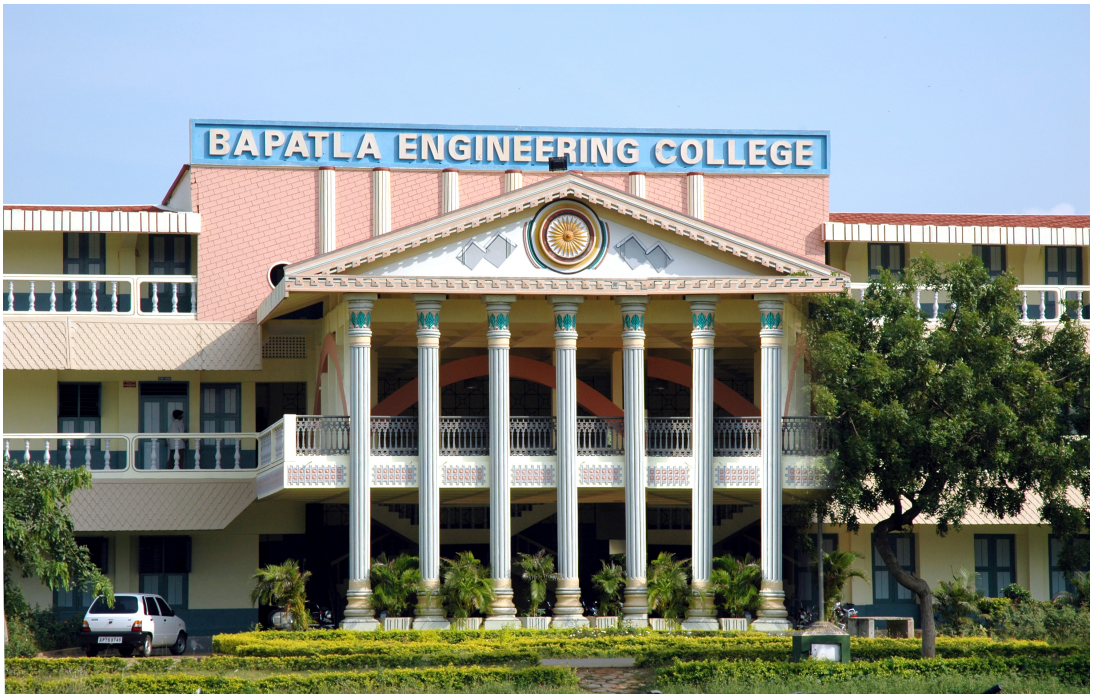
Bapatla Engineering College

(Autonomous)

B.Tech

Information Technology
Curriculum Effective from A.Y. 2024-25
(R24 Regulation)



Bapatla Engineering College :: Bapatla

(Autonomous under Acharya Nagarjuna University)
(Sponsored by Bapatla Education Society)
BAPATLA - 522102 Guntur District, A.P., INDIA
www.becbapatla.ac.in

Contents

Vision of the College

To build centers of excellence, impart high quality education and instill high standards of ethics and professionalism through strategic efforts of our dedicated staff, which allows the college to effectively adapt to the ever changing aspects of education.

To empower the faculty and students with the knowledge, skills and innovative thinking to facilitate discovery in numerous existing and yet to be discovered fields of engineering, technology and interdisciplinary endeavors.

Mission of the College

Our Mission is to impart the quality education at par with global standards to the students from all over India and in particular those from the local and rural areas.

We continuously try to maintain high standards so as to make them technologically competent and ethically strong individuals who shall be able to improve the quality of life and economy of our country.

Vision of the Department

Our vision is to empower our students with the skills and knowledge necessary to meet the challenges of the 21st century, driving sustainable socio-economic development through innovative solutions and responsible use of technology.

Mission of the Department

1. Catering to the needs of students by providing good infrastructure and by imparting skills relevant to the IT industry.
2. To motivate students and faculty members towards self-learning to acquire knowledge about emerging technologies in the IT industry.
3. Promoting research that leads to innovative solutions using cutting-edge technologies in IT domain for the benefit of the society.
4. To inculcate team spirit, leadership qualities and ethics among the students and faculty.

Program Educational Objectives

The students graduated in Information Technology will be able to

PEO1: Become successful and ethical professionals in IT and ITES (Information Technology Enabled Services) industries contributing to societal progress.

PEO2: Engage in lifelong learning, adapting to changing technological scenarios.

PEO3: Communicate and work effectively in diverse teams and exhibit leadership qualities.

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes

1. **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9. **Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
10. **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes

B.Tech. in Information Technology graduates will be able to:

PSO1 **Domain Knowledge:** Acquire knowledge of hardware functionality, design and development of software components required to process the information.

PSO2 **Problem Solving Skills:** Analyze data, Identify required data structures, design suitable algorithms, develop, operate and maintain software for real world problems.

PSO3 **Paradigm Shifts:** Understand the progressive changes in computing, possess knowledge of context aware applicability of paradigms.

Academic Rules & Regulations (R24 Regulations)
Regulations for Four Year Bachelor of Technology (B.Tech)
Degree Program for the Students Admitted from the Academic Year 2024-25

1. **Admissions:** The sanctioned intake in a particular B.Tech program comprises of Category-A (presently 70%) and Category-B (30%) seats which is supplemented with supernumerary (10%) EWS seats. Admissions for the Category-A seats and the supernumerary seats shall be made by the Andhra Pradesh (A.P.) State Government based on the merit rank obtained by the student in the common entrance examination conducted. Admissions for the remaining Category-B seats shall be made by the college in accordance with the guidelines issued by the A.P. State Government.

2. **Medium of Instruction and Examination:** The medium of instruction of the entire B.Tech undergraduate program in Engineering and Technology and the examinations will be in English only.

3. **Minimum Instruction Days:** A semester comprises of 90 working days and the year is divided into two semesters.

4. **Award of B.Tech. Degree:** A student will be declared eligible for the award of the B.Tech degree if he / she fulfills the following academic regulations:

   a. The student pursues a program of study in B.Tech for four academic years and in not more than eight academic years. A lateral entry student pursues a program of study for three academic years and not more than six academic years. However, for the students availing Gap year facility, this period shall be extended by two years at the most and these two years would not be counted in the maximum time permitted for graduation.

   b. The student registers for 160 credits and secures all 160 credits. However, a lateral entry student registers for 121 credits and secures all the 121 credits from III semester to VIII semester of regular B. Tech program.

   c. **Award of B. Tech degree with Minor:** The student secures an additional 16 credits from Minor stream chosen and fulfills all the requisites of a B.Tech program i.e. secures 160 (Regular program) / 121 (Lateral Entry program) credits. Minor is to be completed simultaneously with B.Tech program. Registering for a Minor degree is optional.

   d. **Award of B.Tech degree with Honors:** The student secures an additional 16 credits fulfilling all the requisites of B.Tech program i.e. secures 160 (Regular program) / 121 (Lateral Entry program) credits. Registering for Honors is optional and is to be completed simultaneously with B.Tech program.

   Students can register either for Honors stream or Minor stream.

5. **Courses of study:** At present the following B.Tech programs of study are offered.

S.No.	Title of the UG Programme	Abbreviation
1.	Civil Engineering	CE
2.	Computer Science & Engineering	CS
3.	Computer Science & Engineering (Cyber Security)	CB
4.	Computer Science & Engineering (Data Science)	DS
5.	Computer Science & Engineering (Artificial Intelligence & Machine Learning)	CM
6.	Electronics & Communication Engineering	EC
7.	Electrical & Electronics Engineering	EE
8.	Information Technology	IT
9.	Mechanical Engineering	ME

6. **Credits:**

   a. **Credit:** A unit by which the course work is measured. It determines the number of hours (60 minutes) of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

   b. **Academic Year:** Two consecutive (one odd & one even) semesters constitute one academic year.

   c. **Choice Based Credit System (CBCS):** The CBCS provides a choice for students to select courses (Professional, Job Oriented & Open Electives) from the prescribed set of courses.

   d. Each course in a semester is assigned certain number of credits based on the following

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
Internship of 4 to 6 weeks	2 Credits
Project Work of 16 weeks	12 Credits

7. **Course Structure:** Every course of the B.Tech program will be placed in one of the 7 categories with suggested credits as listed below.

S. No.	Category	AICTE Recommended Credits (%)	Breakup of Credits (Total 160)
1.	Humanities and Social Sciences including Management (HM)	5 – 8 %	8 – 13
2.	Basic Science Courses (BS)	12 – 16 %	19 – 26
3.	Engineering Science Courses (ES)	10 – 18 %	16 – 29
4.	Professional Core Courses (PC)	30 – 36 %	48 – 58
5.	Electives – Professional Electives (PE); Job Oriented Electives (JOE); Open Electives (OE); Skill Enhancement Courses (SEC)	19 – 23 %	37
6.	Internships & Project Work (PR)	8 – 11 %	16
7.	Mandatory Courses (MC)	-	Non-credit

8. **Course Evaluation Process:** The performance of the students in each semester shall be assessed course wise. All assessments will be done on an absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded.

   The performance of a student in each course is assessed with term examinations during the semester called Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE) conducted at the end of the semester. For each course, there shall be a comprehensive SEE of three hours duration at the end of each semester, except for Mandatory courses.

   The performance of a student in Internships, NSS/NCC/Scouts & Guides/Community Service and Health & Wellness/Yoga/Sports will be evaluated after completion of the course at the end of that semester.

   8.1 **Weightage for Course Evaluation:** The distribution of marks between CIE and SEE to be conducted at the end of the semester will be as follows:

Nature of the Course	CIE	SEE
Theory Courses	40	60
Practical Courses	40	60
Mandatory Courses	40	-
Embedded Courses (Theory + Practical)	50	50
NSS / NCC / Scouts & Guides / Community Service and Health & Wellness / Yoga / Sports	-	100
Summer Internship	-	100
Project Work	40	60

8.2 **CIE in Theory/Mandatory Courses:** In each Semester there shall be two Term Examinations and **Alternate Assessment Tools (AAT)** like Home Assignment, Class Test, Problem Solving, Group Discussion, Quiz, Seminar and Field Study in every theory course. The AAT with detailed modality of evaluation for each course shall be finalized by the teacher concerned before beginning of the course. It will be reviewed and approved by the Department Committee.

The Term Examination is conducted in the regular mode according to a schedule which will be common for a particular semester of study. The maximum weightage for Term Examinations, AATs and the calculation of marks for CIE in a theory course is given in the following Table.

Term Exams (Max. 20 marks[1])	AAT (Max. 15 marks[2])	Attendance (Max. 5 marks)
75% of marks obtained in the best performed term exam + 25% of marks obtained in the other term exam	Continuous assessment by teacher as per the predetermined course delivery & assessment plan. (Minimum two & maximum four assessments). AAT marks shall be considered based on average of all tests conducted.	Attendance secured & marks awarded will be as under: ≥75% and <80% - 2 marks, ≥80% and <85% - 3 marks, ≥85% and <90% - 4 marks ≥90% - 5 marks

[1] Term Examination will be conducted for 30 marks and reduced to 20 marks.
[2] Each AAT will be conducted for 10 marks and the average performance shall be scaled up to 15 marks.

8.3 **CIE in Laboratory Courses:** The CIE for 40 marks of a laboratory course comprises of 15 marks

for day-to-day laboratory work, 5 marks for record submission, 5 marks for attendance and 15 marks for a laboratory examination at the end of the laboratory course work. In any semester, a minimum of 90% of prescribed number of experiments / exercises specified in the syllabi for laboratory course shall be completed by the students. They shall complete these experiments / exercises in all respects and get the record certified by the internal lab teacher concerned and the Head of the Department.

8.4 **CIE in Project Work:** The CIE is for 40 marks which consist of 20 marks for reviews at the end of each month as per the process document in the form of seminars / presentations, 5 marks for attendance and 15 marks for the evaluation of project report submitted at the end of the semester.

8.5 **Pass Criteria for CIE:** A minimum of 20 (50%) marks are to be secured exclusively in the CIE with a minimum of 65% attendance in that course to be declared as qualified (Q) in that course and be eligible to appear for the SEE of that course. If a student fails to obtain 20 marks in CIE or a minimum of 65% attendance in that course, then the student will be regarded as not qualified (NQ) and that student is not eligible to appear for the SEE in that course. Such Student can register for the course repetition as per the guidelines mentioned in clause 13 to qualify in that course. After securing 20 marks in course repetition, the student can appear for the SEE of that course as a supplementary candidate.

8.6 **SEE in Theory Course, Laboratory Course and Project Work:**

a) For each theory course, there shall be a comprehensive SEE of three hours duration at the end of each Semester for 60 marks.

b) For each laboratory course, the SEE shall be conducted by one internal and one external examiner appointed by the principal and the duration of the exam shall be for three hours. The SEE is for 60 marks which include 15 marks for write up, 35 marks for lab experiment / exercise and 10 marks for Viva-voce.

c) Project Work shall be evaluated in the form of a Viva-Voce and demonstration of the thesis work for 60 marks. Viva-voce Examination in project work shall be conducted by one internal examiner appointed by the HOD and one external examiner to be appointed by the Principal.

8.7 **Evaluation of Internships:** Summer Internship at the end of IV & VI semesters carried out in industry / organization are to be evaluated in V & VII semesters respectively after the submission of certificate provided by the organization and a concise report submitted by the student to the department committee. The internship will be evaluated by the department committee for a total of 100 marks with 50 marks for the report and 50 marks based on seminars / presentation given to the department committee by the student.

8.8 **Evaluation of NSS/NCC/Scouts & Guides/Community Service and Health & Wellness/Yoga/Sports:** The above courses will be evaluated by the department committee for a total of 100 marks with 50 marks for the activities pursued by the student during that semester and 50 marks based on seminars / presentation given to the department committee by the student.

8.9 **Pass Criteria for SEE:**

a) **Theory/Laboratory Courses and Project Work**

- A minimum of 21 (35%) marks are to be secured exclusively in the SEE of the above courses for the award of the grade and securing the credits for that course.

- A student eligible to appear for the SEE in a course but is absent or has failed the examination may appear for SEE of that course in the next supplementary examination when offered.

b) **Internship, NSS / NCC / Scouts & Guides / Community Service and Health & Wellness / Yoga / Sports**

- A minimum of 40 (40%) marks are to be secured exclusively in the evaluation of the above courses for the award of the grade and securing the credits for that course.
- A student eligible to appear for the evaluation in the above courses but is absent or has failed in the examination may appear for evaluation of that course in the next supplementary examination when offered.

8.10 **CIE in Embedded Course:** In each embedded course 25 marks are alloted for theory part and 25 marks for practical part. Theory part is evaluated in terms of two term examinations and practical part is evaluated in terms of day-to-day work and one term examination.

a) **Theory Part – 25 marks:** For theory part the term examination is conducted in the regular mode according to a schedule given for Honors / Minor courses which will be common for a particular semester of study. The weightage for Term Examinations and the calculation of marks for CIE in theory part is given in the following Table.

Term Exams in Theory Part (Max. 25 marks)
15 marks from the best performed term exam + 10 marks from the other term exam

b) **Practical part – 25 marks:** The practical part comprises of 10 marks for day-to-day laboratory work, 5 marks for record submission and 10 marks for a practical examination at the end of the practical course work. In any semester, a minimum of 90% of prescribed number of experiments / exercises specified in the syllabi for laboratory course shall be completed by the students. They shall complete these experiments / exercises in all respects and get the record certified by the internal lab teacher concerned and the Head of the Department.

8.11 **SEE in Embedded Course:** For each course, SEE shall be conducted for theory part only. A comprehensive SEE will be conducted of three hours duration at the end of each semester course for 50 marks.

8.12 **Pass Criteria in Embedded Course:**

a. **In CIE** a minimum of 25 (50%) marks are to be secured exclusively in the CIE with a minimum of 65% attendance in that course to be declared as qualified (Q) in that course and be eligible to appear for the SEE of that course. If a student fails to obtain 25 marks in CIE or a minimum of 65% attendance in that course, then the student will be regarded as not qualified (NQ) and such a student will be discontinued from the Honors / Minor degree program.

a. **In SEE** a minimum of 20 (40%) marks of theory part is to be secured exclusively in the SEE of each course. A student eligible to appear for the SEE in a course but is absent or failed in the examination will be discontinued from the Honors / Minor degree program.

9. **Choice Based Courses:** Students can select a course from a prescribed set of courses offered by the department in the following categories.

   a) **Professional Elective Courses:** There shall be five Professional Elective Courses from V Semester to VII. For each elective course there shall be a choice such that the student can choose a course from the list of courses offered by the department for that elective.

   b) **Job Oriented Elective Courses:** There shall be three Job Oriented elective Courses in all programs from V to VII semester. For each elective course there shall be a choice such that the student can choose a course from the list of courses offered by the department for that elective.

   c) **Open Elective Courses:** One Open Elective course in VII semester will be offered by various departments. A student can choose and register for an open elective course which is offered by other departments only and he / she has not studied the same course in any form during the Program.

   d) **Massive Open Online Courses (MOOCs):** A Student must pursue and complete one course compulsorily through MOOCs from approved organizations for awarding the degree. A student can pursue MOOCs courses from Professional Elective / Job Oriented Elective / Open Elective Courses only. The student must inform and take prior permission / approval from the Internal Department Committee. The courses must be of a minimum of 8 weeks in duration and shall contain proctored examinations. The student must acquire a certificate for the concerned course from the agency to earn the credits for that course. For further details and guidelines, the students can visit the college website.

   e) The Internal Department Committee comprising Head of Department and two senior faculty members shall evaluate the certificate / grades / marks awarded for a course by external agencies and convert the same to equivalent marks / grades.

