PRASAD V POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
(Autonomous)

ACADEMIC RULES &REGULATIONS (PVP20)
and
B.Tech Course Structure, Syllabus

Applicable for the batch of students admitted from the Academic Year 2020-2021

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
(Autonomous)
AICTE approved, NBA & NAAC A^+ Accredited, An ISO 9001:2015 certified Institution
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w.e.f. A.Y 2020 – 2021

PREFACE

PVP Siddhartha Institute of technology, established in 1998, is one of the seventeen educational institutions sponsored and run by Siddhartha Academy of General & Technical Education. The 250 members of the Academy are a group of industrialists, educationists, auditors and philanthropists with vast experience in their respective fields and above all with an ardent desire to spread quality Education. All the academic organizations of Siddhartha Academy stand symbolic of the pragmatic vision of its founders. PVP Siddhartha Institute of Technology has the advantage of inheriting the higher academic standards. The college is approved by AICTE and is permanently affiliated to JNTUK. It is certified by ISO 9001-2015 for its quality standard. All the UG Programs are accredited by the National Board of Accreditation and NAAC with A^+ grade. It is an Autonomous institute.

The curriculum is revised continuously to address the challenges of industry and academia and to foster the global competencies among the students. The curriculum is revised thrice since 2012. The present curriculum(PVP20) is designed incorporating the features such as outcome based approach, encouraging self-learning through MOOCs platforms i.e., Swayam, COURSERA, EDX, NPTEL, etc., Transformation of creative ideas into a prototype through Internship & Project, enhancing depth & breadth by introducing more number of programs, open electives in core and multi-disciplinary areas, offering courses by industry experts to improve Industry Institute Interaction in addition to internships at industry and introduction of wide range of value added courses beyond curriculum to choose according to their interest to enhance their employability skills.

Institute Vision

To provide rich ambience for Academic and Professional Excellence, Research, Employability skills, Entrepreneurship and Social responsibility.

Institute Mission

To empower the students with Technical knowledge, Awareness of up-to-date technical trends, Inclination for research in the areas of human needs, Capacity building for Employment / Entrepreneurship, Application of technology for societal needs.

Quality Policy

At PVPSIT, We commit ourselves to offer Quality professional education in engineering & Management by adhering to applicable statutory and regulatory requirements and through continuous improvement in the Quality of our services by,

- Regular up gradation of knowledge and skills of faculty
- Improving the teaching methods and strategies
- Providing state of art infrastructure
- Recruiting competent faculty and maintaining prescribed Teacher Student ratio
- Improving the employability of students
- Enhanced Collaboration with industry and institutions of National Repute

➢ DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE DEPARTMENT

To be a centre of excellence in academics and research in Computer Science and Engineering and take up challenges for the benefit of society.

MISSION OF THE DEPARTMENT

- Impart professional education through best curriculum in harmony with the industry needs.
- Inculcate ethics, research capabilities and team work in the young minds so as to put efforts to the advancement of the nation.
- Strive for student achievement and success with leadership qualities and preparing them for continuous learning in the global environment.

PROGRAM EDUCATIONAL OBJECTIVES	
PEO	**STATEMENTS**
PEO I	The graduates of the program will excel in the concepts of basic engineering and advanced concepts of computer science engineering.
PEO II	The graduates of the program will be professional in computing industry or pursuing higher studies.
PEO III	The graduates of the program will excel in team work, ethics, communication skills and contribute to the benefit to the society.

PROGRAM OUTCOMES (PO's)	
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PROGRAM SPECIFIC OUTCOMES (PSOs)	
PSO1	Apply the principal concepts of AI to solve problems in computer vision, speech recognition, natural language processing, and decision-making
PSO2	Design and develop the system that demonstrate intelligence using Machine Learning and Deep Learning techniques.
QUALITY POLICY	
At PVPSIT, We commit ourselves to offer Quality professional education in engineering & Management by adhering to applicable statutory and regulatory requirements and through continuous improvement in the Quality of our services by, • Regular up gradation of knowledge and skills of faculty • Improving the teaching methods and strategies • Providing state of art infrastructure • Recruiting competent faculty and maintaining prescribed Teacher Student ratio • Improving the employability of students • Enhanced Collaboration with industry and institutions of National Repute	

CONTENTS

Engineering UG Programmes

Introduction

The redesigned curriculum focused on up skilling the graduates on the skills relevant to the need and demands of the industry. The curriculum mandates students to take up five skill courses which are relevant to the industry from second year onwards, two basic level skill courses, one on soft skills and other two on advanced level skill courses. The students are also given the option of choosing between skill courses offered by the Institute and a certificate course offered by industry, a professional body, APSSDC or any other accredited body.

Another major change brought in the curriculum is the introduction of B.Tech. with Honors or a B.Tech with a Minor. This is to give an opportunity for the fast learners to earn additional credits either in the same domain or in a related domain, making them more proficient in their chosen field of discipline or be a graduate with multidisciplinary knowledge and job ready skills.

Mandatory Internship, both industry and social, is included in the revised curriculum that aims at making engineering graduates connect with the needs of the industry and society at large. It will be mandatory for the students to intern in the industry/field for four to six weeks during the summer vacation and also in the final semester to acquire the skills required for job.

The redesigned curriculum offers academic flexibility by introducing a pool of inter-disciplinary and job-oriented skill courses which are integrated in to the curriculum of each branch of engineering, from which a student can pick his choice. Flexibility is not only given to students in the choices of courses, but flexibility is given in choosing courses either from the pool of courses offered by the concerned department or in choosing the courses offered by APSSDC or by any other reputed organization/professional body which offers with certification, as decided by respective BoS. Hence, the students are given wide choice and flexibility to undertake courses, while at the same time offering relevance to the interest of individual student in their own context. The curriculum also gives flexibility to the institution in offering a variety of courses to the students of a particular discipline. The Board of Studies is empowered to identify as many tracks and pools as possible in emerging technologies and industrial relevance, and also in humanities and sciences.

