
CO4	Implement BIM in building design
CO5	Prepare 3-D modelling and manufacture building component

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Donald R. Askeland and Pradeep P. Fulay, Essentials of Materials Science and Engineering, 2009,Cengage Laerning.

Web links and Video Lectures (e-Resources):

- YouTube Videos.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Site visits to understand the prefabricated building components.
- Visit to Smart material manufacturing facilities
- Visit to 3-D printing facility

Waste Management			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1005B/2005B**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**Exam Hrs**	**03**
Total Hours		**Credits**	**3**

Course objectives

- To learn broader understandings on various aspects of solid waste management practiced in industries.
- To learn recovery of products from solid waste to compost and biogas, incineration and energy recovery,hazardous waste management and treatment, and integrated waste management.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Include traditional teaching learning process such as Chalk and Talk using writing boards.
2. Construct graphical and pictorial representation of the subject in the form of Chart, hand-outs or PowerPoint presentations.
3. Collaborate with students how tools are applied to solve biological problems.
4. Integrate real time case studies in various scientific tools used.
5. Reflective approaches on analysing how and why the tools are used in self-reflected or published data.

6. Incorporate Inquiry based approach using demonstration, field study, experiments and project work
Module 1 : **No. of Hrs:06**
INTRODUCTION TO SOLID WASTE MANAGEMENT: Classification of solid wastes (source and type based), solid waste management (SWM), elements of SWM, ESSWM (environmentally sound solid waste management) and EST (environmentally sound technologies), factors affecting SWM, Indian scenario, progress in MSW (municipal solid waste) management in India. Indian and global scenario of e-waste
Module 2 : **No. of Hrs:06**
WASTE GENERATION ASPECTS: Waste stream assessment (WSA), waste generation and composition, waste characteristics (physical and chemical), health and environmental effects (public health and environmental), comparative assessment of waste generation and composition of developing and developed nations, a case study results from an Indian city, handouts on solid waste compositions. E-waste generation.
Module 3 : **No. of Hrs: 06**
COLLECTION, STORAGE, TRANSPORT AND DISPOSAL OF WASTES: Waste Collection, Storage and Transport: Collection components, storage-containers/collection vehicles, collection operation, transfer station, waste collection system design, record keeping, control, inventory and monitoring, implementing collection and transfer system, a case study. Waste Disposal: key issues in waste disposal, disposal options and selection criteria, sanitary landfill, landfill gas emission, leachate formation, environmental effects of landfill, landfill operation issues, a case study.
Module 4 : **No. of Hrs: 06**
WASTE PROCESSING TECHNIQUES & SOURCE REDUCTION, PRODUCT RECOVERY & RECYCLING: Purpose of processing, mechanical volume and size reduction, component separation, drying and dewatering. Source Reduction, Product Recovery and Recycling: basics, purpose, implementation monitoring and evaluation of source reduction, significance of recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and processes, a case study.
Module 5 : **No. of Hrs:06**
HAZARDOUS WASTE MANAGEMENT AND TREATMENT: Identification and classification of hazardous waste, hazardous waste treatment, pollution prevention and waste minimization, hazardous wastes management in India. E-waste recycling.
Course outcome (Course Skill Set) At the end of the course the student will be able to:

CO1	Apply the basics of solid waste management towards sustainable development
CO2	Apply technologies to process waste and dispose the same.
CO3	Design working models to convert waste to energy
CO4	Identify and classify hazardous waste and manage the hazard

Assessment Details (both CIE and SEE)

Suggested Learning Resources:

Books

Text Books:

1. Tchobaanoglous, G., Theisen, H., and Samuel A Vigil, Integrated Solid Waste Management, McGraw-Hill Publishers, 1993.
2. Bilitewski B., Hard He G., Marek K., Weissbach A., and Boeddicker H., Waste Management, Springer, 1994.

Reference Books:

1. White, F. R., Franke P. R.,, & Hindle M., Integrated solid waste management: a life cycle inventory. McDougall,P. John Wiley & Sons. 2001
2. Nicholas, P., & Cheremisinoff, P. D., Handbook of solid waste management and waste minimization technologies, Imprint of Elsevier Science. 2005

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/105103205
- https://www.youtube.com/watch?v=k0ktJRoRcOA
- https://nptel.ac.in/courses/103/107/103107125/
- https://onlinecourses.nptel.ac.in/noc22_ce76/preview
- https://onlinecourses.swayam2.ac.in/cec20_ge13/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- AV presentation by students (on specific topics).
- Discussion of case studies based on research findings.
- Model making and Poster presentations

MATERIALS CHEMISTRY FOR COMPUTER SYSTEMS			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BBSC1002B/2002B**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**2:2:2**	**Exam Hrs**	**3**

Total Hours	**40 Hours Theory +10-12 Hours Lab Slots**	**Credits**	**4**

Note: Wherever the contact hours is not sufficient, tutorial hour can be converted to theory hours.

Course Objectives:

To enable students to use advanced materials and processes for various engineering applications.
To beware of the importance of alternate pollution free, energy sources.
To enable the efficient use of e-wastes resulting in minimum waste.
To employ the processes associated with chemical substances in multidisciplinary situations.

Teaching-Learning Process

These are sample strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching–Learning more effective.