10. **Induction Program:** There shall be a mandatory induction program for ***three weeks*** before the commencement of the first semester with no credits.

11. There shall be credit programs like NSS/NCC/Scouts & Guides/Community Service and Health & Wellness/Yoga/Sports. Also Design Thinking & Innovation and Tinkering lab are made compulsory credit courses for all branches.

12. **Make-up Test:**

   a) A student can appear for a Make-up Test for a maximum of two theory courses of a semester to improve marks in the Continuous Internal Evaluation (CIE).

   b) A student is eligible for the Make-up test which is conducted after the second Mid Term examination and before SEE examination if the student satisfies the following conditions.

      i) Unable to secure 50% internal marks (CIE) and has more than or equal to 65% attendance in a particular theory course (After finalizing the internal marks).

ii) Attendance in Remedial classes is more than or equal to 65% (if Remedial classes are conducted) or secured greater than 50% marks in the I Mid Term Examination and AAT-1 together.

iii) Attended 50% of CIE tests (at least one AAT & one Mid Term Examinations).

The make-up test will be conducted for 40 marks (8 questions of 1 mark each, 2 questions of 16 marks each) in Mid Examination format covering the entire syllabus and the marks obtained in this test are final. However, the maximum marks awarded will be 20 only.

The students must apply to the principal through the respective HOD by paying prescribed fees.

The documents for registration of the Make-up test are available from the departments and college website.

13. **Course Repetition:** The students not qualified to write SEE in a course may register for the repeater courses through Course Repetition. The students must apply to the principal through the respective HOD by paying prescribed fees. A student can take up a maximum of two theory courses and one laboratory course in a semester immediately after the semester end examinations of that semester. The students who are not taking regular semester courses may additionally register for one more theory course. The documents for registration of course and monitoring the candidates registered for course repetition are available from the departments and college website.

14. **Minimum Academic Requirements for Promotion:**

a) **Semester Promotion** A student is eligible to register for SEE if he/she satisfies the following conditions. However, the student can appear only for the SEE of those courses in which the student is qualified (Q).

i) **Attendance Requirements**

- A student shall be eligible to register for SEE, if he / she acquires a minimum of 75% of attendance in aggregate of all the courses in a semester.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on genuine medical grounds with a doctor certificate and duly approved by the principal.
- A shortage of attendance below 65% in aggregate shall in NO case be condoned. Students whose shortage of attendance is not condoned in any semester are not eligible to take their SEE of that semester and will be considered as detained in that semester.
- If a student does not satisfy the attendance requirements of the present semester, he / she will not be promoted to the next semester (considered as detained in the present semester). They may seek readmission for that semester when offered next.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

ii) **Qualification in CIE**

- A student must qualify in a minimum of three courses in each semester (as per Clause 8.5) in CIE to register for the SEE of that semester.
- If a student does not satisfy the above conditions, he / she will not be promoted to the next semester (considered as detained in that semester). They may seek readmission for the detained semester when offered next.

b) **Promotion / Detention Conditions based on the minimum credits to be secured by the student:** A student shall be promoted from I to II, III to IV, V to VI and VII to VIII semesters if he / she fulfills the academic requirement as specified in 14.a). For other semesters i.e. II to III (1st year to 2nd year), IV to V (2nd year to 3rd year) and VI to VII (3rd year to 4th year) semesters, the following criteria is to fulfilled in addition to 14.a clause.

i) **II semester to III semester (1st year to 2nd year)** A student shall be promoted from II semester to III semester only if he / she fulfills the academic requirement of securing 25% of the credits in the courses that have been studied up to I Semester.

ii) **IV semester to V semester (2nd year to 3rd year)** A student shall be promoted from IV semester to V semester only if he/she fulfills the academic requirement of securing 40% of the credits in the courses that have been studied up to III Semester.

iii) **VI semester to VII semester (3rd year to 4th year)** A student shall be promoted from VI semester to VII semester only if he/she fulfills the academic requirements of securing 40% of the credits in the courses that have been studied up to V semester.

If a student is not promoted or detained for want of credits in a particular semester as per clause 14.b above, the student may secure the required credits through supplementary examinations and only after securing the required credits he / she shall be permitted to join in the III or V or VII Semester as the case may be.

c) **With–holding of Results** If the candidate has any dues not paid to the college or case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases until the issue is resolved.

15. **Guidelines for offering a Minor in a discipline:** Minor in a discipline concept is introduced in the curriculum for all conventional B. Tech programs in which it offers a Major Program (B.Tech degree). The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional added feature of the B. Tech. program.

a. Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in Minor specialization groups offered by a department other than their parent department.

b. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the Minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc.

c. The list of disciplines / branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BOS.

d. There shall be no limit on the number of programs offered under Minor. The Institution can offer Minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

e. The concerned BOS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.

f. A student shall be permitted to register for Minor program at the beginning of 4th semester provided that the student must have acquired **a minimum of 7.0 CGPA up to the end of 3rd semester without any backlogs. A CGPA of 7.0 must be maintained in the subsequent semesters without any backlog to keep the Minor registration active.**

g. A student must earn an additional 16 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Undergraduate degree in Major discipline (i.e. 160 credits for regular students and 121 credits for Lateral Entry students). The concerned BOS shall finalize the modalities to earn the above credits.

h. For securing the above additional 16 credits, the students must register and complete three courses of 4 credits each offered by the department concerned. These 3 courses must contain a laboratory component also (i.e. Embedded course having three lecture hours and two practical hours). The balance of 4 credits may be secured through two MOOCs courses of 2 credits each or an embedded course offered by the department.

i. If a student opts for two MOOC's, the courses must be of a minimum of 8 weeks in duration and shall contain proctored examinations. As per MOOCs guidelines the Internal Department Committee comprising Head of Department and two senior faculty members shall evaluate the certificate / grades / marks awarded for a course by external agencies and convert the same to equivalent marks / grades.

j. Courses that are used to fulfil the students' primary Major may not be double counted towards the Minor. Courses with content substantially equivalent to courses in the students' primary Major may not be counted towards the Minor.

k. The student registered for Minor shall pass in all subjects that constitute the requirement for the Minor program. No class / division (i.e., second class, first class, distinction, etc.) shall be awarded for Minor degree programme

l. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra.

m. In case a student fails to meet the CGPA requirement for B.Tech degree as per clause 15.f or drops (or terminated) from the Minor program, he/she will be dropped from the list of students eligible for Minors degree and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

n. The Minor will be mentioned in the Major degree certificate only. No additional degree certificate will be given for Minor degree.

o. Transfer of credits from Minor to regular B.Tech degree and vice-versa shall not be permitted

p. Minor must be completed simultaneously with a Major degree program. A student cannot earn the Minor degree after he / she has already earned bachelor's degree.

q. The documents for registration of Minor courses are available from the departments and college website.

16. **Guidelines for offering an Honors in a Discipline:** The objective of introducing B.Tech (Honors) is to facilitate the students to choose additional specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

Honors is introduced in the curriculum of all B. Tech. programs offering a Major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology. Students are eligible to opt for Honors program offered by the same Department / Discipline.

a. Students who are desirous of pursuing special interest / advanced areas of their discipline of Engineering may opt for additional courses as part of Honors programs offered by the parent department.
b. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand.
c. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired **a minimum of 7.5 CGPA up to the end of 3rd semester without any backlogs. A CGPA of 7.5 must be maintained in the subsequent semesters without any backlog to keep the Honors registration active.**
d. A student must earn additional 16 credits for award of B.Tech. (Honors) degree from the same branch / department / discipline registered for Major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major discipline (i.e., 160 credits for regular students and 121 credits for Lateral Entry students). The concerned BOS shall finalize the modalities to earn the above credits.
e. For securing the above additional 16 credits, the students must register and complete three courses of 4 credits each offered by the department concerned. These 3 courses must contain a laboratory component also (i.e. Embedded course having three lecture hours and two practical hours). The balance of 4 credits may be secured through two MOOCs courses of 2 credits each or an embedded course offered by the department.
f. If a student opts for two MOOC's, the courses must be of a minimum of 8 weeks in duration and shall contain proctored examinations. As per MOOCs guidelines the Internal Department Committee comprising Head of Department and two senior faculty members shall evaluate the certificate / grades / marks awarded for a course by external agencies and convert the same to equivalent marks / grades.
g. Courses that are used to fulfil the students' primary Major may not be counted towards the Honors.
h. The student registered for Honors shall pass in all subjects that constitute the requirement for the Honors program. No class / division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors program.
i. If a student drops or is terminated from the Honors program, the additional credits earned so far cannot be converted into open or core electives; they will remain extra.
j. In case a student fails to meet the CGPA requirement for B.Tech degree as per clause 16.c or drops (or terminated) from the Honors program, he/she will be dropped from the list of students eligible for degree with Honors and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them
k. The Honors will be mentioned in the Major degree certificate only as Bachelor of Technology (Honors). No additional degree certificate will be given for Honors.
l. Transfer of credits from Honors to regular B.Tech degree and vice-versa shall not be permitted.

m. Honors is to be completed simultaneously with a Major degree. A student cannot earn the Honors after he / she has already earned bachelor's degree

n. The documents for registration of Honors are available from the departments and college website.

17. **Summer Internships:**

- Students shall undergo two summer internships each for a minimum of four weeks duration at the end of second and third years of the program for 2 credits each. The organization in which the student wishes to carry out Internship needs to be approved by Internal Department Committee comprising Head of Department and two senior faculty members. The student shall submit a report along with an internship certificate from the organization. The evaluation of the first and second summer internships shall be conducted at the end of the V Semester & VII semester respectively.
- Completion of the internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship in the subsequent summer. The student pursuing two summer internships in the same summer is not permitted.
- Community Service Project focusing on specific local issues shall be an alternative to the four weeks of summer Internship. The Community Service Project shall be for 4 weeks in duration which includes preliminary survey for 1 week, community awareness programs for one week, community immersion program in consonance with Government agencies for 1 week and a community exit report (a detailed report) for 1 week.

18. A student shall register and put-up minimum attendance in all 160 credits and earn all the 160 credits. In the case of lateral entry students, the number of credits is 121.

19. Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. Program, and their admission shall be cancelled. However, for the students availing the Gap year facility, this period shall be extended by corresponding gap year duration availed. Lateral entry students who fail to earn 121 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission shall be cancelled. However, for the students availing gap year facility, this period shall be extended by corresponding gap year duration availed.

20. **Securing Credits and award of Grade Points: Grading**
After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the % of marks in the course fall	Grade	Grade Points Assigned
≥ 90	S (Superior)	10
80-89	A (Excellent)	9
70-79	B (Very Good)	8
60-69	C (Good)	7
50-59	D (Average)	6
40-49	E (Below Average)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

A student obtaining Grade F shall be considered failed and will be required to reappear for that course when the next supplementary SEE is offered. Same is the case with a student who obtains 'Ab' in the SEE.

Since there are no credits for Mandatory/Audit courses, only 'Pass' or 'Fail' shall be mentioned for such courses.

21. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA): (i) The Semester Grade Point Average (SGPA) in a particular semester is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \frac{\sum_{i=1}^{n} C_i \times GP_i}{\sum_{i=1}^{n} C_i} \tag{1}$$

where, C_i is the number of credits of the i-th course and GP_i is the grade point scored by the student in the i-th course.

(ii) The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$SGPA = \frac{\sum_{j=1}^{m} SGPA_j \times TC_j}{\sum_{j=1}^{m} TC_j} \tag{2}$$

where $SGPA_j$ is the $SGPA$ of the j-th semester and TC_j is the total number of credits in that semester.

(iii) Both $SGPA$ and $CGPA$ shall be truncated to 2 decimal points and reported in the transcripts. (iii) While computing the $SGPA$, the courses in which the student is awarded Zero grade points will also be included. (iv) Grade Point: It is a numerical weightage allotted to each letter grade on a 10-point scale. (v) Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D, E and F.

22. **Award of Class:** After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree, he / she shall be placed in one of the following four classes.

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

23. **Gap Year:** Gap year concept for Student Entrepreneur shall be introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue entrepreneurship program / to establish startups. This period may be extended to two years at the most and these two years would not be counted as the maximum time for graduation.

    An evaluation committee shall be constituted by the College to evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail themselves of the Gap Year.

    After rejoining the student can pursue the remaining period of study under transitory regulations (if the regulation changes).

24. **Transitory Regulations:**

    - Discontinued or detained candidates (as per clause 14.b) are eligible for readmission as and when the semester is offered and after fulfillment of academic regulations. Candidates who have been detained as per clause 14.a) are eligible for readmission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered.
    - Candidates who were permitted with Gap Year shall be eligible for rejoining into the succeeding year of their B.Tech from the date of commencement of class work.
    - The readmitted students must follow the regulations in which he/she is admitted and residual courses if any must be completed based on the equivalent courses for each semester specified by the BOS considering the previous and readmitted regulations.

25. **Credit Transfer Policy:** Adoption of MOOCs is mandatory, to enable blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the Institution shall allow up to a maximum of 15 credits (5 courses, approximately 10% for the total credits of the program) through MOOCs platform.

    a. The Institution shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
    b. Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information and take prior approval from the department.

c. Credit transfer policy will be applicable to the Professional Elective Courses, Job Oriented Elective Courses, Open Elective Courses & Management Courses only.
d. The concerned department shall identify the courses permitted for credit transfer.
e. The department shall notify the list of the online learning courses at the beginning of semester eligible for credit transfer.
f. The department shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the course.
g. The department shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the Institution will re-issue the marks sheet for such students.
h. Credits transfer will be considered only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and/or grades.
i. The institution shall submit the following to the examination section:
    1. List of students who have passed MOOC courses in the current semester along with the certificate of completion.
    2. Undertaking form filled by the students for credit transfer.
j. The Institution shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

26. **Academic Bank of Credits (ABC):** The College has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

    a. Provide option of mobility for learners across the universities of their choice.
    b. Provide option to gain the credits through MOOCs from approved digital platforms.
    c. Facilitate award of Certificate / Diploma / Degree (B.Sc) in line with the accumulated credits in ABC
    d. Execute Multiple Entry and Exit system with credit count and credit transfer.

27. **Exit Policy:** The students can choose to exit the four-year programme at the end of first / second / third year of study.

    a. **UG Certificate** (in Field of study / discipline) - Programme duration: First year (first two semesters) of the undergraduate programme, 39 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship / apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.
    b. **UG Diploma** (in Field of study / discipline) - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship / apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.
    c. **Bachelor of Science** (in Field of study / discipline) i.e., B.Sc. Engineering in (Field of study / discipline)- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

28. Student Transfers
Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the affiliated University from time to time.

29. **Punishments for Malpractice cases – Guidelines:**

a) If any student caught under malpractice during the CIE examinations, the entire cycle of examinations will be cancelled and awarded zero marks for all the courses during that cycle. For example, if any student is caught while doing malpractice in an AAT, the AAT marks of all the courses in that cycle will be cancelled. Similar punishment will be considered for mid-term examinations also.

b) For Semester End Examinations, the examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators / squad members etc. The punishment may be more severe or less severe depending on the merits of the individual cases.

SN	Nature of Malpractice / Improper conduct	Punishment
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the course of the examination).	Expulsion from the examination hall and cancellation of the performance in that course only.
2	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
3	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
4	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the students involved. In case of an outsider, he will be handed over to the police and a case shall be registered against him.

SN	Nature of Malpractice / Improper conduct	Punishment
5	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
6	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
7	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeit of seat.
8	Refuses to obey the orders of the Chief Superintendent /Asst. Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses of that semester / year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case shall be registered against them.

SN	Nature of Malpractice / Improper conduct	Punishment
9	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from classwork and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in S.No7 to S.No 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them.
12	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case shall be registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination including practicals and project work of that semester/year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.

SN	Nature of Malpractice / Improper conduct	Punishment
13	If any malpractice is detected which is not covered in the above S.No 1 to S.No 12 items, it shall be reported to the college academic council for further action and award suitable punishment.	
14	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.	

30. **Additional Academic Regulations:**

    a. Any attempt to impress upon the teachers, examiners, faculty and staff of Examinations, bribing for either marks or attendance will be treated as malpractice.

    b. When a component of Continuous Internal Evaluation (CIE) or Semester End Examination (SEE) is cancelled as a penalty, he/she is awarded zero marks in that component.

31. **Amendments to Regulations:** The Academic Council of Bapatla Engineering College (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations and / or Syllabi, Academic schedules, Examination schedules, Examination pattern, Moderation to students, Special opportunity to complete degree beyond stipulated time and any other matter pertained that meets to the needs of the students, society and industry without any notice and the decision is final.

Discipline and Code of Conduct for Students

The following are some of the important rules of discipline. All students are required to be aware of and act consistently with these values.