1. SHORT TITLE AND COMMENCEMENT

a. The regulations listed under this head are common for all degree level undergraduate programmes (B.Tech.), offered by the college with effect from the academic year 2020-21 and they are called as "PVP20" regulations.

b. The regulations here under are subjected to amendments as may be made by the Academic Council of the college from time to time, keeping in view of the recommendations of the Board of Studies. Any or all such amendments will be effective from such date and to such batches of candidates including those already undergoing the programme, as may be decided by the Academic Council.

2. DEFINITIONS

a. "**Commission**" means University Grants Commission(UGC);

b. "**Council**" means All India Council for Technical Education(AICTE);

c. "**University**" means Jawaharlal Nehru Technological University Kakinada(JNTUK);

d. "**College**" means Prasad V Potluri Siddhartha Institute of Technology, Vijayawada;

e. An **Academic Programme** means any combination of courses and/or requirements leading to award of a degree.

f. "**Course**" means a subject either theory or practical identified by its course title and code number and which is normally studied in a semester.

g. "**Degree**" means an academic degree conferred by the university upon those who complete the under graduate curriculum.

h. "**MOOC**" means Massive Open Online Course

i. "**Regular Students**" means students enrolled into the four year programme in the first year.

j. "**Lateral Entry Students**" means students enrolled into the four year programme in the second year.

3. ACADEMIC PROGRAMMES

3.1 Nomenclature of Programmes

3.1.1 The nomenclature and its abbreviation given below, shall continue to be used for the Degree programmes under the University, as required by the Council and the Commission:

Bachelor of Technology (B. Tech)

Besides, the name of specialization shall be indicated in brackets after the abbreviation, for example, engineering degree in Mechanical Engineering programme is abbreviated as B.Tech (Mechanical Engineering).

3.1.2 Bachelor of Technology (B. Tech.) degree programme is offered in:

1. Civil Engineering(CE)
2. Computer Science and Engineering(CSE)
3. Computer Science and Engineering(AI & ML)
4. Computer Science and Engineering(Data Science)
5. Electronics and Communication Engineering(ECE)
6. Electrical and Electronics Engineering(EEE)
7. Information Technology(IT)
8. Mechanical Engineering(ME)

4. DURATION OF THE PROGRAMMES

4.1 Normal Duration

4.1.1. The duration of an academic programme shall be four years consisting of eight semesters.

4.1.2. The duration of the programme for lateral entry students who are admitted in II year shall be three years that consists of six semesters.

4.2 Maximum Duration

4.2.1 The maximum period for which a student can take to complete a full time academic programme shall be double the normal duration of the programme, i.e., for regular students eight years, for lateral entry students six years.

4.3 Minimum Duration of a Semester

Each semester consists of a minimum of 90 instruction days with about minimum 20 and maximum 33 contact hours per week.

5. ADMISSION CRITERIA

The eligibility criteria for admission into UG Engineering programmes are as per the norms approved by Government of Andhra Pradesh from time to time. The sanctioned seats in each programme in the college are classified into CATEGORY-A, and CATEGORY-B at I year level and only CATEGORY-A at Lateral Entry II year level.

The percentages of Category–A, Category-B and Lateral Entry Seats are decided from time to time by the Government of Andhra Pradesh.

5.1 CATEGORY – A Seats

Category - A seats are filled as per the norms approved by the Government of Andhra Pradesh.

5.2 CATEGORY – B Seats

Category - B seats are filled by the College as per the norms approved by the Government of Andhra Pradesh.

5.3 CATEGORY - Lateral Entry Seats

Lateral entry candidates shall be admitted into the III semester directly as per the norms approved by Government of Andhra Pradesh.

6. CREDIT SYSTEM AND GRADE POINTS

6.1 Credit Definition

'Credit' means quantified and recognized learning. Credit is measured in terms of contact hours per week in a semester. Typically one credit is given to:

(a) Theory/Tutorial course conducted for one contact period.

(b) Laboratory course conducted for two contact periods.

Each course is assigned a certain number of credits depending upon the number of contact hours (Lectures/Tutorials/Practical) per week.

The curriculum of the eight semesters B.Tech program is designed to have a total of 160 credits for the award of B.Tech degree.

For lateral entry students, the curriculum of six semesters B.Tech program is designed to have a total of 121 credits for the award of B.Tech degree.

6.2 Semester Course Load

The average course load shall be fixed at 20 credits per semester with its minimum and maximum limits being set at 12 and 23 credits.

6.3 Grade Points and Letter Grade for a Course

The grade points and letter grade will be awarded to each course based on student's performance as per the grading system shown in the Table.

Table: Grading System for B. Tech Programme (PVP20 Regulations)

Grades and Grade Points (PVP20 Regulations)

Theory / Drawing (Max-100)	Laboratory/ Mini Project/ Internship etc. (Max – 50)	Level	Grade Point	Letter Grade
≥ 90	≥ 45	Outstanding	10	A+
≥ 80 to ≤ 89	≥ 40 to ≤ 44	Excellent	9	A
≥ 70 to ≤ 79	≥ 35 to ≤ 39	Very Good	8	B
≥ 60 to ≤ 69	≥ 30 to ≤ 34	Good	7	C
≥ 50 to ≤ 59	≥ 25 to ≤ 29	Fair	6	D
≥ 40 to ≤ 49	≥ 20 to ≤ 24	Satisfactory	5	E
< 40	< 20	Fail	0	F (FAIL)
ABSENT	ABSENT	ABSENT	0	AB

* For Major Project same (%) percentages will be followed for grading

6.4 Semester Grade Points Average(SGPA)

The performance of each student at the end of each semester is indicated in terms of SGPA calculated as shown in equation (1)

$$SGPA = \frac{\sum (CR \times GP)}{\sum CR \text{ (for all courses offered in the semester)}} \quad \text{---------- (1)}$$