- Tutorial & remedial classes for needy students.
- Conducting Makeup classes /Bridge courses for needy students.
- Demonstration of concepts either by building models or by industry visit.
- Experiments in laboratories shall be executed in blended mode (conventional or non–conventional methods).
- Use of ICT–Online videos, online courses.
- Use of online platforms for assignments/Notes/Quizzes(Ex. Google classroom)

Module 1 : Sensors and Energy Systems	**No. of Hrs:08**

Sensors: Transducer, Actuators, Sensors, Electrochemical sensors, Conductometric sensors, Optical sensors, Thermometric Sensors.

Sensors for the measurement of dissolved oxygen (DO), Electrochemical sensors for the pharmaceuticals, Electrochemical gas sensors for SOx and NOx, Disposable sensors in the detection of biomolecules and pesticides.

Energy Systems: Introduction to batteries, construction, working and applications of Lithium ion and Sodium ion batteries. Quantum Dot Sensitized Solar Cells (QDSSC's)-Principle, Properties and Applications.

Module 2 : Materials for Memory and Display Systems	**No. of Hrs:08**

Memory Devices: Introduction, Basic concepts of electronic memory, History of organic/polymer electron memory devices, Classification of electronic memory devices, Types of organic memory devices (organic molecules, polymeric materials, organic-inorganic hybrid materials.

Display Systems: Photoactive and electroactive materials, Nanomaterials and organic materials used in optoelectronic devices. Liquid crystals (LC's)-Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). Properties and application of Organic Light Emitting Diodes (OLEDs) and Quantum Light Emitting Diodes (QLED's), Light emitting electrochemical cells.

Module 3 : Corrosion and Electrode Systems	**No. of Hrs:08**

Corrosion Chemistry: Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration corrosion. Corrosion control-galvanization, anodization and sacrificial anode method. Corrosion penetration rate (CPR)-Introduction and numerical problems.

Electrode System: Introduction, types of electrodes. Ion selective electrodes-definition, construction, working and applications of glass electrode. Determination of pH using glass electrode. Reference electrode-Introduction, calomel electrode-construction, working and applications of calomel electrode. Concentration cell-Definition, construction and numerical problems.

Analytical Techniques: Introduction, principle and instrumentation of conductometry; its application in the estimation of weak acid. Potentiometry; its application in the estimation of iron.

Module 4 : Polymers and Green Fuels	**No. of Hrs:08**

Polymers: Introduction, Molecular weight-Number average, Weight average and numerical problems. Preparation, properties and commercial applications of Kevlar. Conducting polymers-Synthesis and conducting mechanism of polyacetylene and commercial applications.

Green Fuels: Introduction, construction and working of solar photovoltaic cell, advantages and disadvantages, Generation of energy (green hydrogen) by electrolysis of water and its advantages.

Module 5 : E-Waste Management	**No. of Hrs:08**

Introduction, sources of E-Waste, Composition, Characteristics and Need of e-waste management. Toxic materials used in electronic and electrical products, health hazards due to exposure to e-waste. Recycling and Recovery: Different approaches of recycling (separation, thermal treatments, hydrometallurgical extraction, pyrometallurgical methods, direct recycling). Extraction of gold from E-waste. Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers and statutory bodies).

PRACTICALMODULE

A–Demonstration (any two) offline/virtual:

A1. Chemical structure drawing using software: Chem Draw ACD/ ChemSketch.
A2. Determination of strength of an acid in Pb-acid battery.
A3. Synthesis of Iron-oxide Nanoparticles.
A4. Electrolysis of water.

B–Exercise (compulsorily any 4 to be conducted):

B1.Conductometric estimation of acid mixture.
B2.Potentiometric estimation of FAS using K2Cr2O7.
B3.Determination of pKa of vinegar using pH sensor (Glass electrode)
B4.Determination of rate of corrosion of mild steel by weight loss method.
B5. Estimation of total hardness of water by EDTA method.

C–Structured Enquiry (compulsorily any 4 to be conducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)

C2. Determination of Viscosity coefficient of lubricant(Ostwald's viscometer)
C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method
C4. Estimation of Sodium present in soil/effluent sample using flame photometry.
C5.Determination of Chemical Oxygen Demand (COD)of industrial waste water sample.

D–Open Ended Experiments (any two):

D1. Evaluation of acid content in beverages by using pH sensors and simulation.
D2. Construction of photovoltaic cell.
D3.Design an experiment to Identify the presence of proteins in given sample.
D4.Searching suitable PDB file and target for molecular docking.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1	Use the advanced materials for various engineering applications.
CO2	Demonstrate the importance of alternate pollution free, energy sources for the present-day energy requirement.
CO3	Predict solutions based on the knowledge of corrosion control and polymers for the improvement of various engineering materials
CO4	Calibrate the efficient use of e-wastes resulting in minimum waste, leading to ecofriendly sustainable development.
CO5	Apply the processes associated with chemical substances in multidisciplinary situations.

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).The
minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each
subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end
examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE(Continuous Internal Evaluation) and SEE(Semester End Examination)taken together.

Continuous Internal Evaluation(CIE):

The CIE marks for the theory component of the IC shall be **30 marks** and for the laboratory component
20 Marks.

CIE for the theory component of the IC

- Three Tests each of 20 Marks**;** after the completion of the syllabus of 35-40%, 65-70%, and 90-100%
respectively.
- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project
totalling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to **30 marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test **(duration 03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to **05 marks.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC/IPCC for **20 marks**.

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination (SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada).

The duration of SEE is 03 hours.

- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.

There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub questions), **should have a mix of topics** under that module.