1. Students must punctually attend all lectures, practical's, tutorials, assignments, tests, examinations, etc. A student whose attendance and/or progress in the various tests and examinations are not satisfactory and who does not perform the required number of assignments, tutorials and/or practical's are likely to lose their terms. Prolonged absence even on ground of ill health may also lead to loss of terms. Defaulters will not be sent up for Final /University Examinations.
2. The identity card is meant for identifying bonafide students and is used for permitting the students to participate in various activities and programs of the college. Every student must wear Identity card as long as he/she is in the college campus. It must be produced by the student whenever demanded by the member of the teaching or non-teaching staff of the college. Every student must wear his/her Identity card in the college every day. He/She must take proper care of it to avoid its misuse by other students and outsiders. In case the Identity card is lost, the matter should be immediately reported to the Principal and an application should be made for a duplicate Identity card, which will be issued on payment of charges.
3. The conduct of the students in the classes and in the premises of the college shall be such as will cause no disturbance to teachers, fellow students or other classes.
4. Every student shall wear a clean formal dress while coming to the college also when representing the college for various activities out station. No Society or Association shall be formed in the College and no person should be invited in the college campus without the specific permission of the Principal.
5. No student is allowed to display any Notice/Circular/Poster/Banner in the College premises without the prior permission of the Principal.
6. Using foul language in the college campus is prohibited. If any student is caught using foul language, disciplinary action shall be initiated against the student.
7. Use of BEC name tag or logo by the students for their caste, political, religious, personal reasons is prohibited. Further placing banners on caste, political, religious, personal reasons, promoting cinema heroes & political leaders, taking possessions and burning fire crackers in front of the college is strictly prohibited. If any student is involved in such activities in and around the campus, severe disciplinary action will be taken including rusticating from the college and filing a criminal case.
8. Outsiders are not permitted in the college premises without the prior permission of the Principal. College students are not allowed to bring their relatives/friends to the college premises without the permission of the principal.
9. All meetings, cultural programs, debates, elocutions etc. organized on the college premises must be held in presence of teaching staff members and with the prior permission of the Principal. The subjects of debates/elocutions must have the prior approval of the principal.
10. Conducting fresher's meet, farewell meets etc. by the students outside the campus are prohibited. If any student is involved in such activities (organizing as well as participating), severe disciplinary action will be taken including rusticating from the college.

11. Students must take proper care of the college property. Strict action will be taken against students damaging College property and will be required to compensate the damage.
12. Students should not be involved in academic offences including cheating or plagiarism in academic course work malpractices at the College/Board/University Examinations
13. Smoking is strictly prohibited in the college premises.
14. If, for any reason, the continuance of a student in the College is found detrimental to the best interest of the college, the Management may ask the student to leave the college without assigning any reasons and the decision will be final and binding on the student.
15. Playing music on Transistors, Tape-Recorders, Car Stereos, Mobile phones or any other similar gadgets with or without earphones is strictly prohibited in the college premises. Defaulters will be punished and their instrument shall be confiscated.
16. Use of Mobile phones is strictly prohibited in the academic area of the college, Defaulters will be penalized and their instrument confiscated.
17. Students who are travelling to college on personal vehicles (2/4 wheelers) need to have valid driving license issued by RTO and follow all the rules listed by RTO. Students have to park the vehicle in the parking area of the college.
18. Students must not hang around in the college premises while the classes are at work.
19. Students must not attend classes other than their own without the permission of the authority concerned.
20. Students shall do nothing inside or outside the college that will interface with the discipline of the college or tarnish the image of the college.
21. Students are not allowed to communicate any information about college matters to Press.
22. Matters not covered above will be decided at the discretion of the Principal. Acts of misbehavior, misconduct, indiscipline or violation of the Rules of Discipline mentioned above liable for one more punishment as stated below:
    a) Warning to the students.
    b) Warning to the student as well as inform the parents.
    c) Imposition of a fine.
    d) Denial of gymkhana, library, laboratory, N.C.C., N.S.S. student aid or any other facility for a specified period or for the whole Term/Year.
    e) Expulsion from College for a specified period
    f) Cancellation of Terms.
    g) Refusal of admission in the term or academic year.
    h) Cancellation of admission.
    i) Rustication.

Anti Ragging Rules and Regulations
(As per AICTE norms)

1. **What constitutes Ragging:** Ragging constitutes one or more of any of the following acts:
   a) any conduct by any student or students whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness a fresher or any other student;
   b) indulging in rowdy or undisciplined activities by any student or students which causes or is likely to cause annoyance, hardship, physical or psychological harm or to raise fear or apprehension thereof in any fresher or any other student;
   c) asking any student to do any act which such student will not in the ordinary course do and which has the effect of causing or generating a sense of shame, or torment or embarrassment so as to adversely affect the physique or psyche of such fresher or any other student;
   d) any act by a senior student that prevents, disrupts or disturbs the regular academic activity of any other student or a fresher;
   e) exploiting the services of a fresher or any other student for completing the academic tasks assigned to an individual or a group of students.
   f) any act of financial extortion or forceful expenditure burden put on a fresher or any other student by students;
   g) any act of physical abuse including all variants of it: sexual abuse, homosexual assaults, stripping, forcing obscene and lewd acts, gestures, causing bodily harm or any other danger to health or person;
   h) any act or abuse by spoken words, emails, posts, public insults which would also include deriving perverted pleasure, vicarious or sadistic thrill from actively or passively participating in the discomfiture to fresher or any other student;
   i) any act that affects the mental health and self-confidence of a fresher or any other student with or without an intent to derive a sadistic pleasure or showing off power, authority or superiority by a student over any fresher or any other student.
2. **Actions to be taken against students for indulging and abetting ragging in technical institutions Universities including Deemed to be University imparting technical education:**
   a) The punishment to be meted out to the persons indulged in ragging has to be exemplary and justifiably harsh to act as a deterrent against recurrence of such incidents.
   b) Every single incident of ragging a First Information Report (FIR) must be filed without exception by the institutional authorities with the local police authorities.
   c) The Anti-Ragging Committee of the institution shall take an appropriate decision, with regard to punishment or otherwise, depending on the facts of each incident of ragging and nature and gravity of the incident of ragging.
   d) Depending upon the nature and gravity of the offence as established the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following:
      i. Cancellation of admission
      ii. Suspension from attending classes
      iii. Withholding/withdrawing scholarship/fellowship and other benefits
      iv. Debarring from appearing in any test/examination or other evaluation process

v. Withholding results
vi. Debarring from representing the institution in any regional, national or international meet, tournament, youth festival, etc.
vii. Suspension/expulsion from the hostel
viii. Rustication from the institution for period ranging from 1 to 4 semesters
ix. Expulsion from the institution and consequent debarring from admission to any other institution.
x. Collective punishment: when the persons committing or abetting the crime of ragging are not identified, the institution shall resort to collective punishment as a deterrent to ensure community pressure on the potential raggers.

Guidelines for Remedial Classes and Make-up Test

(R24 Regulations)

a) Faculty need to identify the underperforming students in their respective subject. An underperforming student is one, whose marks are less than 50% in the I Mid Term Examination and AAT 1 together. A list of such students should be prepared by the faculty soon after the I Mid Term examination is over and get it signed by the concerned HOD.

b) Faculty should conduct remedial classes for the underperforming students with an objective of improving their marks in the CIE. Minimum number of remedial classes to be taken should be 20% of the classes taken prior the I Mid Term Examination which is 6 classes. Teaching methodology is left to the faculty member, but he/she should keep the objective in mind.

c) Regular students who could not appear for the I Mid Term Examination and AAT (with genuine reason) should appear to the remedial classes with the prior permission of the HOD.

d) The entire process of conduct of remedial classes should be well documented and is subjected to academic audit.

The guidelines for conducting the Make-up test: (Refer to S.No:12 in academic rules and regulations)

Bapatla Engineering College

(Autonomous)

Department of Information Technology

Application for Make-up Test

Date:

1 Name of the Candidate :

2 Register Number :

3 Academic Year :

4 Branch :

5 Year & Semester of Study :

6 Student Mobile No. :

Course Code Title	% of attendance	CIE Marks				(To be filled by the concerned subject faculty)	
		AAT-1	MID-1	AAT-2	MID-2	% of attendance in remedial classes*	Signature

* Write 'NA' if the student's name is not in the remedial class list.

Signature of the Student

Signature of the
Head of the Department

Fee Particulars:

The make-up test fee has to be paid through HDFC payment gateway and a printout of the receipt has to be taken. The student has to submit the office copy of the receipt in the COE office, get the signature and has to submit the signed application form along with student copy of the receipt in the department.

Amount paid in Rs	Date of payment	Signature of Exam Section Clerk

Note:

1. As per the "Make-up test guidelines", the eligible students have to fill this form, with the signature of the concerned subject faculty and the HOD.
2. After making the payment, the filled form along with a photocopy of the payment receipt has to be submitted in the department.
3. The make-up test will be scheduled and conducted by the department.

Guidelines for Internships

- As per R24 guidelines, every student has to undergo internship twice, once between IV and V semester, the other between VI and VII Semester. The first internship is for a duration of 4 to 6 weeks.
- There shall be a departmental internship committee consisting of the Head of the Department and two faculty members nominated by the HOD. The committee shall identify the potential organizations which can provide internship opportunity to the students. The department shall enter into an MOU with the concerned organization and the details will be shared with the students.
- The students shall be informed to apply for undergoing internship in the specified proforma. The details and consent of the organization in which he/she is seeking for internship are to be furnished. Further, the student along with the parent must submit an undertaking form. The committee shall scrutinize the applications and approve the same. If a student fails to acquire internship, he/she may be permitted to undergo equivalent work (mini project, research project, fabrication work, field work, research paper, etc.,) in the department under the guidance of a faculty member.
- After the completion of the internship, the student must submit the report and attend a departmental internal assessment for award of grade and credits.

Internship Approval Proforma

Name of the Department	
Name of the Student	
Registered No	
Email id	
Mobile No	
Academic Year	
Internship Semester	After VI Semester / After IV Semester

Internship Details

Internship Organization	
Duration in weeks	
Start Date of Internship	
End Date of Internship	
Probable Date of Certificate Submission	

Note:

1. The consent letter from the organization is to be enclosed
2. Undertaking form from the student and parent

Signature of the Student

Signature of the
Internship Committee

Signature of the
Head of the Department

Guidelines for Massive Open Online Courses (MOOCs)

1. Head of the department should constitute a three member MOOC committee under his chairmanship along with two more members.
2. The committee should take the responsibility of
   a) Notifying the MOOC courses twice in a semester (May and November) along with the details of portals offering the MOOC such as NPTEL/SWAYAM.
   b) Checking the relevance of courses to the concerned branch.
   c) Verifying the syllabus of chosen MOOC course and to ensure that it is not studied in the regular curriculum (either full or partial)
3. A student willing to take MOOCS course should apply in the prescribed format to the concerned Head of the Department at least one week prior to the commencement of the MOOC course.
4. The MOOC committee should ensure the following
   - The course duration must be minimum of 8 weeks
   - The course should contain a proctored examination for evaluation
   - The agency offering MOOCs should be a recognized and reputed one and approved by the BOS of the concerned program.
5. Students should submit the Course completion certificate with marks memos to the department MOOCs committee.
6. If the certifying authority/agency is not able to conduct the exam, then the student can show certified course progress, applied hall ticket and mail communication from the authority as proofs and can avail the extension time by one semester for submitting the course completion certificate.
7. After the student submits the MOOCs certificates, the committee should recommend 3 credits and the appropriate grade to be allocated to the student and send to the Controller of Examination.
8. If a student fails to successfully complete and acquire the certificate as per the guidelines and timelines specified by the concerned MOOCs authority, he/she has to register for that course subsequently. Unsuccessful candidates in the first attempt shall be marked as supplementary.

Bapatla Engineering College

(Autonomous)

Department of Information Technology

MOOCS Application

Date:

Name of the Department:	
Name of the Student:	
Registered No:	
Email id:	
Mobile No:	
Academic Year & Semester	

Course title	MOOCS agency	Duration in weeks	Course start &end date	Probable date of certificate submission	MOOCs course in lieu of (Professional elective /Job oriented elective /Open elective /Management courses)	Remarks

Note: Syllabus, Timelines and Guidelines of the MOOC course should be attached.

Signature of the Student

Recommendations of the
MOOCs Committee

Signature of the
Head of the Department

Guidelines for Project work

1. In R24 regulations, there is no theory or practical courses in VIII semester. An exclusive 12 credit course is included as Project Work and Internship. At the end of the semester the student should submit a project report. A student shall also be permitted to submit project report on the work carried out during the internship in case of Advance Placement.
2. The Head of the department should constitute a three-member Project Work Committee (PWC) under his chairmanship with three faculty members as defined in the Process Document for project work (R20 regulation). The PWC shall adhere to the process explained in the said document.
3. Evaluation of the Project work: (Refer 8.4 and 8.6(c)) in academic rules and regulations)
4. The project work committee should ensure the following, if the students are doing project work at any organization/ industry.
   i) The student gets placement before commencement of eighth semester and joined the organization/Industry as advance placement. The student who obtained project work opportunity in organization / Industry may also be allowed as per the recommendation of the PWC.
   ii) The above students will be informed to apply in the specified proforma for approval to undergo for project work along with the details and consent of the organization in which he/she is seeking for doing project work. Further, the student and the parent/guardian have to submit an undertaking form to the concerned department. The PWC shall scrutinize the applications and approve.
   iii) The list of such approved students undertaking project work in organization/ industry shall be maintained in the department by the PWC.
   iv) The students who are undertaking the project work outside the campus have to necessarily submit the monthly attendance duly certified by the concerned authority in the organization/ industry.
   v) The PWC will have to maintain interaction regularly with the out-side organization/ concerned who are offering the project works.
   vi) During the course of project work, the student has to attend the departmental internal reviews/assessment periodically as notified by the department mandatory. After the completion of the project work, the student has to submit the report and attend semester end assessment examination by paying prescribed exam fee for award of grade and credits.
   vii) The students who are undertaking the project work outside the campus will have to complete their project work with in the stipulated period (as per Academic Calander) along with the in-house project work students.

Bapatla Engineering College

(Autonomous)

Department of Information Technology

Project Work Approval Proforma

Date:

Name of the Department	
Name of the Student	
Registered No.	
Email id	
Mobile Number	
Academic Year and Semester	

Project Work Details:

Organization/Industry Name	
Duration in weeks	
Start date of project work	
End date of project work	
Probable date of project work completion certificate submission	

Note:

1. The consent letter from the organization/industry is to be enclosed.
2. Undertaking form from the student and parent.

Signature of the Student

Recommendations of the
Project Work Committee (PWC)

Signature of the
Project Coordinator

Signature of the
Head of the Department

Process document for Project work

As per the R24 regulations, students are required to do a project work in the VIII semester and submit a report. The following is the process to be followed for the project work.

A. Project batches and Guide allocation
- The Head of the department should constitute a three-member Project Work Committee (PWC) under his chairmanship with three faculty members. One of them shall be a senior faculty member and acts as a Project Coordinator.
- List of faculty members and their specializations, research areas will be communicated to the students. The information is disseminated via email, notice boards and display on the website. List of projects and their titles/themes should be identified and same may be communicated to all the students. Project batches are formed based on the performance of the students up to VI semester.
- Students are given an option of specifying their choices for the project titles/guides and the final allocation of guides to project batches is done based on the merit order and the choices opted by the project batches.
- It is to be ensured that no project batch should have more than 4 students.
- Not more than two batches should be allocated to each project guide.

B. Project classification and mapping with program outcomes and program specific outcomes.
Projects may be broadly classified into the following categories.
- Application oriented: When the project is related to hardware, then all the components are procured and assembled to get the desired outcome. If it is related to software, then a complete working version of the application is to be created.
- Research oriented: In this category extensive review of literature is done. This aims to learn and implement new methods or procedures and validate results.
- Simulation projects: These projects may be hardware or software related. The students will create a working prototype for the same.
  - The PWC should ensure that the projects are selected in such a way that the program outcomes and program specific outcomes are mapped with the themes of the project works.
  - A document consisting of project titles, area of specialization, project guides should be prepared and submitted to the concerned HOD and should be put on the website. The theme of the work may be changed with the consent of the project guide.

C. Continuous monitoring mechanism and evaluation
- Project slots (24 hours per week) should be allocated as per the existing scheme and curriculum.
- A laboratory or a class room should be identified for executing the project works. It is preferred to have a separate laboratory for the purpose of conducting the project works.
- Each project batch is allowed to consult their respective guide to discuss about their Progress during the project slot.
- At the end of every month there will be an overall assessment of each project by the PWC by scheduling project reviews in association with project guides.

- The performance of the students should be evaluated in each review and should be documented.
- Department staff meeting should be conducted to discuss the performance of the students in the projects and should be documented.

D. Methodology to assess individual as well as collective Contribution/understanding of Project:

- The project guide should monitor the presence (attendance) of each student in the project work
- The project guide should ensure that the batch allocated to him is able to understand the objectives of the project. The guide should also identify the requirements (hardware and software) of the project. If a particular software or hardware is not available, same may be communicated to the HOD and may be procured based on the financial and budgetary requirements.
- Evaluation of the project is based on
  1. Understanding the objectives of the project.
  2. Day to day work done by the students (Should be documented)
  3. Partial/Full completion of the project
  4. Students' presentation and demonstration
  5. Results and documentation
- Evaluation is intimated to the students for further improvement

E. Papers published/Awards won/conferences attended

- It is encouraged for every project batch to publish/communicate a paper in any national/ international conference/journal. The project guide may encourage the students so that the work of their batch is published as a research paper.
- Students must be given some awareness/training program for effective writing of a research paper. The research papers should be checked with anti-plagiarism software before the submission to the concerned journal or conference.
- A report should be prepared by the concerned coordinator comprising all the research papers published and should be made available in the library and soft copies must be put on the website for availability to the students.