Where CR= Credits of a course

GP = Grade points awarded for a course

$\sum CR$ = Summation of all the courses offered in the semester

6.5 Cumulative Grade Point Average (CGPA)

The Cumulative Performance of each student at the end of each semester is indicated in terms of CGPA which is calculated as shown in equation (2).

$$CGPA = \frac{\sum CR \; X \; GP}{\sum CR (for\ all\ courses\ offered\ upto\ that\ semester\ /entire\ program)} \text{-- (2)}$$

Where CR = Credits of a course

GP = Grade points awarded for a course

Percentage equivalent of CGPA = (CGPA – 0.75) * 10

7.CURRICULUM FRAMEWORK

7.1. Regular and Honors B.Tech Programmes of all Branches

1. Award of the Degree: A student will be declared eligible for the award of

B. Tech. degree if he/she fulfils the following:

i. Pursues a course of study in not less than four and not more than eight academic years.

ii. After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.

iii. Registers for 160 credits and must secure all the 160 credits.

iv. A student shall be eligible for the award of B.Tech degree with Honors or Minor if he / she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

2. Structure of the Undergraduate Engineering program:

Every course of B.Tech. Program shall be placed in one of the nine categories as listed in table below:

S. No.	Category	Code	Suggested breakup of Credits (APSCHE)	Suggested breakup of Credits (AICTE)
1	Humanities and social science including Management courses	HSMC	10.5	12
2	Basic Science courses	BSC	21	25
3	Engineering Science courses	ESC	24	24
4	Professional core Courses	PCC	51	48
5	Open Elective Courses	OEC	12	18
6	Professional Courses Elective	PEC	15	18
7	Internship, project work seminar, Community Service Project	PROJ	16.5	15
8	Mandatory courses	MC	Non-credit	Non-credit
9	Skill Oriented Courses	SC	10	-
Total Credits			160	160

3. Assigning of Credits:

   1 Hr. Lecture (L) per week - 1 credit

   1 Hr. Tutorial (T) per week - 1 credit

   1 Hr. Practical (P) per week - 0.5 credits

   2 Hours Practical (Lab)/week - 1 credit

4. There shall be mandatory student induction program for fresher's, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., shall be included in the guidelines issued by AICTE

5. All undergraduate students shall register for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Completed or Not Completed in the mark sheet on the basis of participation, attendance, performance and behavior, and it is treated as student practice course . If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

6. Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

7. Institution may swap some of the courses between first and second semesters to balance the workload.

8. The concerned Board of studies can assign tutorial hours to such courses wherever it is necessary, but without change in the total number of credits already assigned for semester.

9. There shall be 05 Professional Elective courses and 04 Open Elective courses. All the Professional & Open Elective courses shall be offered for 03 credits, wherever lab component is involved it shall be (2-0-2) and without lab component it shall be (3-0- 0). If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.

10. All Open Electives are offered to students of all branches in general. However, a student shall choose an Open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.

11. A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the Programme. Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

12. The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

13. Students shall undergo mandatory summer internships for a minimum of four to six weeks duration at the end of second and third year of the Programme. There shall also be mandatory full internship in the final semester of the Programme along with the project work.

14. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course.

15. Under graduate Degree with Honors / Minor shall be issued by the institute to the students who fulfil all the academic eligibility requirements for the B. Tech program and Honors / Minor program. The objective is to provide additional learning opportunities to academically motivated students.

16. Assessment: The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 50 marks for practical subject. The distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Semester Theory Examinations. 15 marks for Internal Evaluation and 35 marks for the

End Semester practical Examinations A student has to secure not less than 35% of marks in the end semester examination and minimum 40% of marks in the sum total of internal and end semester examination marks to earn the credits allotted to each course. Detailed guidelines for continuous evaluation shall be planned by concerned combined BOS of the Universities.

17. **Attendance Requirements**:

i. A student shall be eligible to appear for end semester examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

iii. Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.

v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the college. A student is eligible to write the semester end examinations if he acquires 75% of attendance in aggregate of all the subjects.

7.2 General Issues

7.2.1 Curriculum framework is important in setting the right direction for a degree programme as it takes into account the type and quantum of knowledge necessary to be acquired by a student in order to qualify for the award of degree in his/her chosen branch or specialization.

7.2.2 Besides, this also helps in assigning the credits for each course, sequencing the courses semester-wise and finally arriving at the total number of courses to be studied and the total number of credits to be earned by a student in fulfilling the requirements for conferment of degree.

7.2.3 Each theory course shall consist of five units.

7.3 Curriculum Structure

The curriculum is designed to facilitate B. Tech (Honors) and B.Tech (Major, Minor) incorporates courses required to attain the expected knowledge, skills and attitude by the time of graduation as per the needs of the stakeholders. The curriculum structure consists of various course categories (as described in 7.3.1 to7.3.5) to cover the depth and breadth required for the programme and for the attainment of programme outcomes of the corresponding programme.

7.3.1 Institutional Core

Institutional Core consists of the courses required for all UG Engineering

Programmes offered in this college. The courses offered under this category cover the required knowledge in the following areas:

a) Basic Sciences:

Basic Science courses include Engineering Physics, Applied Physics, Engineering Physics Lab, Applied Physics Lab Engineering Chemistry, Engineering Chemistry Lab, and Engineering Mathematics, etc.

b) Engineering Sciences:

Engineering Science courses include Problem Solving and Programming, AI Tools, Internet of Things, Design Thinking, Basic Electrical and Electronics Engineering, Engineering Graphics, Problem Solving & Programming Lab, Basic Electrical & Electronics Engineering Lab, AI Tools Lab, Internet of Things Lab, Design Thinking Lab and Basic Workshop, etc.

c) Humanities and Social Sciences:

Humanities and Social Science Courses consist of Communicative English I, Communicative English II, HS Elective, Communicative English-I Lab and Communicative English-II Lab, etc.