Suggested Learning Resources:

Books (Title of the Book/ Name of the author/Name of the publisher/Edition and Year)

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. NewDelhi,2013-2ndEdition.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai &Co.(P)Ltd.
4. Essentials of Physical Chemistry, Bahl & Tuli, S.Chand Publishing.
5. Applied Chemistry, Sunita Rattan, Kataria
5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry–I, D.Grour Krishana,VikasPublishing
7. A Textbook of Engineering Chemistry,SS Dara & Dr.SSUmare, SChand & Company Ltd., 12th Edition, 2011.
8. A Text Book of Engineering Chemistry, R.V.Gadag and Nityananda Shetty, I.K. International Publishing house. 2nd Edition,2016.
9. Text Book of Polymer Science, F.W. Billmeyer, JohnWiley&Sons,4thEdition,1999.
10. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
11. Corrosion Engineering, M.G. Fontana, N.D. Greene, McGraw Hill Publications, NewYork, 3rd Edition,1996.
12. Linden's Hand book of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
13. OLED Display Fundamentals and Applications,T akatoshi Tsujimura, Wiley–Blackwell,2012
14. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, Elzbieta Frackowiak, Wiley-VCH;1stedition,2013.
15. Handbook on Electroplating with Manufacture of Electrochemicals", ASIA PACIFIC BUSINESS PRESS Inc., 2017. Dr. H. Panda,
16. Expanding the Vision of Sensor Materials. National Research Council 1995,Washington, DC: The National Academies Press. doi:10.17226/4782.
17. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN978-93-85155-70-3, 2022.
18. High Performance Metallic Materials for Cost Sensitive Applications, F.H. Froes, etal. John Wiley & Sons, 2010.
19. Instrumental Methods of Analysis, Dr.K.R. Mahadik and Dr.L.Sathiyanarayanan,Nirali Prakashan, 2020.
20. Principles of Instrumental Analysis, Douglas A.Skoog, F.James Holler, Stanley R.Crouch Seventh Edition, Cengage Learning, 2020
21. Polymer Science, VR Gowariker, NV Viswanathan, Jayadev, Sreedhar, Newage Int.Publishers, 4th Edition, 2021
22. Engineering Chemistry,PC Jain & MonicaJain,DhanpatRai Publication,2015-16th Edition.
23. Nano structured materials and nanotechnology,Hari Singh, Nalwa, academicpress, 1st Edition,2002.
24. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 3rd Edition 2014.
25. Principles of nanotechnology, Phanikumar, Scitech publications,2nd Edition,2010.
26. Chemistry for Engineering Students, B.S.JaiPrakash,R.Venugopal, Sivakumaraiah &Pushpa Iyengar.,Subash Publications,5thEdition, 2014.

27. Engineering Chemistry", O.G.Palanna, Tata McGrawHill Education Pvt.Ltd. NewDelhi, FourthReprint,2015.
28. Chemistry of Engineering materials, Malini S, KS Anantha Raju, CBS publishers PvtLtd.,
29. Laboratory Manual Engg. Chemistry, Anupma Rajput, Dhanpat Rai & Co.

WeblinksandVideoLectures(e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

ActivityBasedLearning(SuggestedActivitiesinClass)/PracticalBasedlearning
https://www.vlab.co.in/broad-area-chemical-sciences
https://demonstrations.wolfram.com/topics.php
https://interestingengineering.com/science

Back-end Web Development			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1008B/2008B**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**Exam Hrs**	**03**
Total Hours		**Credits**	**3**

Introduction
This course provides a comprehensive introduction to back-end web development, focusing on building scalable and secure server-side applications. Students will learn how to use Node.js and Express to create dynamic web services and APIs. The course covers database management, server optimization, and integration with front-end technologies.

Module 1 : Introduction to Back-end Development	**No. of Hrs:03**

Fundamentals of server-side programming, Role of back-end in web development, Introduction to Node.js, Setting up a Node.js environment, Basics of JavaScript for back-end development

Module 2 : Working with Express.js	**No. of Hrs:03**
Introduction to Express.js, Routing in Express, Middleware in Express, Building RESTful APIs, Handling requests and responses	
Module 3 : Database Management	**No. of Hrs: 03**
Introduction to databases, SQL vs NoSQL databases, Working with MongoDB, Mongoose ORM, CRUD operations in MongoDB	
Module 4 : Security and Authentication	**No. of Hrs: 03**
Security best practices in web development, User authentication and authorization, Implementing JWT-based authentication, Protecting routes and data, Secure communication with HTTPS	
Module 5 : Performance and Scalability	**No. of Hrs:03**
Performance optimization techniques, Caching strategies, Load balancing and clustering, Handling concurrent requests, Scaling applications	

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1	Explain fundamental concepts of server-side programming and the role of backend in web development.
CO2	Develop server-side applications using Node.js and Express.
CO3	Compare different database management systems and their use in back-end development.
CO4	Assess the performance of server-side applications for the purpose of optimizing them.
CO 5	Design secure and scalable back-end solutions.
CO 6	Integrate back-end services with front-end applications in a full-stack environment.

Text book(s)

Beginning Node.js, Express & MongoDB Development; Greg Lim; Published by Greg Lim; 2020 edition

Reference book(s)

Learning Node.js Development: Learn the fundamentals of Node.js, and deploy and test Node.js applications on the web; Andrew Mead; Packt Publishing; 2018 edition

Full Stack Web Development			
Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1008B/2008B**	**SEE Marks**	**0**
Teaching Hours/Week (L:T:P)	**1:0:0**	**Exam Hrs**	**0**
Total Hours		**Credits**	**1**

Introduction

Full Stack Web Development is a course designed to teach students how to build dynamic web applications using the MERN stack (MongoDB, Express, React, and Node.js). The course covers both backend and database development, as well as front-end technologies like HTML, CSS, and JavaScript. By the end of the course, students will have built their own unique full stack application, which they can showcase in their portfolio.