Bapatla Engineering College

(Autonomous)

Department of Information Technology

Application for Honor/Minor Degree (A.Y: Semester:)

Date:

1. Name of the Candidate :

2. Register Number and Branch :

S.No.	Passed all the subjects in single attempt (Yes/No)	B.Tech / Lateral Entry*	Month and Year	CGPA
01		Semester I		
02		Semester II		
03		Semester III		

*For Lateral entry students, furnish the SGPA from third Semester of B. Tech only

3. Student Mobile Number :

4. Parent Mobile Number :

5. Undertaking by the Candidate :
(To be written by the candidate)

Undertaking: I have read the guidelines for Honor / Minor Degree and I will abide by the same.

Signature of the
Candidate

Signature of the
Mentor

Signature of the
HOD

Signature of the
Principal

Scheme of Instruction and Examination
B.Tech., I Semester
in
Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT101	BS	Linear Algebra and Ordinary Differential Equations	2	1	0	3	40	60	100	3
24IT102	BS	Semiconductor Physics and Nano materials	3	0	0	3	40	60	100	3
24IT103	ES	Basic Electrical & Electronics Engineering	3	0	0	3	40	60	100	3
24IT104	ES	Introduction to Programming	3	0	0	3	40	60	100	3
24ITL101	ES	Engineering Mechanics & Surveying Lab	1	0	2	3	40	60	100	2
24ITL102	BS	Semiconductor Physics Lab	0	0	2	2	40	60	100	1
24ITL103	ES	Basic Electrical & Electronics Engineering Lab	0	0	3	3	40	60	100	1.5
24ITL104	ES	Introduction to Programming Lab	0	0	3	3	40	60	100	1.5
24ITL105	ES	IT Workshop	0	0	2	2	40	60	100	1
Induction Program	First Three Weeks (Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Familiarization to Dept./Branch & Innovations)									
TOTAL			**12**	**1**	**12**	**25**	**360**	**540**	**900**	**19**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination
Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Scheme of Instruction and Examination

B.Tech., II Semester

in

Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT201	BS	Numerical Methods & Advanced Calculus	2	1	0	3	40	60	100	3
24IT202	BS	Engineering Chemistry	3	0	0	3	40	60	100	3
24IT203	HM	Communicative English	2	0	0	2	40	60	100	2
24IT204	ES	Programming for Problem Solving	3	0	0	3	40	60	100	3
24IT205	BS	Discrete Mathematics	3	0	0	3	40	60	100	3
24ITL201	ES	Engineering Graphics Lab	1	0	3	4	40	60	100	2.5
24ITL202	BS	Engineering Chemistry Lab	0	0	2	2	40	60	100	1
24ITL203	HM	English Communication Skills Lab	0	0	2	2	40	60	100	1
24ITL204	ES	Programming for Problem Solving Lab	0	0	3	3	40	60	100	1.5
TOTAL			**14**	**1**	**10**	**25**	**360**	**540**	**900**	**20**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination

Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Scheme of Instruction and Examination
B.Tech., III Semester
in
Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT301	BS	Probability and Statistics	3	0	0	3	40	60	100	3
24IT302	ES	Digital Logic Design	3	0	0	3	40	60	100	3
24IT303	PC	Data Structures	3	0	0	3	40	60	100	3
24IT304	PC	Object Oriented Programming	3	0	0	3	40	60	100	3
24IT305	PC	Computer Networks	3	0	0	3	40	60	100	3
24ITL301 /SEC1	SEC	Python Programming	1	0	2	3	40	60	100	2
24ITL302	HM	Design Thinking & Innovation	1	0	2	3	40	60	100	2
24ITL303	PC	Data Structures Lab	0	0	3	3	40	60	100	1.5
24ITL304	PC	Object Oriented Programming Lab	0	0	3	3	40	60	100	1.5
24ITL305	HM	NSS/NCC/SCOUTS & Guides / Community Service	0	0	1	1	0	100	100	0.5
24IT306 /MC01	MC	Environmental Science	2	0	0	2	40	-	40	0
TOTAL			**19**	**0**	**11**	**30**	**400**	**640**	**1040**	**22.5**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination
Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Scheme of Instruction and Examination
B.Tech., IV Semester
in
Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT401	PC	Computer Organization	3	0	0	3	40	60	100	3
24IT402	PC	Operating Systems	3	0	0	3	40	60	100	3
24IT403	PC	Frontend Web Technologies	3	0	0	3	40	60	100	3
24IT404	PC	Database Management System	3	0	0	3	40	60	100	3
24IT405	PC	Design & Analysis of Algorithms	2	1	0	3	40	60	100	3
24ITL401 /SEC2	SEC	Linux Essentials	1	0	2	3	40	60	100	2
24ITL402	PC	Frontend Web Technologies Lab	0	0	3	3	40	60	100	1.5
24ITL403	PC	RDBMS Lab	0	0	3	3	40	60	100	1.5
24ITL404	HM	Health & Wellness Yoga & Sports	0	0	1	1	0	100	100	0.5
24IT406 /MC02	MC	Constitution of India	2	0	0	2	40	0	40	0
Total			**17**	**1**	**9**	**27**	**360**	**580**	**940**	**20.5**
24ITH4A 24ITM4A		**Honors Course** **Minor Course**	**3**	**0**	**2**	**5**	**50**	**50**	**100**	**4**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination
Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Scheme of Instruction and Examination
B.Tech., V Semester
in
Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT501	PC	Automata Theory & Compiler Design	2	1	0	3	40	60	100	3
24IT502	PC	Machine Learning	3	0	0	3	40	60	100	3
24IT503	PC	Software Engineering	3	0	0	3	40	60	100	3
24IT504 /PE01	PE	Professional Elective - 1	3	0	0	3	40	60	100	3
24IT505 /JOE01	JO	Job Oriented Elective - 1	3	0	0	3	40	60	100	3
24ITL501	HM	Soft Skills	1	0	2	3	40	60	100	2
24ITL502	PC	Machine Learning Lab	0	0	3	3	40	60	100	1.5
24ITL503	JOE	Job Oriented Elective-1 Lab	0	0	3	3	40	60	100	1.5
24ITL504 /INT1	PR	Summer Internship-I*	0	0	0	0	0	100	100	2
24IT506 /MC03	MC	Technical Paper Writing and IPR	2	0	0	2	40	0	40	0
Total			**17**	**1**	**8**	**26**	**360**	**580**	**940**	**22**
20ITH5B 20ITM5B		**Honors Course Minor Course**	**3**	**0**	**2**	**5**	**50**	**50**	**100**	**4**

Professional Elective-I		Job Oriented Elective-I (Theory and Lab)	
1A	Digital Image Processing	1A	Prompt Engineering and AI Tools
1B	Wireless Networks	1B	Data Analytics
1C	Microprocessor and Microcontrollers	1C	Mobile Application Development

∗ **To be completed after IV semester during summer vacation and is evaluated in V semester**

Scheme of Instruction and Examination

B.Tech., VI Semester

in

Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT601	PC	ANN & Deep Learning	3	0	0	3	40	60	100	3
24IT602	PC	Cloud Computing	3	0	0	3	40	60	100	3
24IT603 /PE02	PE	Professional Elective -2	3	0	0	3	40	60	100	3
24IT604 /JOE02	JO	Job Oriented Elective - 2	3	0	0	3	40	60	100	3
24ITL601 /SEC03	SEC	Server Side Technologies	1	0	2	3	40	60	100	2
24ITL602	PC	Deep Learning Lab	0	0	3	3	40	60	100	1.5
24ITL603	PC	Cloud Computing Lab	0	0	3	3	40	60	100	1.5
24ITL604	JOE	Job Oriented Elective - 2 Lab	0	0	3	3	40	60	100	1.5
24IT605 /MC04	MC	Campus Recruitment Training	2	0	0	2	40	0	40	0
Total			**15**	**0**	**11**	**26**	**360**	**480**	**840**	**18.5**
20ITH6_ 20ITM6_		**Honors (Set I) / Minor (Set II) Course**	**3**	**0**	**2**	**5**	**40**	**60**	**100**	**4**

Professional Elective-2		**Job Oriented Elective-2 (Theory and Lab)**	
2A	Cryptography & Network Security	2A	Immersive Technologies
2B	UX/UI design	2B	Big Data Analytics
2C	Software Project Management	2C	Industrial IOT

Scheme of Instruction and Examination

B.Tech., VII Semester

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT701	HM	Industrial Management & Entrepreneurship Development	3	0	0	3	40	60	100	3
24IT702 /PE03	PE	Professional Elective - 3 MOOC*	3	0	0	3	40	60	100	3
24IT703 /JOE3	JOE	Job Oriented Elective - 3	3	0	0	3	40	60	100	3
24IT704 /OE	OE	Open Elective	3	0	0	3	40	60	100	3
24ITL701 /SEC04	SEC	DevOps	1	0	2	3	40	60	100	2
24ITL702	PC	Advanced Database Management Systems Lab	1	0	2	3	40	60	100	2
24ITL703	JOE	Job Oriented Elective – 3 Lab	0	0	3	3	40	60	100	1.5
24ITL704	PR	Term Paper	0	0	6	6	40	60	100	3
24ITL705 /INT2	PR	Summer Internship-II	0	0	0	0	0	100	100	2
Total			**14**	**0**	**13**	**27**	**320**	**580**	**900**	**22.5**
24ITH71_ 20ITM71_		**Honors / Minor MOOC-1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
24ITH72_ 20ITM72_		**Honors / Minor MOOC-2**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**2**

Professional Elective-3		Job Oriented Elective-3 (Theory and Lab)	
3A	Natural Language Processing	3A	Software Testing Methodoligies
3B	Block Chain Technologies	3B	Cyber Security
3C	Graph Theory	3C	Computer Vision

Scheme of Instruction and Examination

B.Tech., VIII Semester

in

Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT801 /PE04	PE	Professional Elective -4	3	0	0	3	40	60	100	3
24IT802 /PE05	PE	Professional Elective - 5	3	0	0	3	40	60	100	3
24IT803	PRJ	Project Work	0	0	18	18	40	60	100	9
Total			**6**	**0**	**18**	**24**	**120**	**180**	**300**	**15**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination

Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Equivalent courses in R20 regulation for courses in R24 regulation

Table 1: I Semester equivalent courses

R24Course		R20Course	
Code	**Title**	**Code**	**Title**
24IT101	Linear Algebra and Ordinary Differential Equations	20IT101	Linear Algebra and Ordinary Differential Equations
24IT102	Semiconductor Physics & Nano materials	20IT202	Semiconductor Physics & Nano materials
24IT103	Basic Electrical & Electronics Engineering	20IT103	Basic Electrical & Electronics Engineering
24IT104	Introduction to Programming	20IT204	Programming for Problem Solving
24ITL101	Engineering Mechanics & Surveying Lab	-	-
24ITL102	Semiconductor Physics Lab	20ITL201	Semiconductor Physics Lab
24ITL103	Basic Electrical & Electronics Engineering Lab	20ITL103	Basic Electrical & Electronics Engineering Lab
24ITL104	Introduction to Programming Lab	20ITL203	Programming for Problem Solving Lab
24ITL105	IT Workshop	20ITL104	IT Workshop

Table 2: II Semester equivalent courses

R24Course		R20Course	
Code	**Title**	**Code**	**Title**
24IT201	Numerical Methods & Advanced Calculus	20IT201	Numerical Methods & Advanced Calculus
24IT202	Engineering Chemistry	20IT102	Engineering Chemistry
24IT203	Communicative English	20IT203	Communicative English
24IT204	Programming for Problem Solving	-	-
24IT205	Discrete Mathematics	20IT206	Discrete Mathematics
24ITL201	Engineering Graphics Lab	20ITL101	Engineering Graphics
24ITL202	Engineering Chemistry Lab	20ITL102	Chemistry Lab
24ITL203	English Communication Skills Lab	20ITL202	English Communication Skills Lab
24ITL204	Programming for Problem Solving Lab	-	-

Equivalent courses in R20 regulation for courses in R24 regulation

Table 3: III Semester equivalent courses

R24Course		R20Course	
Code	**Title**	**Code**	**Title**
24IT301	Probability and Statistics	20IT401	Probability and Statistics
24IT302	Digital Logic Design	20IT205	Digital Logic Design
24IT303	Data Structures	20IT302	Data Structures
24IT304	Object Oriented Programming	20IT303	Object Oriented Programming
24IT305	Computer Networks	20IT502	Computer Networks
24ITL301 /SEC1	Python Programming	20ITL401	Python Programming
24ITL302	Design Thinking & Innovation	-	-
24ITL303	Data Structures Lab	20ITL302	Data Structures Lab
24ITL304	Object Oriented Programming Lab	20ITL303	Object Oriented Programming Lab
24ITL305	NSS/NCC/SCOUTS & Guides / Community Service	-	-
24ITL306 /MC01	Environmental Science	20IT104	Environmental Studies

Table 4: IV Semester equivalent courses

R24Course		R20Course	
Code	**Title**	**Code**	**Title**
24IT201	Numerical Methods & Advanced Calculus	20IT201	Numerical Methods & Advanced Calculus
24IT202	Engineering Chemistry	20IT102	Engineering Chemistry
24IT203	Communicative English	20IT203	Communicative English
24IT204	Programming for Problem Solving	-	-
24IT205	Discrete Mathematics	20IT206	Discrete Mathematics
24ITL201	Engineering Graphics Lab	20ITL101	Engineering Graphics
24ITL202	Engineering Chemistry Lab	20ITL102	Chemistry Lab
24ITL203	English Communication Skills Lab	20ITL202	English Communication Skills Lab
24ITL204	Programming for Problem Solving Lab	-	-

Table 5: Residual subjects to be completed by the students who migrate from R20 regulation to R24 regulation

Joined R24 regulation in the IV semester		
Semester	**Code**	**Title**
I	24ITL101	Engineering Mechanics & Surveying Lab
III	24IT301	Probability & Statistics
III	24IT305	Computer Networks
III	24ITL301/SEC1	Python Programming
III	24ITL302	Design Thinking & Innovation
III	24ITL305	NSS/NCC/SCOUTS & Guides/ Community Service

List of Courses for B.Tech. Honors program in Information Technology

1. The student can opt for any three courses from the following table.
2. The fourth course is optional; the student may either take two MOOC courses of 2 credits each or choose one course from the following table.
3. Concerned BOS can add or delete the subjects as per their decision.
4. Prerequisites if any, to be defined by the BOS for each course.
5. The list of MOOC courses will be specified every year at the beginning of the odd and even semesters by the Department MOOC Committee.

Table 6: List of Honors Courses

SNo.	Code	Title	Prerequisites
1	A	Advanced Data Structures	Data Structures (24IT303)
2	B	Advanced Database Management Systems	Database Management Systems (24IT404)
3	C	Real Time Operating Systems	Operating Systems (24IT402)
4	D	Quantum Computing	-

List of Courses for B.Tech. Minor program in Web Application Development

1. The student can opt for any three courses from the following table.
2. The fourth course is optional; the student may either take two MOOC courses of 2 credits each or choose one course from the following table.
3. Concerned BOS can add or delete the subjects as per their decision.
4. Prerequisites if any, to be defined by the BOS for each course.
5. The list of MOOC courses will be specified every year at the beginning of the odd and even semesters by the Department MOOC Committee.

Table 7: List of Minor Courses

SNo.	Code	Title	Prerequisites
1	A	Front End Web Technologies	Basic knowledge of Computer Programming
2	B	Server Side Web Technologies	Basic knowledge of Computer Programming
3	C	No SQL Databases	Basic knowledge of Computer Programming
4	D	Mobile Application Development	Basic knowledge of Computer Programming

Automata Theory and Compiler Design
III B.Tech – V Semester (24IT501)

Lectures	:	2 Hours / Week	Tutorial	:	1	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Discrete Mathematics(24IT205)

Course Objectives:

The course aims to enable the students

- Understand the different models of finite automata.
- Understand the basics of CFG and language processors.
- Familiarize with top-down and bottom-up parsing techniques.
- Apply various intermediate languages to understand code generation algorithm.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1: Design finite automata with & without epsilon transitions and regular expressions.

CO2: Demonstrate the basic concept of context free grammar, compiler and its different phases.

CO3: Compute different top-down and bottom-up parsing methods.

CO4: Describe a number of intermediate languages with respect to the code generation algorithm.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Finite Automata: Introduction to Finite Automata, Deterministic Finite Automata(DFA)-Definition of DFA, DFA processing strings, Notations for DFA, Transition Function, The language of DFA, Non deterministic finite automata (NFA) – Definition of NFA, Transition function, The language of NFA, Equivalence of DFA and NFA, use of ϵ – transition, Notation for an ϵ – NFA, ϵ –Closures.

Regular Expressions and Languages: Regular expressions, Finite automata and Regular expressions, Algebraic laws of regular expressions.

UNIT - II **(10 Hours)**

Context Free Grammars: Context Free Grammars, Parse Trees, Ambiguous Grammars, Normal forms.

Introduction: Language Processors, The Structure of a Compiler.

Lexical Analysis: The Role of the Lexical Analyser, Input Buffering, Specification of Tokens, Recognition of Tokens.

UNIT - III **(10 Hours)**

Syntax Analysis: Introduction, Writing a Grammar, Elimination of left recursion, Left Factoring, Top-Down Parsing: FIRST and FOLLOW, LL (1) Grammars, Non-recursive Predictive Parsing.