7.3.2 Elective Courses

Elective courses are offered across the programmes to enhance the knowledge breadth and professional competency of the students.

Courses	Branch Specific	Compulsory
Elective courses	Professional Electives	Supportive to the discipline courses with expanded scope in a chosen track of specialization or cross track courses
	HS Management Elective	Nurture the student interests in management courses.
	Open Electives	Common to all disciplines that helps general interest of a student

7.3.3 Professional Core

The Professional core consists of set of courses considered which are necessary for the students of the specific programme. The courses under this category satisfy the Programme Specific Criteria prescribed by the appropriate professional societies.

7.3.4 Project

In the final semester, the student should mandatorily undergo internship and in parallel he/she should work on a project with well-defined objectives.

7.3.5 Mandatory Learning Courses

According to the guidelines given by statutory bodies, Courses on Environmental Science, Constitution of India and Engineering Ethics, Life Sciences for Engineers and Life Sciences for Engineers Lab shall be offered. Induction program shall be offered in I semester for all the branches.

7.3.6 Honors Programme

In order to obtain honors degree students shall earn additional 20 credits in addition to the 160 credits for obtaining the UG degree. Students can register for additional courses by satisfying the pre-requisite course(s) to a maximum of 8 credits in each of the

semesters from IV semester onwards along with the regular semester courses as prescribed. There is no minimum limit to the credits for taking additional courses.

1. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

    - 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 8.0 CGPA up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 CGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

    - An SGPA and CGPA of 8.0 and above has to be maintained in the subsequent semesters in major degree without any backlogs in order to keep the Honors degree registration active.

    - Should both the SGPA and CGPA of major degree fall below 8.0 in major degree at any point after registering for the Honors; the Honors degree registration will cease to be active.

2. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

3. In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

4. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

5. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

6. The concerned BOS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.

7. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.

8. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the Institute/academic council.

9. The concerned BOS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a

student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

10. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: The courses which were not done under the dropped Honors will not be shown in the transcript.
11. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
12. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

7.4 Minor Programme:

In order to obtain Minor degree students shall earn additional 20 credits in addition to the 160 credits for obtaining the UG degree. Students can register for additional courses by satisfying the pre-requisite course(s) to a maximum of 8 credits in each of the semesters from IV semester onwards along with the regular semester courses as prescribed. There is no minimum limit to the credits for taking additional courses.

A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 7.75 CGPA (Cumulative Grade point average) up to the end of 2^{nd} semester without any history of backlogs. It is expected that the 3^{rd} semester results may be announced after the commencement of the 4^{th} semester. If a student fails to acquire 7.75 CGPA up to 3^{rd} semester or failed in any of the courses, his registration for Minors program shall stand cancelled.

- An SGPA and CGPA of 7.75 and above has to be maintained in the subsequent semesters in major degree without any backlogs in order to keep the minor registration active.
- Should both the SGPA and CGPA fall below 7.75 in major degree at any point after registering for the minor; the minor registration will cease to be active.

1. 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. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

   b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

2. 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 CE, EEE, ME, ECE, CSE, AND IT etc., or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc.

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

4. 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.

5. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BOS along with prerequisites. It is the responsibility of the student to acquire / complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he / she has not studied in any form during the Programme.

6. 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.

7. A student shall earn additional 20 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 Under Graduate Degree in Major Discipline (i.e. 160credits).

8. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4credits.If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the Institute/academic council.

9. Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BOS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

10. A committee should be formed at the level of College / Universities / department to evaluate the grades / marks given by external agencies to a student which are approved by concerned BOS. Upon completion of courses the departmental committee should convert the obtained grades / marks to the

maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

11. 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. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass(P)" grade and also choose to omit the mention of the course as for the following: The courses which were not done under the dropped Minors will not be shown in the transcript.

12. In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

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

7.6 Industrial Collaboration (Case Study)

Institute - Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Institutes in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Institution is permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the Institution can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs. Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Universities / Institutions shall also explore the possibilities of collaborations with major Industries in the core sectors and professional bodies to create specialized domain skills.

7.7 Mandatory Internships

1. Two summer internships each with a minimum of six weeks duration, done at the end of second and third years, respectively are mandatory. The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs.

2. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the Institute.

3. Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee consisting of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department. The report and the oral

presentation shall carry 40% and 60% weightages respectively.

4. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship.

5. In the final semester, the student should mandatorily undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

6. The College shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

7.8 Skill Oriented Courses

1. For skill oriented / skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.

2. Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

3. A pool of interdisciplinary skill oriented courses shall be designed by a common Board of studies by the participating departments / disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

4. The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries / Professional bodies / APSSDC, COURSERA or any other accredited bodies as approved by the concerned BOS.

5. The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.

6. If a student chooses to take a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency / professional bodies as approved by the Board of studies.

7. If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance

requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

8. A committee shall be formed at the level of the college to evaluate the grades / marks given for a course by external agencies and convert to the equivalent marks / grades. The recommended conversions and appropriate grades / marks are to be approved by the Institute / Academic Council.

9. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner (course instructor or mentor). There are no internal marks for the skill oriented courses.

7.9 Course Numbering Scheme

The Course code consists of Eight / Nine characters. The following is the structure of the course Code (Figure 1).