Module 1 : Introduction to Full Stack Web Development	**No. of Hrs:03**
Overview of full stack web development, the MERN stack and its components, setting up the development environment (using tools like Node.js, MongoDB, and VSCode), basic backend development concepts (e.g., routing, handling requests, working with databases)	

Module 2 : Backend Development and Databases	**No. of Hrs:03**
Designing and implementing a database schema using MongoDB, writing basic queries and data manipulation commands, creating a RESTful API using Node.js and Express, handling HTTP requests and responses, interacting with the database using Mongoose	

Module 3 : Front-end Development with React	**No. of Hrs: 03**
Overview of React and its components, creating and managing React components, working with state and props, handling user input and events, styling with CSS and Bootstrap	

Module 4 : Software Engineering and Project Management	**No. of Hrs: 03**
Introduction to Software Engineering and SDLC, Agile and Scrum methodologies, software project management tools (like JIRA/ Trello/ GitHub), version control with Git	

Module 5 : Integrating Front-end and Back-end Components	**No. of Hrs:03**
Asynchronous communication between front-end and back-end, handling errors and exceptions, using middleware to process requests, authentication and authorization with JWT	

Module 5 : Building a project

Design and development of a unique full stack application, identifying user requirements and developing a software design, implementing and testing the application, deployment on cloud platforms like AWS, Heroku or Netlify

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO 1	Describe the architecture and components of a full stack web application, including front-end and back-end technologies and their interactions.
CO 2	Design a database schema using MongoDB, including defining data models, creating indexes, and writing queries.
CO 3	Create RESTful APIs using Node.js and Express, including handling HTTP requests and responses, and interacting with the database.
CO 4	Apply front-end user interfaces using React, including using React components, managing state, and handling user input.
CO 5	Integrate front-end and back-end components to create a fully functional full stack web application, including using asynchronous communication and handling errors and exceptions.
CO 6	Design a unique full stack application as a capstone project, including identifying user requirements, developing a software design, and implementing and testing the application.

Text book(s)

Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js; Shama Hoque; Packt Publishing Limited; 2nd edition

Reference book(s)

1. Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App; Greg Lim
2. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node; Vasan Subramanian; Apress; 2nd edition

Front-end web development

Semester	**I/II**	**CIE Marks**	**50**
Course Code	**BAEC1008B/2008B**	**SEE Marks**	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	**Exam Hrs**	**03**
Total Hours		**Credits**	**3**

Introduction

In this course, students will learn the fundamentals of front-end web development, including HTML, CSS, JavaScript, and React JS. They will learn how to create responsive and dynamic web pages, as well as develop their problem-solving and critical thinking skills. The course will focus on hands-on projects and exercises to give students practical experience in front-end web development.

Module 1 : HTML, CSS & JS first steps	**No. of Hrs:03**

Environment set up, Introduction to HTML, HTML Block Elements, HTML Inline Elements, HTML Forms, Introduction to CSS, CSS Font & Text, CSS Selectors, CSS Inheritance, CSS Colors, Box Model, Flex Box, JS DOM, Introduction to JS, JS Variables, JS Data Types, Basics of JS Operators, Basics of JS Strings, Basics of JS Conditional Statements, Basics of JS Control Statements, Basics of JS Arrays, Basics of JS Functions, Basics of JS Objects

Module 2 : HTML, CSS & JS Deep dive Part 1	**No. of Hrs:03**

CSS Advanced Selectors, CSS Positioning, Advanced Flexbox, CSS Grids, Responsive Design, JS Operators, JS Strings, JS Conditional Statements, JS Control Statements, JS Arrays & Functions, JS Objects

Module 3 : HTML, CSS & JS Deep dive Part 2	**No. of Hrs: 03**

JS Advanced Functions, JS Nested Data Structures, JS Higher Order Functions, JS Event Handling, Object Oriented JS, JS Closure, JS Storage, CSS Transition, CSS Animation

Module 4 : JS the hard parts	**No. of Hrs: 03**

JS Prototypal Inheritance, JS Async, JS Callbacks, JS Promises, JS APIs, JS Axios, Unit testing in JS, Deployment

Module 5 : React first steps	**No. of Hrs:03**

Environment set up, Introduction to React, Props & State, Components, React App using Babel, Rendering lists of data, JSX, Hooks, Additional Hooks, Event Handling, Component Lifecycle, Class based components, Routing

React deep dive

React Forms, Fetching Data from API, Redux, React Redux, Redux Toolkit, React CSS Library, Material-ui

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO 1	Explain concepts of HTML, CSS, JavaScript and React effectively.
CO 2	Demonstrate proficiency in HTML, CSS, and JavaScript by applying them to the development of interactive and responsive web pages.
CO 3	Make use of reusable code components to improve productivity and maintainability.
CO 4	Demonstrate an understanding of the principles of web design and user experience.
CO 5	Make use of debugging tools and techniques to identify and fix errors in web applications.
CO 6	Design web pages that are accessible, user-friendly and optimized for search engines.