Bottom-Up Parsing: Introduction to LR Parsing, Simple LR, Cannonical LR, LALR Parsing.

UNIT - IV **(11 Hours)**

Intermediate-Code Generation: Variants of Syntax Trees, Three Address Codes, Syntax-Directed Translation schemes for Control Flow Statements, Boolean expressions, Backpatching for Boolean Expressions.

Code Generation: Issues in the Design of a Code Generator, Basic Blocks and Flow Graphs, A Simple Code Generator.

TEXT BOOKS:

1. John E Hopcroft, Rajeev Motwani, and Jeffery D Ullman. *Introduction to Automata Theory Languages and Computations.* Pearson, 3 edition, 2008. ISBN 978131720479
2. Alfred V Aho, Ravi Sethi, and JD Ullman. *Compilers Principles, Techniques and Tools.* Pearson, 2 edition, 2013. ISBN 9789332518667

REFERENCES:

1. KLP Mishra and N Chandrasekharan. *Theory of Computation*. PHI, 3 edition, 2006. ISBN 9789352136278
2. Alfred V Aho and Jeffrey D Ullman. *Principles of Compiler Design*. Narosa, 1 edition, 2002. ISBN 9788185015613

Machine Learning

B.Tech – V Semester (24IT502)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Illustrate the steps involved in building a regression model.
- Illustrate generative classifiers and discriminative classifiers.
- Compare different classifier models.
- Build an efficient supervised learning model using ensemble methods for a given supervised learning problem.
- Calculate a lower bound on sample complexity for probably approximately correct learning.
- Choose the correct clustering algorithm for a given clustering problem.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Illustrate the steps involved in building a regression model.

CO2 Illustrate generative classifiers and discriminative classifiers.

CO3 Compare different classifier models.

CO4 Build an efficient supervised learning model using ensemble methods for a given supervised learning problem.

CO5 Calculate a lower bound on sample complexity for probably approximately correct learning.

CO6 Choose the correct clustering algorithm for a given clustering problem.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO5	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO6	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I (11 Hours)

Machine learning basics: What is machine learning?, Key terminology, Types of Machine Learning Systems, How to choose the right algorithm, Steps in developing a machine learning application, Main Challenges of Machine Learning Essential Python Libraries: Scikit-learn, NumPy, matplotlib, Pandas. A First Application: Classifying iris species using Sci-kit learn.

Linear Regression: Simple linear regression. Optimization of model parameters using Batch gradient decent algorithm, Mini batch gradient decent algorithm and Stochastic gradient descent algorithm, Multiple linear regression, Locally weighted linear regression, Polynomial Regression. Regularized Linear Models- Ridge Regression and Lasso Regression

Regularization: Bios Variance tradeoff, L1 and L2 regularization.

UNIT - II (11 Hours)

Generative Classifiers: Classifying with Bayesian decision theory, Bayes' rule, Naïve Bayes classifier.

Discriminative Classifiers: Logistic Regression, Decision Trees: Training and Visualizing a Decision Tree, Making Predictions, Estimating Class Probabilities, The CART Training Algorithm, Attribute selection measures- Gini impurity; Entropy, Regularization Hyperparameters, Regression Trees, Linear Support vector machines.

UNIT - III (11 Hours)

Evaluation of a Classifier: Measuring Accuracy Using Cross-Validation, Confusion Matrix, Precision and Recall, Precision/Recall Trade-off, The ROC Curve.

Ensemble Learning: Voting Classifiers, Bagging and Pasting, Random Forests, Boosting- AdaBoost and Gradient Boosting.

UNIT - IV (11 Hours)

Computational Learning Theory: Introduction, Probably Learning an Approximately Correct Hypothesis, Sample Complexity for Finite Hypothesis Spaces.

Unsupervised Learning: K-means Clustering Algorithm, Hierarchical Clustering Algorithm, Gaussian Mixture Model.

TEXT BOOKS:

1. Aurelien Geron. *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*. O'Reilly publishers, 2 edition, 2019b. ISBN 9781492032649
2. Peter Harrington. *Machine Learning in Action*. Manning, 1 edition, 2012. ISBN 9781617290183

REFERENCES:

1. Andrew Ng. *Machine Learning Lecture Notes*. Stanford University. URL `https://see.stanford.edu/Course/CS229`
2. Sebastian Raschka and Vahid Mirjalili. *Python Machine Learning*. Packt Publishing, 2 edition, 2017. ISBN 9789352136278
3. Andreas C. Müller and Sarah Guido. *Introduction to Machine Learning with Python*. Oreilly, 1 edition, 2016. ISBN 9781449369415
4. Tom M. Mitchell. *Machine Learning*. Mc.Graw Hill, 1 edition, 1997. ISBN 0070428077. URL `http://www.cs.cmu.edu/~tom/mlbook.html`

Software Engineering
B.Tech – V Semester (24IT503)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- understand different process models of Software Engineering.
- collect requirements from client and analyze the collected requirements.
- understand how to design and implement the Software Product or Project
- understand the concepts of Testing and Measuring the software project or Product

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Describe software, myths and process models

CO2 Discuss agile process models, requirements and modeling techniques of an analysis model

CO3 Describe software architectural, component level design and user interface Design.

CO4 Explain software project metrics, quality assurance and software testing techniques/strategies.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	2	3	2	2
CO2	3	2	2	-	2	-	-	-	-	-	2	3	2	2
CO3	3	2	2	-	2	-	-	-	-	-	2	3	2	2
CO4	3	2	2	-	2	-	-	-	-	-	2	3	2	2

UNIT - I **(11 Hours)**

Introduction to Software Engineering: The Evolving Role of Software, Software, The Changing Nature of Software, Legacy Software, Software Myths.

A Generic View of Process: Software Engineering - A Layered Technology, A Process Framework, the CMMI, Process Patterns, Process Assessment, Personal and Team Process Models, Product and Process.

Process Models: Prescriptive Models, The Waterfall Model, Incremental Process Models, Evolutionary Models, The Unified Process.

UNIT - II **(10 Hours)**

An Agile View of Process: What Is Agility? , What Is an Agile Process? , Agile Process Models.

Requirements Engineering: A Bridge To Design and Construction, Requirements Engineering Tasks, Initiating the Requirements Engineering Process, Eliciting Requirements, Developing Use-cases, Building the Analysis Model, Negotiating Requirements, Validating Requirements.

Building The Analysis Model: Requirements Analysis, Analysis Modelling Approaches, Data Modelling Concepts, Flow-Oriented Modelling, Class Based Modelling Creating a Behavioural Model.

UNIT - III **(10 Hours)**

Design Engineering: Design within the Context of Software Engineering, Design Process and Design Quality, Design Concepts The Design Model, Pattern Based Software Design.

Creating An Architectural Design: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design, Assessing Alternative Architectural Designs.

Modelling Component-Level Design: What Is a Component? , Designing Class-Based Components, Conducting Component-Level Design, Designing Conventional Components.

Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

UNIT - IV **(11 Hours)**

Software Process And Project Metrics: Introduction, Metrics Process and Project Domains, Software Measurement, Metrics for Software Quality, Integrating Metrics with Process.

Software Quality Assurance: Quality Concepts, Quality Movement, SQA, Software Reviews, Formal Technical Reviews, Formal Approaches to SQA, Software Reliability, ISO 9000 Quality Standards, SQA Plan.

Software Testing Strategies: Strategic Approach, Strategic Issues, Test strategies for Conventional Software, White box testing, Black Box testing, Test strategies for Object Oriented Software, Validation Testing, System Testing, The Art of Debugging.

TEXT BOOKS:

1. Roger S. Pressman. *Software Engineering - A Practitioner's Approach*. McGraw Hill, 7 edition, 2017. ISBN 978-9339212087

REFERENCES:

1. Ian Sommerville. *Software Engineering*. Pearson Education, 10 edition, 2017. ISBN 978-9332582699

2. RajibMall. *Fundamentals of Software Engineering*. Prentice-Hall of India, 4 edition, 2014. ISBN 978-8120348981

Digital Image Processing

III B.Tech – V Semester (24IT504/PE1A)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

NIL

Course Objectives:

The course aims to enable the students

Understand and apply basic image processing concepts including image manipulation, sampling, Fourier Transform, and convolution.

Apply image enhancement and derivative-based techniques for noise reduction, edge detection, sharpening, and image blending.

Implement convolution and frequency domain filtering along with morphological image processing techniques using relevant libraries.

Analyze and apply feature extraction, descriptors, and image segmentation techniques for effective image analysis.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1: describe the image manipulation, sampling, Fourier Transform, and convolution.

CO2: describe noise reduction, edge detection, sharpening, and image blending.

CO3: explain convolution and frequency domain filtering along with morphological image processing techniques.

CO4: explain feature extraction, descriptors, and image segmentation techniques.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	2	2	-	-	-	-	-	3	3	3	3
CO2	3	3	3	2	2	-	-	-	-	-	3	3	3	3
CO3	3	3	3	2	2	-	-	-	-	-	3	3	3	3
CO4	3	3	3	2	2	-	-	-	-	-	3	3	3	3

UNIT - I (11 Hours)

Getting Started with Image Processing: What is image processing? Applications of Image Processing, The Image Processing Pipeline, Image I/O and Display with Python, Dealing with Different Image Types and File Formats and Performing Basic Image Manipulations.

Sampling, Fourier Transform, and Convolution: The Image formation – Sampling and Quantization, Discrete Fourier Transform, Understanding Convolution.

UNIT - II (10 Hours)

Image Enhancement : Point-wise Intensity Transformations – Pixel Transformation, Histogram Processing – Histogram Equalization and Matching, Linear Noise Smoothing, Nonlinear Noise Smoothing.

Image Enhancement Using Derivatives: Image derivatives – Gradient and Laplacian, Sharpening and Unsharp Masking, Edge Detection using Derivatives and Filters (Sobel, Canny, and so on), Image Pyramids (Gaussian and Laplacian) – Blending Images.

UNIT - III (10 Hours)

Convolution and Frequency Domain Filtering: Convolution Theorem and Frequency Domain Gaussian Blur, Filtering in the Frequency Domain (HPF, LPF, BPF, and Notch Filters)

Morphological Image Processing: The scikit-image morphology module, The scikit-image filter.rank module, The SciPy ndimage.morphology module.

UNIT - IV (11 Hours)

Extracting Image Features and Descriptors: Feature Detectors versus Descriptors, Harris Corner Detector, Blob Detectors with LoG, DoG, and DoH, Histogram of Oriented Gradients, Scale-invariant Feature Transform, Haar-like features.

Image Segmentation: What is image segmentation? Hough Transform – Detecting Lines and Circles, Thresholding and Otsu's Segmentation, Edges-based/Region-based Segmentation, Felzenszwalb, SLIC, QuickShift and Compact Watershed Algorithms, Active Contours, Morphological Snakes, and GrabCut Algorithms.

TEXT BOOKS:

1. Sandipan Dey. *Hands-On Image Processing with Python*. Packt Publishing Ltd, 1 edition, 2018. ISBN 9781789343731

2. RC Gonzalez and R E Woods. *Digital Image Processing*. Pearson Education Publishers, 4 edition, 2019. ISBN 9781292223049

REFERENCES:

1. S Jayaraman, S Esakkirajan, and T Veerakumar. *Digital Image Processing*. Mc-Grah Hill Publications, 1 edition, 2010. ISBN 9780070144798

Wireless Networks

B.Tech – V Semester (24IT504/PE1B)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Computer Networks (24IT305)

Course Objectives:

The course aims to enable the students

- To describe the merits and demerits and medium access control mechanisms of wireless communication.
- To describe the architecture of cellular networks upto 3G and satellite communications.
- To describe wireless LAN standards.
- To explain 4G and 5G cellular networks.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Describe the merits and demerits and medium access control mechanisms of wireless communication.

CO2 Describe the architecture of cellular networks upto 3G and satellite communications

CO3 Describe wireless LAN standards.

CO4 Explain 4G and 5G cellular networks.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	2	-	-	-	-	-	3	2	2
CO2	3	2	-	-	-	2	-	-	-	-	-	3	2	2
CO3	3	2	-	-	-	2	-	-	-	-	-	3	2	2
CO4	3	2	-	-	2	2	-	-	-	-	-	3	2	2

UNIT - I **(11 Hours)**

Introduction: Applications, Short History of Wireless Communications, Simplified Reference Model.
Wireless Transmission: Frequencies, Signals, Signal Propagation, Multiplexing, Modulation, Spread Spectrum, and Cellular Systems.
Medium Access Control: Motivation for a Specialized MAC, SDMA, FDMA, TDMA, CDMA, and Comparison.

UNIT - II **(10 Hours)**

Telecommunication Systems: GSM, DECT, TETRA, UMTS and IMT-2000: System Architecture and Radio Interface.
Satellite Systems: History, Applications, Basics, Routing, Localization, and Handover.

UNIT - III **(10 Hours)**

Wireless LAN: Infrared Vs. Radio Transmission, Infrastructure and Ad-hoc Networks, IEEE 802.11: System Architecture, Protocol Architecture, Physical Layer, MAC Layer, and MAC Management.
Mobile Network Layer: Mobile IP: Entities and Terminology, IP packet delivery, Agent discovery, Registration, and Tunneling and Encapsulation, Dynamic Host Configuration Protocol. Ad hoc Networks.

UNIT - IV **(11 Hours)**

4G Cellular Networks: Driving factors, Evolved Radio Access Network, Evolved Packet Core Network.
5GCellular Networks: Driving factors, Next Generation Radio Access Network, 5G Core Network.

TEXT BOOKS:

1. Jochen. Schiller. *Mobile communications.* Addison-Wesley, 2 edition, 2003. ISBN 9780321123817
2. William Stallings. *5G Wireless A Comprehensive Introduction.* Addison-Wesley, 1 edition, 2021. ISBN 9780136767145

REFERENCES:

1. Martin Sauter. *An Introduction to Mobile Networks and Mobile Broadband.* John Wiley & Sons, 3 edition, 2017. ISBN 9781119346906
2. UWE Hansmann, Lother Merk, Martin S. Nicklous, and Thomas Stober. *Principles of Mobile Computing*. Addison-Wesley, 1 edition, 2020. ISBN 9780321564085

Microprocessors and Microcontrollers
III B.Tech – V Semester (24IT504/PE1C)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Computer Organization (24IT401)

Course Objectives:

The course aims to enable the students

- Identify the various functional blocks of hardware of the 8086 microprocessor and special features of Pentium Processors.
- Construct Assembly Language Programming for solving simple problems and apply the different instructions of 8086 microprocessor.
- Describe the interrupt responses of an 8086 microprocessor with interrupt applications.
- Identify the hardware and software elements of the 8051 microcontroller and their applications using 8051 microcontroller.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1: Identify the importance of 8086 microprocessor and special features of Pentium Processors.

CO2: Write assembly language programs for solving simple problems.

CO3: Analyse interrupt responses of an 8086.

CO4: Explain the applications of 8051 microcontroller.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	1	2	-	2	-	-	-	-	-	2	2	2	2
CO2	2	2	3	2	2	-	-	-	-	-	2	2	2	2
CO3	2	-	1	2	-	-	-	-	-	-	2	2	2	2
CO4	2	-	1	-	2	-	-	-	-	-	2	2	2	2

UNIT - I (11 Hours)

Introduction: Introduction to Microprocessors, 8-bit/16-bit Microprocessors, Overview of Intel Pentium I (i3, i5, i7) Series Processor.

Introduction to 8086: The 8086 Microprocessor Family Overview, 8086 Internal Architecture: The Execution Unit, BIU.

Introduction to the Pentium Microprocessor: Pentium Processor Instructions, Internal Structure of the Pentium Pro, Special Pentium Pro Features, Hyper-Threading Technology, Multiple Core Technology.

UNIT - II (10 Hours)

8086 Family Assembly Language Programming: Program Development Steps, Constructing the Machine Codes for 8086 Instructions, Writing Program for Use with an Assembler, Assembly Language Program Development Tools, Understand the Business Function, Principles of Good Interface and Screen Design.

8086 Family Assembly Language Programming: Simple Sequence Programs, Jumps Flags and Conditional Jumps, if-then, if-then-else, multiple if-then-else programs, while do programs, repeat-until programs.

UNIT - III (10 Hours)

8086 System Connections and Timing: The Basic 8086 Microcomputer System, 8086 Bus Activities during the Read Machine Cycle, 8086 Bus Activities during the Write Machine Cycle 8086 Pin Diagram.

8086 Interrupts and Interrupt Applications: 8086 Interrupts and Interrupts Responses, 8259A Priority Interrupt Controller.

UNIT - IV (11 Hours)

8051 Microcontrollers: Microcontrollers and Embedded Processors, Overview of the 8051 Family; Architecture of 8051, Pin Diagram of 8051; 8051 Assembly Language Programming; I/O Port Programming; Addressing Modes; LCD and Key Board Interfacing.