Course Numbering Scheme (PVP20)

2	0	C	S	3	2	0	1	A
Regulation		Course Category		Kind of course	Semester	Type	Course Number	[Elective code]
Last two digits of Regulation offered(i.e. 20 for PVP20 regulations)		HS-Humanities and Social Sciences including Management courses BS-Basic Science courses ES-Engineering Science MC- Mandatory Courses		1. Institutional Core(i.e. HS,BS,ES,MC)	1-First 2-Second 3-Third 4-Fourth 5- Fifth 6-Sixth 7-Seventh 8-Eigth	0-Theory 1-Theory studied in MOOCS Mode 2-Integrated Course (Theory+Lab) 4- NCC/NSS 5- Practical 6-Project Work 7-Seminar	i.e. Course sequence Number in that semester	In case if the course is Elective then this field will specify the elective code (i.e A,B,C…)
		Respective Handling department code is placed		2. Open Elective/ Job Oriented Elective				
		In case of Professional Core/ Professional Elective courses department code is placed: CE-Civil Engineering EE- Electrical & Electronics Engineering ME- Mechanical Engineering EC- Electronics and Communication Engineering CS- Computer Science & Engineering IT- Information Technology AM-CSE(Artificial Intelligence & Machine Learning) DS-CSE(Data Science)		3. Professional Core 4. Professional Elective				
		Respective chosen minor department code is placed		5. Minor Course				
		Respective department code is placed		6. Honors Course				
		Respective Handling department code is placed		7. Humanities and Social Science Elective				
		SO- Skill Oriented Course SA- Skill Advanced Course SS- Soft Skill Course		8. Skill Oriented/ Skill Advanced/ Soft Skill Course		8. Summer/ Industrial/ Research Internship		A - Summer B – Industrial C - Research
						9. Community Service Project		

Figure 1: Course numbering scheme

7.10 Medium of Instruction and Examination

The medium of instruction and examinations shall be English.

7.11 Registration

Every student has to register himself/herself for the courses in each semester individually at the time as specified in academic calendar.

8. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) shall be introduced with effect from 2019-20 academic years, based on guidelines of the statutory bodies in order to promote:

- Activity based learning
- Student centered learning
- Students to choose courses of their choice
- Learning at their own pace

Flexibility is extended to the fast learning students to take the courses of higher semesters in advance as per their convenience to concentrate on their placement activity/ project work, etc., during the VII/VIII semesters.

8.1 CBCS Course Registration Policy

Fast learning students can register for additional courses from higher semesters by satisfying the pre-requisite course(s) to a maximum of 8 credits in each of the semesters from III semester onwards along with the regular semester courses as prescribed. There is no minimum limit to the credits for taking additional courses.

Eligibility for choosing CBCS flexibility:

- **Regular Students (4 Year duration),** entering the n^{th} semester with no backlog courses up to $(n-1)^{th}$ semester, are only eligible to opt for this flexibility.
- **Lateral entry students (3 year duration)** with 70% Marks in their Diploma are eligible to opt for this flexibility during III and IV Semesters. Those students entering into V/ VI /VII semester with no backlog courses up to $(n-1)^{th}$ semester, are only eligible to opt for this flexibility.

  The list of additional courses offered in the even & odd semesters, registration dates will be notified by the respective departments well in advance.

  A student can withdraw from the respective course within 15 days after the commencement of the course.

  The choice of utilizing this flexibility is purely optional to the students.

  A minimum number of students required to register for an additional course shall be twenty (20). In case, the registered strength for the additional course is less than twenty (20), the course may be offered on the recommendation of the Head of the Department and subsequent approval of the Principal.

8.2 Continuous Internal Evaluation (CIE) for CBCS opted Courses

The contact hours, continuous assessment pattern, eligibility criteria to write end semester examinations and revaluation scheme for these additional courses will be as per the current

academic regulations [PVP20].

8.3 Eligibility to appear CBCS registered courses for Semester End Examinations

The registered additional courses will be dealt separately as individual courses for the calculation of attendance and continuous assessment of marks for assessing the eligibility to write the end semester examinations for these courses.

The performance of the student in the registered additional courses will be separately mentioned in the semester end grade card and it will not be taken into account for the calculation of the SGPA for that semester.

The performance of the student in the registered additional courses will be taken into account in the corresponding semesters.

8.4 CBCS Course Detention

8.4.1 In case, the student is detained for want of minimum specified attendance and continuous assessment marks criterion either in the regular semester or in the additional courses, he/she will forfeit the eligibility for registering additional courses from that semester onwards. However, the additional courses completed by the students in the earlier semesters will be valid and taken into consideration.

8.4.2 In case, the student is detained for want of minimum specified attendance and continuous assessment marks criterion in the regular semester but meets minimum specified attendance and continuous assessment marks criterion in the registered additional courses, he/she shall write the end semester examinations for these additional courses along with the regular students in the corresponding semester only.

8.4.3 In case, the student fails / is absent in the end semester examinations of the registered additional courses or in the regular semester courses in a particular semester, he will forfeit the eligibility for registering additional courses from that semester onwards. However, the additional courses completed by the students in the earlier semesters will be valid and taken into consideration. They can write the end semester examinations for additional courses in which they failed/were absent, along with regular students in the corresponding semesters only.

8.4.4 The criterion for the promotion to higher semesters will be as per PVP20 regulations, taking only the regular semester courses into consideration for the fast learners.

8.4.5 Additional courses, in which the fast learning student fails, will not be considered as backlogs for them.

8.4.6 The fast learning students shall register for all the courses of a regular semester excluding the courses completed in the previous semesters.

8.4.7 The credits scored by students through CBCS subjects shall not be considered for credit promotion from II year to III year or from III year to IV year B.Tech.

8.4.8 The student opting for the said flexibility will be considered for the award of the division on par with other regular students.

8.4.9 The students who have earlier history of indulging in malpractices in semester end examinations are not eligible for opting CBCS.

8.4.10 If the student fails to register for opted CBCS courses for semester end examination, he/she will forfeit the eligibility for registering additional courses from that semester onwards and marks secured through continuous assessment will not be considered.

8.4.11 The choice of utilizing this flexibility is purely optional to the students.

8.4.12 If a student fails/absent in a CBCS course, he/she is bound to appear in the same course when studied in regular semester.