Text book(s)

1. Web development: This book includes: Web development for Beginners in HTML + Web design with CSS + Javascript basics for Beginners; Andy Vickler; Ladoo Publishing LLC (24 May 2021)
2. The Road to Learn React: Your Journey to Master Plain Yet Pragmatic React.Js; Robin Wieruch; Zaccheus Entertainment (1 January 2018)

Reference book(s)

1. HTML, CSS, and JavaScript All in One; Julie C. Meloni & Jennifer Kyrnin; Pearson Education; Third edition
2. React and React Native: A complete hands-on guide to modern web and mobile development with React.js; Adam Boduch & Roy Derks; Packt Publishing Limited; 3rd edition

10.0 PROGRAM STRUCTURE

-from 3RD to 8th Semester/for each specialization

1.0 Artificial Intelligence

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Artificial Intelligence						
III SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	ESC	Web Application Development-1	4	0	2	5
2	ESC	Problem Solving with Python	4	0	4	6
3	BSC	Mathematics for Computer Science	2	1	0	3
4	HSMC	Communicative English Foundation	2	0	0	2
5	ESC	Introduction to Generative AI	2	0	0	2
6	ESC	Basic electronics for cse	3	0	0	2
7	AEC	Quantitative Aptitude	2	0	2	0

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IV SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	ESC	Web Application Development-2	3	0	2	4
2	PCC-CS	Data Structures	4	0	4	6
3	PCC-CS	Database Management Systems	3	0	2	4
4	HSMC	Communicative English Advanced	1	0	2	2

5	BSC	Engineering Physics	3	0	0	0
6	ESC	Material Chemistry for CSE	2	0	0	2
7	MNC	Environmental Studies	0	0	0	0
8	AEC	Numerical Ability	2	0	2	0

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Scheme for Teaching B.Tech in Artificial Intelligence

V SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	PCC-CS	Back End Development	3	0	2	4
2	PCC-CS	Design and Analysis of Algorithms	4	0	4	6
3	MAT	Probability and Statistics	3	1	0	4
4	HSMC	Applied Communicative English	1	0	2	2
5	AEC	Logical Reasoning	1	0	2	0
6	NMC	Constitution of India				
7	ESC	Renewable Energy Sources				

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VI SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	PCC-CS	Operating Systems	3	0	2	4
2	PCC-CS	Computer Networks	3	0	0	3
3	PCC-CS	Introduction to Problem-Solving Techniques: **Part 1**	3	0	2	4
4	HSMC	Language Analytics	1	1	0	2
5	MAT	Linear Algebra and Calculus	2	1	0	3

6	AEC	Advanced Aptitude	2	0	2	0
7	ESC	Building LLM Applications	1	0	2	2

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VII SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	PCC-CS	Introduction to Machine Learning	4	0	4	6
2	OEC-CS	Open Elective I (Practical Software Engineering)	2	0	4	4
3	OEC-CS	Open Elective II (Data Visualisation Tools)	3	0	0	3
4	PEC-CS	Elective 1	3	0	0	3
5	PROJ	Project/Internship	0	0	8	4
6	HSMC	University Slot				3
7	NMC	Indian knowledge system				

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VII SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	PCC-CS	Foundations of Cloud Computing	3	0	2	4
2	PCC-CS	Introduction to Deep Learning	3	1	2	5

3	PEC-CS	Elective 2	3	0	0	3
4	OEC-CS	University Slot - Open Elective III				4
5	HSMC	Professional skills for workplace				2

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VII SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	PCC-CS	Distributed Systems with High-Level System Design	2	1	2	4
2	PEC-CS	Elective 3	3	0	2	4
3	PEC-CS	Elective 4	3	0	2	4
4	PROJ	Project/Internship	0	0	8	4

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Scheme for Teaching B.Tech in Artificial Intelligence

VIII SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	PCC-CS	Productionisation of ML systems	3	1	4	6
2	OEC-CS	University Slot - Open Elective IV				4
3	PROJ	Capstone Project/Internship	0	0	24	12

2.0 Artificial Intelligence & Machine Learning

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Artificial Intelligence & Machine Learning						
III SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	PCC	Computational Mathematics III	3	2	0	4
2	IPCC	Digital Design & Computer Organization	3	0	2	4
3	IPCC	Operating Systems	3	0	2	4
4	IPCC	Data Structures and Applications	3	0	2	4
5	PCC	Research Methodology and IPR	3	0	0	3
6	AEC	• Python Programming for Data Science • Data Analytics with R	2	0	2	3
7	UHV	Universal Human Values	1	0	0	1

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IV SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Analysis & Design of Algorithms	3	0	2	4
2	IPCC	Artificial Intelligence	3	0	2	4
3	IPCC	Database Management Systems	3	0	2	4
4	PCC	Optimization Technique	3	0	0	3
5	PCC	Probability and Statistics	3	2	0	4

6	AEC	MongoDB / Scala / Julia / MERN	0	0	2	1

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(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Artificial Intelligence & Machine Learning

V SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	PCC	Software Engineering & Project Management	3	0	0	3
2	IPCC	Computer Networks	3	0	2	4
3	PCC	Theory of Computation	3	2	0	4
4	PCC	Computer Vision	3	0	0	3
5	PROJ	Mini Project	0	0	4	2
6	AEC	• Tosca – Automated Software Testing • Hacker Techniques, Tools, and Incident Handling	0	0	2	1
7	IKS	Indian Knowledge System	1	0	0	1
8	Elective	• Unix System Programming • Progressive App Development • Devops • Mobile Application Development • Multimedia Communication	2	0	2	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Artificial Intelligence & Machine Learning