TEXT BOOKS:

1. Douglas V. Hall and SSSP Rao. *Microprocessors and Interfacing*. Mc Graw Hill, 3 edition, 2023. ISBN 9781259006159
2. Muhammad Ali Mazidi and Janice Gillespie Mazidi. *The 8051 Microcontroller and Embedded Systems*. Pearson, 2 edition, 2021. ISBN 9788131710265

REFERENCES:

1. Glenn A Gibson and Yu cheng Liu. *Microcomputer systems: The 8086 /8088 Family architecture, Programming and Design.* Pearson, 2 edition, 2015. ISBN 9789332550087
2. Barry B Bray. *The Intel Microprocessor 8086/8088, 80186,80286, 80386 and 80486 Architecture, programming and interfacing.* PHI, 8 edition, 2011

Prompt Engineering and AI Tools
B.Tech – V Semester (24IT505/JOE1A)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

None

Course Objectives:

The course aims to enable the students

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-
-
-

Course Outcomes:

After the successful completion of the course the students will be able to

CO1

CO2

CO3

CO4

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Introduction: Understanding Prompting and Prompt Techniques, Five Principles of Prompting, Fundamentals of AI and Language Models, Constructing Effective AI Prompts, Types of Prompts, Components of a Prompt, Challenges and Limitations of Using Prompts Tools & Techniques - Getting Set Up ChatGPT, How Does ChatGPT Sound Human, Understanding ChatGPT Capabilities and Limitations, Training ChatGPT.

UNIT - II **(10 Hours)**

The Art of Text Data Generation with GenAI: Standard Practices for Text Generation, Generating Lists, Universal Translation Through LLMs, Ask For Context, Text Style Unbundling, Identifying the Desired Textual Features, Generating New Content with the Extracted Features, Role Prompting. Generating Text with AI for Content Creation, Using AI for Copy Writing, Creating Social Media Posts. Writing Video Scripts, Using AI for Personalized Messaging, Creating Engaging and Tailored Content with AI, Techniques for Crafting Effective Prompts for Surveys, Assessments.

UNIT - III **(10 Hours)**

Modern AI Tools: Introduction to AI Tools, General AI Assistants: ChatGPT, Creative AI Tools, AI Coding Tools, Productivity Tools, Audio & Voice Tools, Automation Tools, Emerging Trends and Ethics.

UNIT - IV **(11 Hours)**

Building AI Powered Applications: AI Blog Writing, Topic Research, Expert Interview, Generate Outline, Text Generation, Writing Style, Title Optimization, AI Blog Images, User Interface, Ethical Considerations of Using AI for Text and Image Generation.

TEXT BOOKS:

1. Timothy Krimmel. *AI Prompt Engineering: The Engineer's Handbook*. 1 edition, 2023. ISBN 9798851359514

REFERENCES:

1. James Phoenix and Mike Taylor. *Prompt Engineering for Generative AI*. O'Reilly, 2024

ON-LINE RESOURCES:

1. URL `https://www.promptingguide.ai/`

Data Analytics

B.Tech – V Semester (24IT505/JOE1B)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Describe the steps involved in Data Analysis.
- Do data analysis using NumPy and Pandas modules.
- Present the results of Data Analysis in graphical form using Matplotlib and Pandas modules.
- Build a single page web application for Data Analysis using Streamlit module.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Describe the steps involved in Data Analysis.

CO2 Do data analysis using NumPy and Pandas modules.

CO3 Present the results of Data Analysis in graphical form using Matplotlib and Pandas modules.

CO4 Build a single page web application for Data Analysis using Streamlit module.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Introduction to Data Analysis: What is Data Analysis? Why is Data Analysis so Important Now? Types of Data Analysis Methods, Steps in Data Analysis, Challenges in Data Analysis, Best Data Analytics Tools.

Essential Terminology: Data Object, Attribute, Types of attributes and Discrete versus Continuous Attributes.

Statistical Descriptions of Data: Measures of Central Tendency and Measures of Dispersion.

Data Quality: Necessity of Data Preprocessing. Major Tasks in Data Preprocessing.

UNIT - II **(10 Hours)**

NumPy Module: What is NumPy? Why is NumPy so Popular? Installation, NumPy Array: Creating NumPy Arrays, Data Types Supported by NumPy Array, Arithmetic Operations on NumPy Arrays, Slicing of NumPy Array and Comparision of NumPy Arrays with Python List object.

Pandas Module: What is Pandas? Why is Pandas so popular? Installation, Input and Output Operations with Pandas, Series Object, Data Frame Object: Loading your Data, Viewing your Data, Getting Information about your Data, Handling Duplicates, Column Cleanup, Find Missing Values, Remove Null Values, Imputation, Understand your Variables/Features, Find Relationships between Continuous Variables, Information Extraction through Column and Row Selections, Conditional Selections, Applying Functions on Column Values, Sort Data by Column Values, Group and Aggregate Data and Save DataFrame to CSV file.

UNIT - III **(10 Hours)**

Data Visualization: Plots using matplotlib, Information Conveyed by Line Plot, Bar Plot, Scatter Plot, Histogram, Pie Chart, Box Plot and Choropleth Plot. Generating Interactive Plots using iplot() method of DataFrame class.

UNIT - IV **(11 Hours)**

Creating Dashboards using Streamlit: Typical Dashboard Layouts, Why Streamlit for Dashboards? Configuring the Web Page, Creating Dashboard Sidebar, Purpose of Expanders, Columnar and Tabbed Layout for Dashboard's Main Content Pane, Containers in Streamlit.

Streamlit Application Program Interface: Displaying Text, Display Code, Embedding Latex Expressions, Displaying Data, Charts using Streamlit builtin Plotting Methods and Embedding Matplotlib Charts in Streamlit Applications.

TEXT BOOKS:

1. F. Nelli. *Python Data Analytics with Pandas, NumPy, and Matplotlib*. Apress Publisher, 3 edition, 2023
2. T. Richards. *Streamlit for Data Science - Create interactive data apps in Python*. Packt Publishing, 2 edition, 2023

Mobile Application Development
III B.Tech – V Semester (24IT505/JOE1C)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Object Oriented Programming (24IT304)

Course Objectives:

The course aims to enable the students

- Understand the fundamentals of modern mobile application development using Flutter and Dart.
- Design responsive and interactive mobile user interfaces using Flutter widgets and navigation components.
- Develop mobile applications with local storage, databases, and API integration techniques.
- Build real-time cloud-enabled mobile applications using Firebase services and modern development tools.

Course Outcomes:

After the course the students are expected to be able to

CO1: Understand the fundamentals of modern mobile application development and Flutter framework

CO2: Design and develop responsive mobile user interfaces using Flutter widgets and navigation components

CO3: Develop mobile applications with local storage, database management, and API integration

CO4: Build real-time mobile applications using Firebase services and modern development tools

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	2	3	2	2
CO2	3	2	2	-	2	-	-	-	-	-	2	3	2	2
CO3	3	2	2	-	2	-	-	-	-	-	2	3	2	2
CO4	3	2	2	-	2	-	-	-	-	-	2	3	2	2

UNIT - I (11 Hours)

Introduction to Modern Mobile App Development: Introduction to Mobile Computing, Evolution of Mobile Applications, Native vs Cross-Platform Development, Introduction to Flutter Framework, Features of Flutter, Installing Flutter SDK, Installing Visual Studio Code, Creating First Flutter Application, Flutter Project Structure, Dart Programming Basics, Variables, Data Types, Operators, Conditional Statements and Loops, Functions and Classes.

UNIT - II (10 Hours)

User Interface Design and Navigation: Flutter Widgets, Stateless Widgets, Stateful Widgets, Material Design Concepts, Layout Widgets, Row, Column, Container, Stack, Text, Image, Icon Widgets, Buttons and Input Controls, Forms and Validation, Navigation Between Screens, Drawer and Bottom Navigation, Responsive UI Design.

UNIT - III (10 Hours)

Data Storage and API Integration: Local Storage Concepts, Shared Preferences, SQLite Database Basics, JSON Data Handling, REST API Concepts, Fetching Data from APIs, HTTP Package in Flutter, Displaying Dynamic Data, State Management Basics, Provider Introduction, Error Handling.

UNIT - IV (11 Hours)

Firebase and Modern App Features: Introduction to Firebase, Firebase Project Setup, Firebase Authentication, Fire Store Database, Firebase Storage, Push Notifications, Cloud Messaging, Background Services, Introduction to AI-Assisted Development, GitHub Version Control, App Testing and Debugging, APK Generation and Deployment.

TEXT BOOKS:

1. Rap Payne. *Beginning App Development with Flutter*. Apress Publisher, 1 edition, 2019. ISBN 9781484251805
2. Simone Alessandria and Brian Kayfitz. *Flutter Cookbook*. Packt Publishing, 1 edition, 2023. ISBN 978-1803245430

REFERENCES:

1. Carmine Zaccagnino. *Programming Flutter*. Pragmatic Bookshelf Publlisher, 1 edition, 2020. ISBN

9781680506952

2. Eric Windmill. *Flutter in Action*. Manning Publications, 1 edition, 2020. ISBN 978-1617296147

Technical Paper Writing and IPR
III B.Tech – V Semester (24IT506/MC03)

Lectures	:	2 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	0	Credits	:	0

Prerequisites:

Course Objectives:

The course aims to enable the students

- To develop an understanding of the structure, style, and ethics of technical and scientific writing.
- To train students in effective academic communication, including research paper, thesis, and project report writing.
- To create awareness about various forms of intellectual property and the process of securing IP rights.
- To provide foundational knowledge on patents, copyrights, trademarks, and designrights

Course Outcomes:

After the successful completion of the course the students will be able to

CO1: Understand the fundamentals and importance of technical communication in engineering and research contexts.

CO2: Apply the standard procedures involved in the submission of research manuscripts to journals and conferences.

CO3: Prepare effective abstracts, posters, and oral presentations for communicating research outcomes.

CO4: Identify and differentiate various categories of IPR, including patents, copyrights, trademarks, trade secrets, and industrial designs.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	2	-	-	-	-	-	2	-	3	-	-	-	-
CO2	2	3	-	2	-	-	-	2	-	3	-	-	-	-
CO3	2	2	2	-	-	-	-	2	2	3	-	-	-	-
CO4	2	2	-	-	-	2	-	2	-	3	-	-	-	-

UNIT - I **(7 Hours)**

Fundamentals of Technical Writing: Basics of technical communication.
Types of technical documents: research papers, project reports, theses.
Structure and components of a technical paper (Abstract, Introduction, Methods, Results, Discussion), Clarity, precision, and language usage in scientific writing.
Ethics in writing: plagiarism, data falsification, multiple submissions.

UNIT - II **(7 Hours)**

Writing for Publication: Selection of journal/conference, understanding journal impact factor, indexing, and scope, manuscript preparation and formatting guidelines, submission process and peer review system, responding to reviewers and revisions.

UNIT - III **(7 Hours)**

Presentation and Dissemination: Preparing abstracts, posters, and oral presentations, tools for formatting and referencing (LaTeX, MS Word, EndNote, Mendeley, Zotero), best practices for graphical and tabular data representation, collaboration and authorship ethics,copyright and open-access publishing.

UNIT - IV **(7 Hours)**

Introduction to IPR: Definition and need for Intellectual Property, Categories: Patents, Copyrights, Trademarks, Trade Secrets, Industrial Designs.
Basic principles of patentability: novelty, non-obviousness, utility, National and international IPR organizations (WIPO, IPO, USPTO, EPO), IPR protection mechanisms in India, sample Patent filing.

TEXT BOOKS:

1. M. Ashok Kumar and R. Murugesan. *Research Methodology and IPR*. Charulatha Publications., 1 edition, 2020. ISBN 978-9370204294
2. R. N. Khandare. *Research Methodology & IPR*. S. Chand Publishing, 1 edition, 2020. ISBN 978-9370204294

REFERENCES:

1. B.L. Wadehra. *Law Relating to Intellectual Property*. Universal Law Publishing Co, 5 edition, 2011. ISBN 978-9350350300
2. Day and Gastel. *How to Write and Publish a Scientific Paper*. Cambridge University Press, 7 edition, 2020. ISBN 978-0313391972

Soft Skills
III B.Tech – V Semester (24ITL501)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Course Objectives:

The course aims to enable the students

- To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
- To know the importance of interpersonal and intrapersonal skills in an employability setting.
- Actively participate in group discussions / interviews and prepare & deliver Presentations.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of teamwork, Inter-personal relationships, stress management and leadership quality.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1: Use appropriate body language in social and professional contexts.

CO2: Demonstrate emotional intelligence and life skills by managing stress, setting goals, and effectively organizing time in real-life situations.

CO3: Develop and deliver structured presentations using appropriate visual and oral techniques while applying cognitive skills for innovative thinking.

CO4: Utilize employability skills to perform effectively in group discussions, interviews, and team environments.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	-	-	-	-	-	-	-	2	3	3	2	-	-	-
CO2	-	-	-	-	-	-	-	2	3	2	3	-	-	-
CO3	-	-	-	-	-	-	-	2	3	3	2	-	-	-
CO4	-	-	-	-	-	-	-	2	3	3	3	-	-	-

List of Experiments

1. Body Language & Habitual Intelligence
   (a) Facial Expressions – Kinesics – Oculesics- Proxemics
   (b) Appearance and Grooming
   (c) Habit Science Fundamentals
   (d) Four Laws of Behaviour Change (Applied to Communication Skills)
2. Emotional Intelligence & Life Skills
   (a) Self-Awareness through Johari Window and SWOC analysis
   (b) Self-Motivation
   (c) Attitude & Personality Traits
   (d) Managing Stress
   (e) Goal Setting
   (f) Time Management
3. Business Presentations and Cognitive Skills
   (a) Preparing effective Presentations
   (b) Power Point Presentations
   (c) Poster Presentation/image presentation
   (d) Oral Presentation
   (e) Cognitive Skills: Lateral and Creative Thinking.
4. Employability Skills
   (a) Group Discussion
   (b) Team Building and Leadership Qualities
   (c) Resumé writing and Interview skills

REFERENCES:

1. Barun K.Mithra. *Personality Development and Soft skills*. Oxford University Press,, 2 edition, 2016. ISBN 9780321564085
2. Allan and Barbara. *The Definitive Book of Body Language*. Pease International, 1 edition, 2004. ISBN 9780321564085
3. Daniel Goleman. *Working with Emotional Intelligence*. Bloomsbury, 1 edition, 1998. ISBN 9780321564085
4. Lina Mukhopadhyay. *English for Jobseekers*. Cambridge University Press, 1 edition, 2013
5. Stephen R. Covey. *The 7 Habits of Highly Effective People*. St. Martin's Press, 1 edition, 2014
6. Clear James. *Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones*. Random House India, 1 edition, 2018
7. De Bono Edward. *Six Thinking Hats*. Penguin Books, 1 edition, 2000

Machine Learning Lab

B.Tech – VI Semester (24ITL502)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	1.5

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Learn a Regression Model.
- Comprehend a Supervised Learning Model.
- Apply Ensemble methods for improving the performance of a Learning Model.
- Apply an Unsupervised Learning Model.

Course Learning Outcomes:

After the successful completion of the course the students will be able to

CO1: Apply the correct regression model for the given problem and implement it.

CO2: Analyse the correct supervised weak learning model for the given problem and implement it.

CO3: Identify the correct supervised strong learning model for the given problem and implement it.

CO4: Choose the correct clustering algorithm for the given problem and implement it.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	2	3	2	2
CO2	3	2	2	-	2	-	-	-	-	-	2	3	2	2
CO3	3	2	2	-	2	-	-	-	-	-	2	3	2	2
CO4	3	2	2	-	2	-	-	-	-	-	2	3	2	2

List of Experiments

1. Write a program to implement the linear regression using stochastic gradient descent approach of training for a sample training data set stored as a .CSV file.
2. Write a program to implement the linear regression using Batch gradient descent approach of training for a sample training data set stored as a .CSV file.
3. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the performance of the classifier, considering few test data sets.
4. Write a program to implement the Logistic regression for a sample training data set stored as a .CSV file. Compute the performance of the classifier, considering few test data sets.
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. Compute the performance of the classifier, considering few test data sets.
6. Write a program to demonstrate the working of the Support Vector Machine Classifier. Use an appropriate data set for building the Classifier and apply this knowledge to classify a new sample. Compute the performance of the classifier, considering few test data sets.
7. Write a program to implement the Random Forest classifier for a sample training data set stored as a .CSV file. Compare the performance of the classifier with any weak classifier, considering few test data sets.
8. Write a program to implement the AdaBoost classifier for a sample training data set stored as a .CSV file. Compare the performance of the classifier with Random Forest classifier, considering few test data sets.
9. Apply k-Means algorithm to cluster a set of data stored in a .CSV file. Calculate the quality of clustering solution.
10. Apply Hierarchical clustering algorithm to cluster a set of data stored in a .CSV file using different linkages. Use the same data set for clustering using k-Means algorithm. Compare the performances of these two algorithms and comment on the quality of clustering.

Prompt Engineering and AI Tools Lab
III B.Tech – V Semester (24ITL503/A)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Nil

Course Objectives:

The course aims to enable the students

- Understand the fundamentals of prompt engineering and effective interaction with AI tools.
- Develop skills to design prompts for generating text, images, and structured outputs.
- Apply AI tools for practical tasks such as content creation, coding assistance, and data annotation.
- Build simple AI-driven applications using prompt-based techniques.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1: Design effective prompts to generate meaningful and context-aware responses from AI systems.

CO2: Utilize AI tools for content generation, transformation, and analysis across different domains.

CO3: Apply prompt engineering techniques in real-world applications such as chatbots, coding, and media generation.