9 EXAMINATIONS & SCHEME OF EVALUATION

9.1 Description of Evaluation

1. **Continuous Internal Evaluation (CIE):** The performance of the student in each course is evaluated by the faculty/course coordinator all through the semester; with mid-term tests (sessional-1and sessional-2), assignments, project reviews, viva-voce, laboratory assessment and other means covering the entire syllabus of the course.

2. **Semester End Examination (SEE):** It shall be conducted by chief controller of examinations at the end of each semester, as per the academic calendar and with a written examination for theory courses and practical/project examination with built-in oral part for laboratory/project.

9.2 Continuous Internal Evaluation (CIE)

9.2.1 Theory Courses

a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one objective examination (20 multiple choice questions) for 10 marks for duration of 20 minutes (ii) one descriptive examination (3 full questions for 5 marks each) for 15 marks for duration of 90 minutes and (iii) one assignment for 5 marks. Mid-1 shall be conducted from first 50% of the syllabi.

b) In the similar lines, the second objective, descriptive examinations, assignment shall be conducted on the rest of the 50% syllabus.

c) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The first mid marks (Mid-1) consisting of marks of objective examination, descriptive examination and assignment shall be submitted by the concerned teacher to the department examination section within one week after completion of first mid examination.

d) The mid marks submitted to the department examination section shall be displayed in the concerned department notice boards for the benefit of the students.

e) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of Head of the department within one week from the submission.

f) Second mid marks (Mid-2) consisting of marks of objective examination, descriptive Examination and assignment shall also be submitted by the concerned teacher to the department examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in

the submitted mid-2 marks, it shall be brought to the notice of Head of the department within one week from the submission.

g) Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for other mid exam.

Example:

Mid-1 marks = Marks secured in (Objective-1+Descriptive examination-1 +Assignment-1)

Mid-2 marks = Marks secured in (Objective-2+Descriptive examination-2 +Assignment-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8

+ Least of (Mid-1/Mid-2) marks x 0.2)

h) With the above criteria, concerned departments have to display the consolidated marks obtained by the students in the department notice boards. If any discrepancy found, it shall be brought to the notice of Head of the department through proper channel within one week with all proofs.

9.2.2 Mandatory Learning Courses

Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, Life Sciences for Engineers, etc. non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.

9.2.3 Drawing Based Courses:

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester for 15 marks each and final marks can be calculated with 80% weightage for better of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work.

9.2.4 Laboratory Courses

For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows: day today work - 5 marks, Record-5 marks and the remaining 5 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner appointed.

Table: Distribution of Marks (CIE)

S. No.	Criterion	Marks
1	Day to Day Evaluation	5
2	Record	5
3	Internal Examination	5

9.2.5 MOOCs Courses

There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall pass.

9.3 Semester End Examination (SEE)

9.3.1 Theory Courses:

a) The semester end examinations will be for 70 marks consisting of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

b) The job oriented skill courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner (course instructor or mentor). There are no internal marks for the job oriented skill courses.

9.3.2 Laboratory Courses: 35 marks

i. The Semester end examination for laboratory courses shall be conducted with three hour duration at the end of semester for 35 marks as given below:

Table : Distribution of Marks (SEE)

S.No.	Criterion	Marks
1	Procedure	5
2	Experiment / Programme Execution	15
3	Result	10
4	Viva-Voce	5

ii. Each Semester end Laboratory Examination shall be conducted by an External Examiner along with the Internal Examiner.

9.3.3 Internship: 50 Marks (Only External marks)

Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 6 weeks. The student shall register for the course as per course structure after commencement of academic year. A supervisor / mentor / advisor have to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the Institute. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department. A certificate from industry / skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the Institute.

9.3.4 Community Service Project (CSP): 100 Marks

Report on CSP should be submitted by each student. An internal Viva shall also be conducted by a Committee constituted by the Principal of the college. The assessment is to be conducted for **100 marks**. The number of credits assigned is 4. Later the marks are converted into grades and grade points to include finally in the SGPA and CGPA. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the Institute. The students must do the community service project in the vacation period after I-II .

The weightings shall be:

Activity Log 20% CSP Implementation 30%

Report 25% Presentation 25%

For Complete details: https://www.jntuk.edu.in/jntuk-dap-community-service-project-guidelines-reg/

9.3.5 Major Project

(Project - Project work, seminar and internship in industry):

In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

Evaluation: The total marks for project work for **200 marks** and distribution shall be **60 marks for internal** and **140 marks** for **external** evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks.

9.4 Conditions for Pass Marks

I. Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Institution Examination section from time to time.

II. To maintain the quality, external examiners and question paper setters shall be selected from premier institutes and Universities, NITs, Autonomous colleges.

III. For non-credit mandatory courses, like Life sciences for Engineers, Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

IV. A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/ project etc by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the sum total of the internal marks and end semester examination marks together.

V. **Distribution and Weightage of marks**:

The assessment of the student's performance in each course will be as per the details given

SNo	Component	Internal	External	Total
1	Theory	30	70	100
2	Lab	15	35	50
3	Mandatory	30	70	100
4	Drawing	30	70	100
5	Project	60	140	200
6	Mini Project/Internship/Industrial Training / Skill Development Programs/Research Project	-	50	50

9.5 Revaluation

9.5.1 Continuous Internal Evaluation

The continuous Evaluation scripts shall be shown to the students before finalizing the marks. However, if the student has any concern, not addressed before the finalization of marks, he/she may submit the application for revaluation to the concerned head of the department. The Head of the Department may constitute a two-member committee for re-evaluating the script. The evaluation of the committee is final and binding.