VI SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	IPCC	Natural language Processing	3	0	2	4
2	IPCC	Machine Learning - I	3	0	2	4
3	PROJ	Project Phase I	0	0	4	2
4	PCC	Human-Centred AI	3	0	0	3
5	PCC	Blockchain Technology	3	0	0	3
6	AEC	• Generative AI • Explainable AI	0	0	2	1

		• Project Management with Git				
7	Elective	• Distributed Systems • Compiler Design • Human Aspects of Cybersecurity	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Artificial Intelligence & Machine Learning						
VII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Deep Learning & Reinforcement Learning	3	0	2	4
2	IPCC	Machine Learning - II	3	0	2	4
3	PCC	Data Security & Privacy	4	0	0	4
4	PROJ	Major Project Phase-II	0	0	12	6
5	PCC	Predictive Analytics /Business Analytics	3	0	0	3
6	Elective	• Enterprise Data Warehousing & Mining • Big Data Analytics • Data Engineering & MLOps	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Artificial Intelligence & Machine Learning						
VIII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	Elective 1	Online Courses	3	0	0	3
2	Elective 2	Online Courses	3	0	0	3
3	INT	Internship (Industry/Research)	0	0	12	10

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
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Scheme for Teaching B.Tech in Computer Science & Engineering

III SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	PCC	Computational Mathematics III	3	2	0	4
2	IPCC	Digital Design & Computer Organization	3	0	2	4
3	IPCC	Operating Systems	3	0	2	4
4	IPCC	Data Structures and Applications	3	0	2	4
5	PCC	Research Methodology and IPR	3	0	0	3
6	AEC	• Python Programming for Data Science • Data Analytics with R	2	0	2	3
7	UHV	Universal Human Values	1	0	0	1
		(14 - 20 weeks)				

*BOS will publish courses based on the availability

3.0 B.Tech in Computer Science & Engineering

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering						
IV SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Analysis & Design of Algorithms	3	0	2	4
2	IPCC	Microcontrollers & Embedded Systems	3	0	2	4
3	IPCC	Database Management Systems	3	0	2	4
4	PCC	Blockchain Technology	3	0	0	3
5	PCC	Probability and Statistics	3	2	0	4
6	AEC	MongoDB / Scala / Julia / MERN	0	0	2	1

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering						
V SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	PCC	Software Engineering & Project Management	3	0	0	3
2	IPCC	Computer Networks	3	0	2	4
3	PCC	Theory of Computation	3	2	0	4
4	PCC	NoSQL Databases	3	0	0	3
5	PROJ	Mini Project	0	0	4	2
6	AEC	• Tosca – Automated Software Testing • Hacker Techniques, Tools, and Incident Handling	0	0	2	1
7	IKS	Indian Knowledge System	1	0	0	1
8	Elective	• Unix System Programming • Progressive App Development • Devops	2	0	2	3

		• Mobile Application Development • Multimedia Communication				

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering						
VI SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Cloud Computing (Open Stack /Google)	3	0	2	4
2	IPCC	Machine Learning	3	0	2	4
3	PROJ	Project Phase I	0	0	4	2
4	IPCC	Progressive App Development	3	0	0	3
5	PCC	Optimization Technique	3	0	0	3
6	AEC	Project Management with Git	0	0	2	1
7	Elective	• Distributed Systems • Compiler Design • Human Aspects of Cybersecurity	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering						
VII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Internet of Things Analytics	3	0	2	4
2	IPCC	Parallel Computing	3	0	2	4
3	PCC	Cryptography & Network Security	3	2	0	4
4	PROJ	Major Project Phase-II	0	0	12	6
5	PCC	Explainable and Generative AI	2	0	2	3

6	Elective	• Deep Learning & Reinforcement Learning • Data Mining & Warehousing • Natural Language Processing	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering						
VIII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	Elective 1	Online Courses*	3	0	0	3
2	Elective 2	Online Courses*	3	0	0	3
3	INT	Internship (Industry/Research) (14 - 20 weeks)	0	0	12	10
*BOS will publish courses based on the availability						

4.0 Computer Science & Engineering (Cyber Security)

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Cyber Security)						
III SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	PCC	Computational Mathematics III	3	2	0	4
2	IPCC	Digital Design & Computer Organization	3	0	2	4
3	IPCC	Operating Systems	3	0	2	4
4	IPCC	Data Structures and Applications	3	0	2	4

5	PCC	Research Methodology and IPR	3	0	0	3
6	AEC	Cyber Crime & Cyber Laws	3	0	0	3
7	UHV	Universal Human Values	1	0	0	1

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Computer Science & Engineering (Cyber Security)

IV SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	IPCC	Analysis & Design of Algorithms	3	0	2	4
2	IPCC	Elements of Cyber Security	3	0	2	4
3	IPCC	Database Management Systems	3	0	2	4
4	PCC	Optimization Technique	3	0	0	3
5	IPCC	• Problem management in Cyber Security • Managed Detection and Resolution (MDR) in Cyber Security	2	0	2	3
6	AEC	MongoDB / Scala / Julia / MERN	0	0	2	1

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Computer Science & Engineering (Cyber Security)

V SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	

1	PCC	Software Engineering & Project Management	3	0	0	3
2	IPCC	Computer Networks	3	0	2	4
3	PCC	Theory of Computation	3	2	0	4
4	IPCC	Hacker Techniques, Tools, and Incident Handling	2	0	2	3
5	PROJ	Mini Project	0	0	4	2
6	AEC	Advanced Cyber Security Lab	0	0	2	1
7	IKS	Indian Knowledge System	1	0	0	1
8	Elective	• Cyber Security for DBMS • Artificial Intelligence in Cyber Security • Digital Watermarking and Steganography	2	0	2	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Computer Science & Engineering (Cyber Security)

VI SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	IPCC	Human Aspects of Cybersecurity	3	0	0	3
2	IPCC	Machine Learning	3	0	2	4
3	PROJ	Project Phase I	0	0	4	2
4	PCC	Human-Centred AI	3	0	0	3
5	PCC	Blockchain Technology	3	0	0	3
6	AEC	• Generative AI • Explainable AI • Project Management with Git	0	0	2	1
7	Elective	• Introduction to Cyber Forensics • Cyber Security Management, Compliance and Governance • Cyber Police and CERT-IN	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Computer Science & Engineering (Cyber Security)

VII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Vulnerability Assessment & Penetration Testing	3	0	2	4
2	IPCC	Ethical Hacking	3	0	2	4
3	PCC	Cryptography & Network Security	3	2	0	4
4	PCC	Data Security & Privacy	4	0	0	4
5	PROJ	Major Project Phase-II	0	0	12	6
6	Elective	• Data Engineering & MLOps • Natural Language Processing • IOT Security • Predictive Analytics	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Cyber Security)						
VIII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	Elective 1	Online Courses*	3	0	0	3
2	Elective 2	Online Courses*	3	0	0	3
3	INT	Internship (Industry/Research) (14 - 20 weeks)	0	0	12	10
*BOS will publish courses based on the availability						

5.0 Computer Science & Engineering (Data Science)

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Data Science)						
III SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	PCC	Computational Mathematics III	3	2	0	4
2	IPCC	Digital Design & Computer Organization	3	0	2	4
3	IPCC	Operating Systems	3	0	2	4
4	IPCC	Data Structures and Applications	3	0	2	4
5	PCC	Research Methodology and IPR	3	0	0	3
6	AEC	• Python Programming for Data Science • Data Analytics with R	2	0	2	3
7	UHV	Universal Human Values	1	0	0	1

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Data Science)						
IV SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Analysis & Design of Algorithms	3	0	2	4
2	IPCC	Computer Networks (NS-2/3)	3	0	2	4
3	IPCC	Database Management Systems	3	0	2	4
4	PCC	Optimization Technique	3	0	0	3
5	PCC	Probability and Statistics	3	2	0	4
6	AEC	MongoDB / Scala / Julia / MERN	0	0	2	1

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Data Science)						
V SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	PCC	Software Engineering & Project Management	3	0	0	3
2	IPCC	NoSQL Databases	3	0	2	4
3	PCC	Theory of Computation	3	2	0	4
4	IPCC	Web Technology(Pearl/PHP Programming)	2	0	2	3
5	PROJ	Mini Project	0	0	4	2
6	IKS	Indian Knowledge System	1	0	0	1
7	Elective	• Progressive App Development • Devops • Mobile Application Development	2	0	2	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Data Science)						
VI SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Big Data Analytics	3	0	2	4
2	PCC	Artificial Intelligence & Machine Learning	4	0	0	4
3	PROJ	Project Phase I	0	0	4	2
4	IPCC	Data Engineering & MLOps	2	0	2	3
5	PCC	Blockchain Technology	3	0	0	3
6	AEC	• Tosca – Automated Software Testing • Hacker Techniques, Tools, and Incident Handling	0	0	2	1
7	Elective	• Explainable AI • Generative AI	3	0	0	3

		• Human Aspects of Cybersecurity				

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Data Science)						
VII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Scalable Computing (Cloud + Scalable Systems)	3	0	2	4
2	IPCC	Statistical Machine Learning for Data Science	3	0	2	4
3	PCC	Data Security & Privacy	4	0	0	4
4	PROJ	Major Project Phase-II	0	0	12	6
5	Elective	• Deep Learning & Reinforcement Learning • Enterprise Data Warehousing & Mining	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Data Science)						
VIII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	

			L	T	P	
1	Elective 1	Online Courses*	3	0	0	3
2	Elective 2	Online Courses*	3	0	0	3
3	INT	Internship (Industry/Research) (14 - 20 weeks)	0	0	12	10
*BOS will publish courses based on the availability						

6.0 Computer Science & Information Technology

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Information Technology						
III SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	PCC	Computational Mathematics III	3	2	0	4
2	IPCC	Digital Design & Computer Organization	3	0	2	4
3	IPCC	Operating Systems	3	0	2	4
4	IPCC	Data Structures and Applications	3	0	2	4
5	PCC	Research Methodology and IPR	3	0	0	3
6	AEC	• Python Programming for Data Science • Data Analytics with R	2	0	2	3
7	UHV	Universal Human Values	1	0	0	1

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Information Technology						
IV SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	

			L	T	P	
1	IPCC	Analysis & Design of Algorithms	3	0	2	4
2	IPCC	Microcontrollers & Embedded Systems	3	0	2	4
3	IPCC	Database Management Systems	3	0	2	4
4	PCC	Blockchain Technology	3	0	0	3
5	PCC	Probability and Statistics	3	2	0	4
6	AEC	MongoDB / Scala / Julia / MERN	0	0	2	1

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Computer Science & Information Technology

V SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	PCC	Software Engineering & Project Management	3	0	0	3
2	IPCC	Computer Networks	3	0	2	4
3	PCC	Theory of Computation	3	2	0	4
4	IPCC	Web Technology (Pearl/PHP Programming)	2	0	2	3
5	PROJ	Mini Project	0	0	4	2
6	AEC	• Tosca – Automated Software Testing • Hacker Techniques, Tools, and Incident Handling	0	0	2	1
7	IKS	Indian Knowledge System	1	0	0	1
8	Elective	• Computer Vision • Progressive App Development • Devops • Mobile Application Development	2	0	2	3

Scheme for Teaching B.Tech in Computer Science & Information Technology						
VI SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Cloud Computing (Open Stack /Google)	3	0	2	4
2	IPCC	Cryptography & Network Security	3	0	2	4
3	PROJ	Project Phase I	0	0	4	2
4	IPCC	Progressive App Development	3	0	0	3
5	PCC	Optimization Technique	3	0	0	3
6	AEC	Project Management with Git	0	0	2	1
7	Elective	• Distributed Systems • Compiler Design • Human Aspects of Cybersecurity	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Information Technology						
VII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Internet of Things Analytics	3	0	2	4
2	IPCC	Ethical Hacking	3	0	2	4
3	PCC	Cryptography & Network Security	3	2	0	4
4	PROJ	Major Project Phase-II	0	0	12	6
5	PCC	Explainable and Generative AI	2	0	2	3
6	Elective	• Deep Learning & Reinforcement Learning • Big Data Analytics • Data Security & Privacy	3	0	0	3

		• Natural Language Processing				

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Information Technology						
VIII SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	Elective 1	Online Courses*	3	0	0	3
2	Elective 2	Online Courses*	3	0	0	3
3	INT	Internship (Industry/Research) (14 - 20 weeks)	0	0	12	10
*BOS will publish courses based on the availability						

7.0 Computer Science & Engineering (Software Engineering)

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Software Engineering)						
III SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	PCC	Computational Mathematics III	3	2	0	4
2	IPCC	Digital Design & Computer Organization	3	0	2	4
3	IPCC	Operating Systems	3	0	2	4
4	IPCC	Data Structures and Applications	3	0	2	4
5	PCC	Research Methodology and IPR	3	0	0	3
6	AEC	• Python Programming for Data Science	2	0	2	3

		• Data Analytics with R				
7	UHV	Universal Human Values	1	0	0	1

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Software Engineering)						
IV SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	IPCC	Analysis & Design of Algorithms	3	0	2	4
2	IPCC	Elements of Cyber Security	3	0	2	4
3	IPCC	Database Management Systems	3	0	2	4
4	PCC	Blockchain Technology	3	0	0	3
5	IPCC	• Problem management in Cyber Security • Managed Detection and Resolution (MDR) in Cyber Security	2	0	2	3
6	AEC	MongoDB / Scala / Julia / MERN	0	0	2	1

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU (Affiliated to Yenepoya Deemed to be University) Scheme for Teaching B.Tech in Computer Science & Engineering (Software Engineering)						
V SEMESTER						
Sl. No.	**Course**	**Course Title**	**Teaching Hours /Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
			L	**T**	**P**	
1	PCC	Software Engineering & Project Management	3	0	0	3
2	IPCC	Agile Software Development	3	0	2	4
3	PCC	Theory of Computation	3	2	0	4
4	IPCC	Computer Networks	3	0	2	4
5	PROJ	Mini Project	0	0	4	2

6	AEC	• Tosca – Automated Software Testing • Hacker Techniques, Tools, and Incident Handling	0	0	2	1
7	IKS	Indian Knowledge System	1	0	0	1
8	Elective	• Computer Vision • Progressive App Development • Devops • Mobile Application Development	2	0	2	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Computer Science & Engineering (Software Engineering)

VI SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	IPCC	Cloud Computing (Open Stack /Google)	3	0	2	4
2	IPCC	Machine Learning	3	0	2	4
3	PROJ	Project Phase I	0	0	4	2
4	IPCC	Software Testing and Quality Assurance	3	0	0	3
5	PCC	Cyber Security Management, Compliance and Governance	3	0	0	3
6	AEC	• Generative AI • Explainable AI • Project Management with Git	0	0	2	1
7	Elective	• Compiler Design • Human Aspects of Cybersecurity • Introduction to Cyber Forensics	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Computer Science & Engineering (Software Engineering)

VII SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	

1	IPCC	Vulnerability Assessment & Penetration Testing	3	0	2	4
2	IPCC	Parallel Computing	3	0	2	4
3	PCC	Cryptography & Network Security	3	2	0	4
4	PCC	Natural Language Processing	3	0	0	3
4	PROJ	Major Project Phase-II	0	0	12	6
5	Elective	• IOT Analytics and Security • Predictive Analytics • Business Analytics	3	0	0	3

YENEPOYA SCHOOL OF ENGINEERING AND TECHNOLOGY, KULUR, MANGALURU
(Affiliated to Yenepoya Deemed to be University)
Scheme for Teaching B.Tech in Computer Science & Engineering (Software Engineering)

VIII SEMESTER

Sl. No.	Course	Course Title	Teaching Hours /Week			Credits
			Lecture	Tutorial	Practical	
			L	T	P	
1	Elective 1	Online Courses*	3	0	0	3
2	Elective 2	Online Courses*	3	0	0	3
3	INT	Internship (Industry/Research) (14 - 20 weeks)	0	0	12	10
*BOS will publish courses based on the availability						

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