CO4: Analyze and improve AI-generated outputs for accuracy, efficiency, and relevance.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

EXPERIMENTS

1. Write prompts to generate simple text responses (e.g., greetings, summaries) and Compare outputs when prompts are vague vs. specific
2. Input a paragraph and prompt the AI to rewrite it in different styles (formal, casual, poetic). observe how prompt wording affects tone.
3. Use prompts to generate structured lists (e.g., top 10 algorithms in machine learning, project ideas). Evaluate completeness and accuracy.
4. Use modern AI tools for generating PPT's
5. Generate social media posts, blog titles, or video script outlines using AI tools.
6. Build a small application (e.g., chatbot for FAQs) using prompt-based interactions.
7. Present prompts with options, prompting the AI to analyze and select the most appropriate answer based on its understanding of the context using modern AI tools.
8. Prompt the AI to analyze existing code and suggest improvements for efficiency, readability, or performance.
9. Craft prompts that describe the desired image in detail, including objects, scenery, lighting, and style, to generate realistic and high-quality images.
10. Use Label studio platform for data labelling.
11. Provide the AI with code containing errors and prompt it to identify and suggest potential solutions for the identified issues.
12. To practice and understand orange tool for data Annotation.

Data Analytics Lab

III B.Tech – V Semester (24ITL503/B)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Do data analysis using NumPy module.
- Do data analysis using Pandas module.
- Present the results of Data Analysis in graphical form using Matplotlib, Pandas and Plotly modules.
- Build a single page web application for Data Analysis using Streamlit module.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1: Do data analysis using NumPy module.

CO2: Do data analysis using Pandas module.

CO3: Present the results of Data Analysis in graphical form using Matplotlib, Pandas and Plotly modules.

CO4: Build a single page web application for Data Analysis using Streamlit module.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

Mini Projects

1. Given the admission data of the college in an academic year, perform data analysis and publish insights in the form of a dashboard.
2. Given the campus placement details of the college in an academic year, perform data analysis and publish insights in the form of a dashboard.
3. Given the students' feedback on faculty in a semester, perform data analysis and publish insights in the form of a dashboard.
4. Given the alumni data of a college, perform data analysis and publish insights in the form of a dashboard.
5. Given the curricula of a program offered by a department, perform data analysis and publish insights in the form of a dashboard.
6. Given the research and academic achievements of the faculty members in a college, perform data analysis and publish insights in the form of a dashboard.
7. Given the attendance details of faculty members, captured using biometric devices in a college, perform data analysis and publish insights in the form of a dashboard.
8. Given the continuous internal evaluation marks of students of a department in a given semester, perform data analysis and publish insights in the form of a dashboard.
9. Given the infrastructure details of a college, perform data analysis and publish insights in the form of a dashboard.
10. Given the curricular, co-curricular and extra-curricular achievements of the students of a college, perform data analysis and publish insights in the form of a dashboard.
11. Given the attendance details of students of a semester, perform data analysis and publish insights in the form of a dashboard.
12. Given the drop-out details of students in a given academic year, perform data analysis and publish insights in the form of a dashboard.
13. Given the fee due details of students in a given academic year, perform data analysis and publish insights in the form of a dashboard.
14. Given the leave details of faculty members in a given calendar year, perform data analysis and publish insights in the form of a dashboard.
15. Given the results of students in a given calendar year, perform data analysis and publish insights in the form of a dashboard.

Mobile Application Development Lab
III B.Tech – V Semester (24ITL503/C)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Object Oriented Programming (24IT304)

Course Objectives:

The students will be able to

- Understand and configure the Flutter mobile application development environment using modern development tools.
- Develop responsive mobile applications using Flutter widgets, layouts, and navigation components.
- Implement local storage, database operations, and API integration in Flutter applications.
- Develop cloud-enabled real-time mobile applications using Firebase services.

Course Outcomes:

After the course the students are expected to be able to

CO1: Develop basic mobile applications using Flutter widgets, layouts, and event handling techniques

CO2: Implement responsive multi-screen mobile applications using navigation and UI components

CO3: Perform local storage, SQLite database operations, and REST API integration in Flutter applications

CO4: Develop real-time mobile applications using Firebase Authentication and Firestore services

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

EXPERIMENTS

1. Design and develop a Flutter application to demonstrate the installation and setup of Flutter SDK, VS Code, and execution of the first Flutter application.
2. Design and develop a Flutter application to demonstrate basic user interface design using widgets, layouts, buttons, images, and text controls.
3. Design and develop a Flutter application to demonstrate form handling, event handling, and input validation using a student registration form.
4. Design and develop a Flutter application to demonstrate navigation between multiple screens using drawer navigation and bottom navigation bar.
5. Design and develop Flutter utility applications to demonstrate arithmetic operations and temperature conversion techniques.
6. Design and develop a Flutter application to demonstrate local data storage using Shared Preferences.
7. Design and develop a Flutter application to demonstrate SQLite database operations including insert, update, delete, and retrieve functionalities.
8. Design and develop a Flutter application to demonstrate REST API integration, JSON parsing, and dynamic data display.
9. Design and develop a Flutter application to demonstrate Firebase Authentication and Firebase Firestore database operations.
10. Design and develop a real-time mobile application using Flutter and Firebase for any one of the following domains:
    - Health Care
    - Education
    - AI Chat Application
    - Attendance System
    - E-Commerce
    - Smart Farming
    - Tourism
    - Fitness Tracking

ANN & Deep Learning

(Common to CSE & IT)

B.Tech – VI Semester (24IT601)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Machine Learning (24IT502)

Course Objectives:

Students will be able to

- Describe the process of training and testing an Artificial Neural Network with appropriate optimization method, loss function and activation functions.
- Design a Convolutional neural network by selecting the number of filters, stride and pooling for image classification and extend pre-trained models for computer vision applications.
- Describe the process of language modelling using RNN, LSTM and GRUs.
- Explain Auto Encoders, Variational Auto Encoders and GANs.

Course Outcomes:

After the course the students are expected to be able to

CO1: Describe the process of training and testing an Artificial Neural Network with appropriate optimization method, loss function and activation functions.

CO2: Design a Convolutional neural network by selecting the number of filters, stride and pooling for image classification and extend pre-trained models for computer vision applications.

CO3: Describe the process of language modelling using RNN, LSTM and GRUs.

CO4: Explain Auto Encoders, Variational Auto Encoders and GANs.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I (11 Hours)

Artificial Neural Networks: Perceptron Learning algorithm, Feedforward neural networks, activation functions, backpropagation algorithm, loss functions, Gradient Descent - Stochastic Gradient Descent (SGD), Mini Batch Stochastic Gradient Descent (MB-SGD), Optimization methods - SGD with momentum, Adaptive Gradient (AdaGrad), RMSprop, Adam, Regularization - L2 regularization, L1 regularization and dropout. Implementation of ANN using TensorFlow.

UNIT - II (10 Hours)

Convolutional Neural Networks: Convolution, filters, stride, padding, feature maps, Architecture of CNNs - input layer, convolutional layers, activation functions, pooling layers, fully connected layers, output layer, training, pre-trained CNN models, transfer learning, image classification. TensorfFow implementation.

UNIT - III (10 Hours)

Sequence Models: Introduction to Sequence Modeling, word embeddings, Recurrent Neural Networks (RNNs) - Basic architecture of RNNs, Language model and sequence generation, Sentiment analysis, Vanishing and exploding gradient problems in RNNs, Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU) architectures to address the vanishing gradient problem, Training RNNs.

UNIT - IV (11 Hours)

Generative Models: Autoencoders, Architecture and training of autoencoders for unsupervised representation learning, Variants of autoencoders - Denoising autoencoders, sparse autoencoders, and contractive autoencoders, Variational Autoencoders (VAEs), The encoder-decoder framework and the reparameterization, The role of the latent space in VAEs for generating new samples, Generative Adversarial Networks (GANs) - Understanding the GAN architecture with generator and discriminator networks.

TEXT BOOKS:

1. Francois Chollet. *Deep Learning with Python*. Manning Publishers, 2 edition, 2021. ISBN 9781617296864
2. Aurelien Geron. *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*. O'Reilly publishers, 2 edition, 2019a. ISBN 9781492032649

REFERENCES:

1. Mitesh M Khapra. *NPTEL Course on Deep Learning*. IIT Madras, 2018. URL `https://archive.nptel.ac.in/courses/106/106/106106184/`
2. Ian Goodfelllow, Yoshua Benjio, and Aaron Courville. *Deep Learning*. The MIT Press, 1 edition, 2020. ISBN 9780321564085. URL `http://www.deeplearningbook.org`
3. Michael Nielsen. *Neural Networks and Deep Learning*. URL `http://neuralnetworksanddeeplearning.com`

Cloud Computing

(Common to CSE & IT)

B.Tech – VI Semester (24IT602)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Course Objectives:

The course aims to enable the students

- To understand the concept of cloud computing.
- To understand various developing applications in cloud computing.
- To familiarize themselves with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1: Articulate the main concepts, models, key technologies, strengths and limitations of cloud computing.

CO2: Describe the process of developing applications in cloud and usage of EC2, SQS and SNS service.

CO3: Design cloud service applications to demonstrate Azure storage service and use of EBS, ECR and ECS.

CO4: Write code to access AWS RDS and NO SQL Database services and Security.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Introduction to Cloud Computing: Definition, 5-4-3 principles of Cloud Computing, Cloud Eco System, features of Cloud service, benefits and drawbacks, Cloud architecture, Anatomy of Cloud, Applications on the Cloud.

Cloud Deployment and Service Models: Deployment Models, Service Models.

UNIT - II **(10 Hours)**

Hands-on Elastic Compute Cloud: Introduction to EC2, Features of EC2, EC2 Instance Types. Migrating into a Cloud- Introduction, Broad Approaches to Migrating into the Cloud, Seven-Step Model of Migration into a Cloud.

Simple Queue Service (SQS): What Is Messaging Queuing Service, Introduction of AWS SQS, Features of SQS. Hands-on Simple Storage Service (S3) - Introduction to AWS S3, Features S3.

UNIT - III **(10 Hours)**

SLA Management in Cloud Computing: Traditional Approaches to SLA Management, Types of SLA, Life Cycle of SLA, SLA Management in Cloud.

Cloud Software Environments: Amazon EBS, Amazon ECR, and Amazon ECS -Eucalyptus – Nimbus.

UNIT - IV **(11 Hours)**

Working with Data: Using AWS RDS, Using NoSQL Databases.

Data Security in the Cloud: An Introduction to the idea of Data Security.

TEXT BOOKS:

1. Chandrasekaran K. *Essentials of Cloud Computing*. CRC Press, 1 edition, 2014. ISBN 9781482205442

REFERENCES:

1. Gautam Shroff. *Enterprise Cloud Computing*. Cambridge University Press, 1 edition, 2010. ISBN 9780521137355
2. Sarkar Aurobindo and Amit Shah. *Learning AWS: Design, build, and deploy responsive applications using AWS Cloud components*. Packt Publishing Ltd, 1 edition, 2018. ISBN 9781784396473

Cryptography and Network Security

(Common to CSE & IT)

B.Tech – VI Semester (24IT603/PE2A)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Computer Networks (24IT305)

Course Objectives:

Students will be able to

- Know about security services, attacks and various encryption techniques.
- Understand the concept of public key cryptography and study about message authentication and hash functions.
- Understand the digital signature, key management and email security mechanisms.
- Impart knowledge on Transport layer & Network layer security

Course Learning Outcomes:

After the course the students are expected to

CO1: Classify the symmetric encryption techniques.

CO2: Illustrate various Public key cryptographic techniques.

CO3: Evaluate the authentication and hash algorithms.

CO4: Understand authentication applications.

CO5: Illustrate the various transport layer security mechanisms.

CO6: Illustrate the various Network layer security mechanisms.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I (11 Hours)

Introduction: Security Goals, Attacks, Service and Mechanism, Techniques
Traditional symmetric key ciphers: Introduction, Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers
Data Encryption Standard (DES): Introduction, DES Structure, DES Analysis, Multiple DES, Security of DES
Encipherment using Modern Symmetric Key Ciphers: Use of Modern Block Ciphers

UNIT - II (10 Hours)

Advanced Encryption Standard: Introduction, Transformations, Key Expansion, Ciphers.
Asymmetric Key Cryptography: Introduction, RSA Cryptosystem, Robin Cryptosystem, Elgamal Cryptosystem.
Message Integrity and Message Authentication: Message Integrity, Message Authentication.
Cryptographic Hash Functions: Introduction, SHA-512.

UNIT - III (10 Hours)

Digital Signatures: Comparison, Process, Services, Attacks on Digital Signature, Digital Signature Standard.
Key Management: symmetric key distribution, Kerberos, Symmetric Key Agreement, Public Key Distribution.
Security at the Application Layer: E-Mail, PGP.

UNIT - IV (11 Hours)

Security at the Transport Layer: SSL Architecture, Four Protocols, SSL Message Format, Transport Layer Security.
Security at the Network Layer: Two Modes, Two Security Protocols, Security Association, Security Policy, Internet Key Exchange, ISAKMP.

TEXT BOOKS:

1. Behrouz A Forouzan. *Cryptography and Network Security*. Mc Graw Hill, 3 edition, 2015. ISBN 9789339220945

REFERENCES:

1. William Stallings. *Cryptography and Network Security*. Pearson Education, 4 edition, 2005. ISBN 9780131873162
2. Kaufman, Perlman, and Speciner. *Network Security*. PHI, 2 edition, 2012. ISBN 8120322134
3. Trappe and Washington. *Introduction to Cryptography with Coding Theory*. Pearson, 2 edition, 2005. ISBN 9780131862395

User Experience / User Interface Design
III B.Tech – VI Semester (24ITPE603/PE2B)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

NIL

Course Objectives:

The students will be able to

- Determine the characteristics of good user interface designs.
- Recognize how a computer system may be modified to include human diversity.
- Investigate the automatic generation of user interfaces from high-level specifications.
- Evaluate user interfaces and applications using a variety of methods.

Course Outcomes:

After the course the students are expected to be able to

CO1: Identify the importance of HCI.

CO2: Understand various HCI design tools.

CO3: Analyse automatic generation of user interfaces.

CO4: understand the User interface for given application.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Introduction: Importance of User Interface – Definition, Importance of Good Design. Benefits of Good Design. A Brief History of Screen Design.

The Graphical User Interface : Popularity of Graphics, The Concept of Direct Manipulation, Graphical System, Characteristics.

Web User – Interface Popularity, Characteristics- Principles of User Interface.

UNIT - II **(10 Hours)**

Design process : The User Interface Design Process, Know Your User or Client, Understand the Business Function, Principles of Good Interface and Screen Design,

UNIT - III **(10 Hours)**

Windows: Develop System Menus and Navigation Schemes, Selection of Window, Select the Proper Interaction Devices and Choose the Proper Screen-Based Controls.

Components: Select Clear Text and Messages, Provide Effective Feedback Guidance and Assistance, Provide Effective Internationalization and Accessibility, Create Meaningful Graphics, Icons and Images, Choose the Proper Colours.

UNIT - IV **(11 Hours)**

Organize and Layout Windows and Pages: Organizing and Laying Out Screens , General Guidelines, Organization Guidelines, Control Navigation, Window Guidelines Web Page Guidelines , Screen Examples.

Test and Retest: Usability, Prototypes, Kinds of Tests, Developing and Conducting a Test

TEXT BOOKS:

1. Wilbert O Galitz. *The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques*. Wiley, 2007

REFERENCES:

1. Alan Dix, Janet Fincay, Gre Goryd, Abowd, and Russel Bealg. *Human-Computer Interaction: A Compact Reference for Practitioners.* Pearson publication, 3 edition, 2003. ISBN 9780130461094
2. Jennifer Preece, Helen Sharp, and Yvonne Rogers. *Interaction Design*. Wiley Dreamtech, 4 edition, 2012. ISBN 9781119020752

Software Project Management
III B.Tech – VI Semester (24IT603/PE2C)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Software Engineering(24IT503)

Course Objectives:

The students will be able to

- Create an end-to-end project plan to address the complex software delivery dealing with the principles and practices of traditional Project Management.
- Design and develop innovative software products by addressing complex user problems dealing with the principles and practices of Product Management
- Compare and determine whether using traditional project management or agile project management would be more appropriate for a project.
- Develop agile project plans to address the complex software delivery and the problems arising out of the traditional methods by applying Agile manifesto and the practices.

Course Outcomes:

After the course the students are expected to be able to

CO1: Create an end-to-end project plan to address the complex software delivery dealing with the principles and practices of traditional Project Management.

CO2: Design and develop innovative software products by addressing complex user problems dealing with the principles and practices of Product Management

CO3: Compare and determine whether using traditional project management or agile project management would be more appropriate for a project.

CO4: Develop agile project plans to address the complex software delivery and the problems arising out of the traditional methods by applying Agile manifesto and the practices.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I (11 Hours)

Software Project Management: Introduction, Principles of Project Management, WBS, Process Groups, Knowledge Areas, Models, Methods and Artefacts, Stakeholder Management, Capstone.
Tools: Microsoft Project, Gannt Charts.

UNIT - II (10 Hours)

Software Product Management: Product Life Cycle, Product Manager, Product Vision and Strategy, Product Discovery, Product Design, Product Roadmap, Product Backlog, Prioritization Techniques, Competitive and Market Analysis, MVP, GTM (Go to Market), Product Analytics, Capstone.
Tools: Figma, Google Analytics, Hotjar.

UNIT - III (10 Hours)

Agile Project Management: Fundamentals of Agile Project Management, Agile Manifesto, Roles and Responsibilities, Preparing for Agile Project Management, Pre-project, Foundation Process and Products, Evolutionary Development, Techniques and Practices, Agile Planning, Agile Control.