9.5.2 Semester End Examination

1. As per the notification issued by the Controller of Examinations, the students can submit the applications for revaluation, along with the requisite fee receipt for revaluation of his/her answer script(s) of theory course(s), if he/she is not satisfied with the marks obtained.
2. The Controller of Examinations shall arrange for re-evaluation of those answer script(s).
3. A new external examiner, other than the first examiner, shall re-evaluate the answer script(s).
4. Revaluation marks will be taken into consideration only if the difference between the two valuations is more than or equal to 15%. Better marks between the two shall be taken into consideration. However, if the revaluation marks facilitates passing of the candidate, then the revaluation marks will be considered even if the difference of marks is less than 15%.
5. If the difference of marks between the two valuations is more than 20%, the answer script will be referred to third valuation. The average of nearest two marks will be awarded.

9.6 Withholding of Results

If the student has not paid the dues to the college, or if any case of malpractice or indiscipline is pending against him, the result of the student will be kept as withheld and he/she will not be allowed to enter the next semester. His/her degree shall be considered as withheld in such cases.

10 CRITERIA TO ATTEND SEMESTER END EXAMINATION AND PROMOTION TO HIGHER SEMESTER

10.1 Eligibility for Semester End Examinations

10.1.1 Students shall put in a minimum average attendance of 75% in the courses. computed by totalling the number of periods of lectures, tutorials, drawing, practical and project work as the case may be, held in every course as the denominator and the total number of periods attended by the student in all the courses put together as the numerator, to be eligible to write semester end examinations.

10.1.2 Condonation of shortage in attendance may be recommended by respective Heads of Departments on genuine medical grounds, provided the student puts in at least 65% attendance as calculated above and provided the Principal is satisfied with the genuineness of the reasons and the conduct of the student.

10.1.3 Students, having more than 65% and less than 75% of attendance, shall have to pay requisite fee towards condonation.

10.2 Promotion Rules

1. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirements.
2. A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to either II year I-Semester or II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
3. A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

11. SUPPLEMENTARY EXAMINATIONS

1. General

Semester end Supplementary examinations shall be conducted along with regular semester end examinations.

2 Advanced Supplementary Exams

Candidate(s), who fails in Theory or Laboratory courses of VIII semester, can appear for advanced supplementary examination conducted within one month after declaration of the revaluation results. However, those candidates who fail in the advanced supplementary examinations of VIII semester shall appear for subsequent examinations along with regular candidates conducted at the end of the respective academic year.

12. READMISSION CRITERIA

A candidate, who is detained in a semester due to lack of attendance/credits, has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling all the required norms stipulated by the college in addition to paying an administrative fee of **Rs. 1,000/-**

Rules for calculation of attendance for readmitted students

a) Number of classes conducted shall be counted from the commencement day of the semester concerned, irrespective of the date of payment of tuition fee.

b) They shall submit a written request to the principal of the college, along with a challan paid towards tuition and other fee, for readmission before the commencement of the class work.

c) They can get the information regarding date of commencement of class work for each semester that will be made available in the college notice boards/website from time to time.

13 BREAK IN STUDY

Student, who discontinues the studies for valid reason permitted by the principal, shall get readmission into appropriate semester of B.Tech. programme after break-in study,

with the prior permission of the Principal and following the transitory regulations applicable to such batch in which he/she joins. An administrative fee of **Rs**. 1**000/-**per each year of break in study, in addition to the prescribed tuition and special fee has to be paid by the candidate to condone his/her break in study.

14 GAP YEAR

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at Institution level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

15 TRANSITORY REGULATIONS

A candidate, who is detained or discontinued in a semester, on re-admission, the academic regulations under which he/she has originally admitted will continue to be applicable to him/her on re-admission.

16 ELIGIBILITY FOR AWARD OF B.TECH DEGREE

1. The B.Tech. Degree shall be conferred on a candidate who satisfies the following requirements.

   a) A Regular student (four year programme) shall register and secure himself/herself for **160** Credits

   b) A Lateral Entry student (three year programme) shall register and secure himself/herself for**12**1 credits

2. Award of Division

The criteria for award of division, after successful completion of programme are as shown in Table:

Table : Criteria for Award of Division

Class Awarded	CGPA to be secured	Remarks
First class with distinction	≥7.75 (Without any supplementary appearance)	From the CGPA secured from 160 credits
First class	≥6.75	
Second class	≥5.75 to <6.75	
Pass Class	≥5.00 to <5.75	

- Awarded only if all the courses prescribed are cleared in single attempt within four years for regular candidates and three years for lateral entry candidates
- Detained and break-in study candidates are not eligible for the award of First Class with Distinction
- The cases of students who are absent for semester end examination only once in his/her duration of B.Tech. Programme on valid medical grounds/humanitarian grounds shall also be considered for the award of First class with Distinction subject to the recommendations of the committee constituted by the Principal.

For the purpose of awarding First, Second and Pass Class CGPA obtained in the

examinations appeared within the maximum period allowed for the completion of the programme shall be considered.

Consolidated Grade Card

A consolidated grade card containing credits & grades obtained by the students will be issued after successful completion of the four year B.Tech Programme.

17 CONDUCT AND DISCIPLINE

1. Students shall conduct themselves within and outside the premises of the Institute in a manner befitting the students of our Institution.
2. As per the order of Honorable Supreme Court of India and AICTE guidelines, ragging in any form is considered a criminal offence and is banned. Ragging within or outside any educational institution is prohibited. Ragging means doing an act, that causes or is likely to cause insult or annoyance or fear of apprehension or threat or intimidation or outrage of modesty or injury to a student. Any form of ragging will be severely dealt with as per AP Prohibition of Ragging Act-1997 section-4.