UNIT - IV (11 Hours)

Scrum: Scrum Definition and Framework, Scrum Theory, Scrum Values, Scrum Team, Scrum Events, Scrum Artefacts, User Story & Acceptance Criteria, Sizing Stories, Capacity Planning, Velocity of a Team, KPI's, Iterative vs Incremental Development, Release Planning.
Tools: Jira/Trello, Planning Poker.

TEXT BOOKS:

1. *A Guide to the Project Management Body of Knowledge*. Project Management Institute, 7 edition, 2021. ISBN 9781628256642

REFERENCES:

1. HansBerndKittlaus and Samuel A. Fricker. *HSoftware Product Management*. Springer Nature, 3 edition, 2017. ISBN 9783642551390
2. Andrew Stellman and Jennifer Greene. *Learning Agile: Understanding Scrum, XP, Lean, and Kanban*. O'Reilly, 4 edition, 2014. ISBN 9781449331924

ON-LINE RESOURCES:

1. https://www.wrike.com/product-management-guide/product-management-definition/
2. https://www.atlassian.com/agile/product-management
3. https://www.aha.io/roadmapping/guide/product-managementf
4. https://agilemanifesto.org/
5. https://scrumguides.org/scrum-guide.html

Immersive Technologies

III B.Tech – VI Semester (24IT604/JO2A)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Course Objectives:

The students will be able to

- To understand the importance and applications of Augmented and Virtual Reality Systems
- To know various types of Hardware and Software used in Augmented and Virtual Reality Systems
- To describe the components of a Virtual Reality system
- To describe the components of an Augmented Reality system

Course Outcomes:

After the course the students are expected to be able to

CO1: Describe the components of augmented & virtual reality systems

CO2: Describe the hardware & software used in augmented & virtual reality systems

CO3: Illustrate the subsystems used in virtual reality systems

CO4: Illustrate the subsystems used in augmented reality systems

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Introduction: Introduction to Augmented, Virtual and Mixed Reality, Difference between AR, VR and MR, Components of VR and AR. Challenges of AR and VR Systems, Applications of AR and VR Systems.

UNIT - II **(10 Hours)**

Theories of Perception: Principle of Human Vision, Modelling Human Vision, Colour Vision. Principle of Hearing.

UNIT - III **(10 Hours)**

Output Interaction Modalities: Displays: Different Types of Displays, Displays used for AR/VR Systems. Tactile Systems.

Human Haptic System: Haptic Sensing, Sensory Motor Control, Grasp Geometry.

Haptic Devices: Criteria to Classify Haptic Devices, Vibrotacticle Systems, Force Feedback Systems and Ultrasound Systems. Haptic Devices for AR or VR Auditory Systems.

UNIT - IV **(11 Hours)**

Input Interaction Modalities: Eye Tracking and Gaze Control, Types of Eye Trackers, Head Tracker, Types of Head Trackers, Hand/Finger Trackers.

Gesture Recognition: Definition of Gesture, Different Types of Gesture, Gesture Recognition from Multiple Body Parts, Basic Components of a Gesture Recognition System.

TEXT BOOKS:

1. Steven M. LaValle. *Virtual Reality.* Cambridge University Press, 1 edition, 2023. ISBN 978-1107198937

REFERENCES:

1. Zeynep Tacgin. *Virtual and Augmented Reality, An Educational Hand Book.* Cambridge Scholars Publishing, 1 edition, 2020. ISBN 9781527548138
2. Jason Jerald. *The VR Book: Human-Centered Design for Virtual Reality.* Morgan and Claypool, 1 edition, 2015. ISBN 9781970001129

Big Data Analytics

III B.Tech – VI Semester (24IT604/JO2B)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Course Objectives:

The students will be able to

- Describe fundamental concepts of Big Data Analytics, including its characteristics, applications and the Hadoop ecosystem
- Describe the architecture and working principles of YARN and MapReduce in the Hadoop environment
- Write scripts using Pig and Hive to process and query large datasets on Hadoop clusters
- Write scripts using Spark and Sqoop for fast, scalable data processing and data import/export in Hadoop-based systems

Course Outcomes:

After the course the students are expected to be able to

CO1: Describe fundamental concepts of Big Data Analytics, including its characteristics, applications,and the Hadoop ecosystem

CO2: Describe the architecture and working principles of YARN and MapReduce in the Hadoop environment

CO3: Write scripts using Pig and Hive to process and query large datasets on Hadoop clusters

CO4: Write scripts using Spark and Sqoop for fast, scalable data processing and data import/export in Hadoop-based systems

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I (14 Periods)

Big Data Analytics: Introduction to Big Data Analytics, Characteristics of Big Data, Sources of Big Data, Applications of Big Data.

Hadoop: Introduction to Hadoop, Hadoop Components, Configuration of Hadoop.

The Hadoop Distributed File System: The Design of HDFS, HDFS Concepts, The Command Line Interpreter , Basic File System Operations, Hadoop File System, Interfaces Data Flow and Parallel Copying with distcp.

UNIT - II (14 Periods)

YARN: Anatomy of YARN Application Run, YARN Compared to Map Reduce 1, Scheduling in YARN.

How Map Reduce Works?: Anatomy of Map Reduce Job Run, Failures, Shuffle and Sort, Task Execution. Map Reduce Features-Counters, Sorting, Joins Side Data Distribution, Writing Map Reduce Programs, Deploying Map Reduce Programs on Hadoop Cluster.

UNIT - III (14 Periods)

Pig: Installing and Running Pig-Execution Types, Running Pig Programs, Grunt, Pig Latin Editors, An Example, Comparison with Databases, Pig Latin-Structure, Statements, Expressions, Types, Schemas, Functions, Macros, User-Defined Functions-A Filter UDF, An Eval UDF, Data Processing Operators, Loading and Storing Data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and Splitting Data, Pig in Practice-Parallelism, Anonymous Relations, Parameter Substitution.

Hive: The Hive Shell, An example, Running Hive, Configuring Hive, Hive Services, The Metastore, Comparison with Traditional Databases, Schema on Read Versus Schema on Write, Update, Transactions and Indexes, SQL on Hadoop Alternatives, HiveQL, Data Types, Operators and Functions, Tables, Querying Data-Sorting and Aggregating, MapReduce Script, Joins, Sub Queries, Views.

UNIT - IV (14 Periods)

Spark: Installing Spark, Spark Application, Jobs, Stages, Tasks, Scala Stand Alone Application, Anatomy of Spark Job Run, Job Submission, DAG Construction, Task Scheduling, Task Execution, Execution Cluster Managers, Spark on YARN.

Sqoop: Getting Sqoop, Sqoop Connectors, A Sample Import, Text and Binary File Formats, Generated Code, Additional Serialization Systems.

Imports: A Deeper Look, Controlling the Import, Imports and Consistency.

TEXT BOOKS:

1. Tom White. *HADOOP "The Definitive Guide":Black Book on Big Data.* O'Reilly Publications, 4 edition, 2020. ISBN 9780321564085

REFERENCES:

1. Jeffrey Aven. *Hadoop in Action,Hadoop Beginner's Guide, Optimizing Hadoop for Map Reduce,Scaling Big Data with Hadoop and Solr.* O'Reilly Media, 1 edition, 2020. ISBN 9780321564085

Industrial Internet of Things
III B.Tech – VI Semester (24IT604/JO2C)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Course Objectives:

The students will be able to

- To understand the IoT challenges and architectures.
- To understand the technologies and the standards relevant to the Internet of Things.
- To design and develop IoT applications
- To understand the significance of cloud platform in the context of IOT

Course Outcomes:

After the course the students are expected to be able to

CO1: Describe the Internet of Things and different levels of deployment templates.

CO2: Describe the hardware components, software components and communication protocols of IOT

CO3: Differentiate machine to machine communication and IoT

CO4: Illustrate the available cloud services and communication APIs for developing IOT Applications

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Introduction to IoT: The Flavour of the IoT, The Technology of the IoT, Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates.

UNIT - II **(10 Hours)**

Elements of IoT: Hardware Components-Computing (Arduino, Raspberry Pi), Sensors, Actuators, I/O Interfaces, Communication Protocols (ZigBee, Bluetooth, 6LOWPAN, and MQTT), Software Components-Programming APIs(using Python/Arduino).

UNIT - III **(10 Hours)**

M2M and IoT Design Methodology: M2M, Differences and Similarities between M2M and IoT, IoT Design Methodology. Software Design Networks(SDN), Network Function Virtualization (NFV).

UNIT - IV **(11 Hours)**

Cloud for IoT and Case Studies: WAMP Server, IoT with Cloud– Challenges, AWS , Xively, Django Web Application Framework, Mapreduce Problem.

Case Studies: Smart Lighting, Home Intrusion Detection, Smart Parking, Weather Monitoring System, Smart Irrigation.

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madisetti. *Internet of Things: A Hands-on-Approach*. VPT, 1 edition, 2014. ISBN 9788173719547
2. Raj Kamal. *Internet of Things: Architecture and Design.* McGraw Hill Education, 1 edition, 2017. ISBN 9789352605224

REFERENCES:

1. Hakim Cassimally and Adrian McEwen. *Designing the Internet of Things.* John Wiley and Sons, 1 edition, 2014. ISBN 9781118430620
2. Jeeva Jose. *Internet of Things*. Khanna Publishing, 1 edition, 2018. ISBN 9789386173591

Server-Side Web Technologies
III B.Tech – VI Semester (24ITL601/SEC3)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Course Objectives:

The students will be able to

- Understand the fundamentals of Node.js, including asynchronous programming, core modules, and package management.
- Apply Express.js concepts such as middleware, routing, and session management in web application development.
- Analyze REST architecture and NoSQL database concepts for effective data handling and API integration.
- Evaluate advanced MongoDB features such as aggregation, indexing, and transactions in real-world applications.

Course Outcomes:

After the course the students are expected to be able to

CO1: Implement Node.js applications utilizing asynchronous programming, file system operations, and core modules.

CO2: Develop web applications and RESTful APIs using Express.js with middleware, authentication, and testing mechanisms.

CO3: Design RESTful services and perform database operations using MongoDB tools and API testing methods.

CO4: Construct full-stack applications by integrating Node.js with MongoDB ensuring data integrity and performance.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I (11 Hours)

Node Js: Introduction to Node.js and its Features.
Asynchronous Programming: Non-Blocking I/O, Callbacks, Promises, Async/Await. Working with File system, and Handling Data I/O (buffer, stream, and zlib modules). Creating Custom Modules, Package Management with npm.
List of Exercises:

1. Real-Time Chat Application Using Node.js with Async Programming Techniques
2. Develop a Server-side Application that Stores, Retrieves, and Manages Book Ratings and Reviews (use internal memory).
3. Develop a Node.js File Handling and Streaming Web Server.

UNIT - II (10 Hours)

Express.JS Framework: Middleware. Routing (get, post, put, delete). Building JSON APIs.
Views and Template Engines: Pug and EJS. Serving Static Files. Cookies, Sessions.
Authentication and Authorization: JWT, OAuth. Testing Express.JS applications.
List of Exercises:

1. Develop a Blog Management System using Express Router Module.
2. Build an Express.js Application that Implements Social Media Posts API (JSON API) with features like Share, Comment.
3. Develop an Express.js Mini E-commerce Application with Session & Cookie Preferences .

UNIT - III (10 Hours)

REST APIs: REST Architecture, Creating REST APIs, Consuming External APIs, JSON Data Handling, API Testing using Postman.
NoSQL & MongoDB: Introduction to NoSQL Databases, Types, SQL vs NoSQL.
MongoDB: Introduction, Features, Core Server and Tools.
List of Exercises:

1. Design RESTful Web Service and REST API and Consume in an Express.js Application.(Ex: Notes Management).
2. Demonstrate Working with MongoDB using MongoDB Compass.

3. Demonstrate Working with MongoDB using MongoDB Shell.

UNIT - IV **(11 Hours)**

Mongo DB (Contd..): Node.js Applications Accessing MongoDB. MongoDB Query Language. Data Validation & Aggregation. Transactions and Data Integrity. Authentication & Authorization and Indexing.
MongoDB Tools: MongoDB Shell: Managing Databases, Collections, Documents; Aggregation, Run Scripts. Using MongoDB Compass and MongoDB Atlas.
List of Exercises:

1. Develop a Node.js Application for Managing Tweets.
2. Developing a Student Records System using MongoDB Query Operators
3. Create a Sales Report System using $group, $sum, $avg Operators
4. Create a Library Management System with Data Integrity Enforcement.

TEXT BOOKS:

1. Alex Young, Bradley Meck, Mike Cantelon, Tim Oxley, Marc Harter, T.J. Holowaychuk, and Nathan Rajlich. *Node.js in Action*. Manning Publications, 2 edition, 2017. ISBN 9789386052049
2. Evan M. Hahn. *Express in Action*. Manning Publications, 2 edition, 2018. ISBN 9781617292422
3. Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, and Tim Hawkins. *MongoDB in Action*. Khanna Publishing, 2 edition, 2016. ISBN 9789351199359

REFERENCES:

1. Brad Dayley, Brendan Dayley, and Caleb Dayley. *Node.js, MongoDB and Angular Web Development*. Addison-Wesley Professional, 2 edition, 2017. ISBN 978-0134655536

Cloud Computing Lab
III B.Tech – VI Semester (24ITL603)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIA Marks	:	40	SEE Marks	:	60	Credits	:	3

Prerequisites:

Course Outcomes:

After the course the students are expected to be able to

CO1: Develop applications using Java and deploy on Linux VM

CO2: Develop applications in cloud using EC2, SQS and SNS EC2 service

CO3: Develop cloud applications using S3, EBS, ECR and ECS, RDS and NoSQL Database service

CO4: Develop cloud applications using RDS, and NoSQL services, RDS and NoSQL Database service

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

EXPERIMENTS

1. Develop a Cloud application using Java and deploy it to AWS Cloud.
2. Demonstrate deploying and using Linux VM in the AWS Cloud.
3. Develop a Cloud application to demonstrate AWS Compute Services.
4. Develop a Cloud application to use Simple Queue Service(SQS).
5. Develop a Cloud application using with Amazon SNS.
6. Develop a Cloud application using with Amazon Simple Storage Service(S3).
7. Develop a Cloud application to use Amazon EBS.

8. Develop a Cloud application using AWS ECR & AWS ECS.
9. Develop a Cloud application using AWS S3.
10. Develop a Cloud application using Amazon Relational Database Service(RDS).
11. Develop a Cloud application to work with NoSQL database.

Campus Recruitment Training
III B.Tech – VI Semester (24IT605/MC04)

Lectures	:	2 Hours / Week	Tutorial	:	0	Practical	:	0
CIA Marks	:	40	SEE Marks	:	0	Credits	:	0

Prerequisites:

Course Objectives:

The course aims to enable the students

- To enhance linguistic proficiency by developing skills in grammatical correction, contextual vocabulary usage, and the ability to comprehend and reorganize complex textual information.
- To build a strong foundation in proportional reasoning for solving mathematical problems related to business partnerships and chronological age calculations.
- To develop the ability to calculate possibilities using counting principles and probability, and to cultivate analytical skills for extracting insights from various data visualizations.
- To sharpen spatial intelligence and logical deduction through the mental manipulation of shapes, figures, and visual patterns.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1: Demonstrate effective communication skills by applying verbal, non-verbal, and business communication techniques.

CO2: Apply the principles of ratio and proportion to model and solve real-world quantitative problems involving equitable profit distribution in partnerships and the calculation of chronological age relationships.

CO3: Calculate the likelihood of complex events by applying counting principles (Permutations and Combinations) and utilize Data Interpretation techniques to analyze, visualize, and draw logical conclusions from diverse numerical datasets.

CO4: Apply logical reasoning and mathematical modeling to solve complex problems by integrating visual pattern recognition, combinatorial analysis, and the probabilistic interpretation of data.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	3	-	2	-	-	-	-	-	-	1	-	-	-
CO4	2	3	-	2	-	-	-	-	-	-	2	-	-	-

UNIT - I (8 Hours)

Sentence Improvement, Sentence Completion, Reading Comprehension, Cloze Test .
Sentence Re-arrangements, Analogy, Industrial Vocabulary, Phrasal Verbs.

UNIT - II (8 Hours)

Quantitative Aptitude : Ratios & Proportion.
Partnership, Problems on Ages.

UNIT - III (8 Hours)

Permutations and Combinations, Probability.
Data interpretation: data graphs (bar graphs, pie charts, and other graphs representing data).

UNIT - IV (6 Hours)

Analytical Aptitude Logic: Dice, Counting figures, Water & Mirror Images, Paper cutting & Folding, Grouping of Figures, Figure Series.

TEXT BOOKS:

1. Biswajit Das and Ipseeta Satpathy. *Business Communication and Personality Development*. Excel Books, 1 edition, 2009
2. Jaidka and Kuldip. *Rich Vocabulary Made Easy*. Mohindra Capital Publishers, 1 edition, 2015
3. Murphy Raymond. *Intermediate English Grammar*. Cambridge University Press, 1 edition, 2018
4. Shoba K.N. and Lourdes Jovani Rayen. *Communicative English: A Workbook*. Cambridge University Press, 1 edition, 2018
5. Rajiv K. Mishra. *Personality Development, Transform Yourself*. Rupa Publications, 1 edition, 2004
6. Barun K. Mitra. *Business Correspondence and Report Writing*. Tata McGraw-Hill, 1 edition, 2016
7. Pushpa Lata. *Communication skills*. Oxford University Press, 1 edition, 2015