Table : Punishments for Ragging

Nature of ragging	Punishment
Teasing, embarrassing and humiliating	Imprisonment up to 6 months or fine up to Rs.1,000/- or both
Assaulting or using criminal force or criminal intimidation	Imprisonment up to 1 year or fine up to Rs.2,000/- or both
Wrongfully restraining or confining or causing hurt	Imprisonment up to 2 years or fine up to Rs.5,000/- or both
Causing grievous hurt kidnapping or raping or committing unnatural offence	Imprisonment up to 5 years and fine up to Rs.10,000/-
Causing death or abetting suicide	Imprisonment up to 10 years and fine up to Rs.50,000/-

3. A student who is convicted of an offence and punished with imprisonment for a term of more than six months shall not be admitted into the institution.
4. Whenever any student complains of ragging to the head or manager of an educational institution, such head or manager should inquire into the complaint and if the complaint is prima-facie found true, should suspend the student or students complained against.
5. If the head or manager of an educational institution fails or neglects to take action in the manner specified in the Act, the person shall be deemed to have abetted the offence and shall be punished with the punishment provided for the offence.
6. If a student commits suicide due to or in consequence of ragging, the person who commits such ragging shall be deemed to have abetted such suicide.
7. The following acts of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures.

i. Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus

ii. Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

The following activities are not allowed within the campus:

- Mutilation or unauthorized possession of library books.
- Noisy and unseemly behaviour, disturbing studies of fellow students.
- Hacking computer systems (such as entering into other person's areas without prior permission, manipulation and/or damage of computer hardware and software or any other cybercrime etc.)
- Use of mobile phones.
- Plagiarism of any nature.
- Any other act of gross indiscipline as decided by the Institute from time to time.
- Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute/ hostel, debarment from a examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.
- For an offence committed in (i) a hostel, (ii) a department or in a class room and (iii) elsewhere, the Chief Warden, the Head of the Department and the Principal, respectively, shall have the authority to reprimand or impose fine.
- Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Principal for taking appropriate action.
- Unauthorized collection of money in any form is strictly prohibited.
- Detained and break-in-study candidates are allowed into the campus for academic purposes only with the permission from authorities.
- Misconduct committed by a student outside the Institute campus but having the effect of damaging, undermining & tarnishing the image & reputation of the institution will make the student concerned liable for disciplinary action commensurate with the nature and gravity of such misconduct.
- The disciplinary action committee constituted by the Principal, shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.
- Grievance redressal committee, constituted by the Principal, shall deal with all grievances pertaining to the academic/ administrative and disciplinary matters.
- All the students must abide by the code and conduct rules of the Institute.

18 MALPRACTICES

The Principal shall refer the cases of malpractices by students in internal assessment tests and end semester examinations, to a malpractice enquiry committee constituted for the purpose. The committee shall follow the approved scales of punishment.
The committee consists of:

1. Heads of Department (Three)
2. Controller of Examinations
3. Assistant Controller of Examinations

Table – 10: Disciplinary action for malpractices/improper conduct in examinations

	Nature of Malpractices/Improper conduct	Punishment
1 (a)	If the candidate possesses or keeps accessible, any paper, note book, programmable calculators, mobile phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in the examination hall but has not made use of (material shall include any marks on the student's body that can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through mobile phones with any candidate 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 subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work. He shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The hall ticket of the candidate is to be cancelled.
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the candidate smuggles in an answer book or additional sheet or takes out	Expulsion from the examination hall and cancellation of performance in that subject and

	or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all other examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	If the candidate 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 subject.
6	If the candidate refuses to obey the orders of the Chief Superintendent/Assistant - 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 results in damage to or destruction of property in the examination hall or any part of the Institute 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 Institute, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	If the candidate leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work

		and all other examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the candidate possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the Institute, who is not a candidate for the particular examination or any person not connected with the Institute indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the Institute: Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work. He shall not be permitted for the remaining examinations of the subjects of that semester/ year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the Institute: Will be handed over to police and a police case will be registered against them.
10	If the candidate comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work. He shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11, shall be awarded suitable punishment.	

Note: Special squads may be formed to oversee the proper conduct of examinations.

19 OTHER MATTER

19.1 Scribe facility is extended to B Tech students strictly following the guidelines issued under F. No. 16-110/2003-DD.III Dt. 26-02-2013 by the Ministry of Social Justice and Empowerment, Department of Disability Affairs, Govt. of India.

19.2 Students who are suffering from contagious diseases are not allowed to appear either continuous internal assessment or semester end examinations

19.3 The students who participate in coaching/tournaments held at State/National/International levels through University/Indian Olympic Association

during semester end examination period will be promoted to subsequent semesters till the entire programme is completed as per the guidelines of University Grants Commission Letter No. F.1-5/88 (SPE/PES), dated18-08-1994.

19.4 Based on the recommendations of HOD & Principal, exemption from attending the class work shall be given to those students who secure placement and intend to join as the employer in VIII semester of B.Tech. Special Continuous Internal Evaluation (Assignment Tests, Sessional, etc.,) will be arranged to such candidates separately if necessary. However, they shall appear for Semester End Examinations as per the Academic Calendar

19.5 The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the Heads of the Departments in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved in the Heads of the Departments Meetings, shall be reported to the academic council for ratification.

20 GENERAL

1 Wherever the words “he”, “him”, “his”, occur in the regulations, they may include “she”, “her”, “hers”.
2 The academic regulations should be read as a whole for the purpose of any interpretation.
3 In case of any doubt or ambiguity in the interpretation of above rules, the decision of the principal is final.

21 INSTITUTE RULES AND REGULATIONS

1 Use of **Mobile phones** is strictly prohibited inside the Institute academic area.

2 Students should come to Institute in **proper dress**.

3 All students should wear **Identity cards** in the Institute premises.

4 Students should be present in their respective classrooms **before the commencement of class sharply**.

5 Students should not leave the Institute premises without prior permission of their respective Heads of the departments during Institute working hours.

6 Students should maintain silence in the class rooms during working periods.

7 Sitting / wandering of the students at the stair cases, corridors, cycle stands or the areas within the Institute premises is strictly prohibited.

8 Usage of Vehicle horn inside the Institute premises is prohibited.

22 AMENDMENTS TO REGULATIONS

The Academic Council may, from time to time, revise, amend or change the regulations, schemes of examination and/or syllabi.

Oratory

PRINCIPAL

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

COURSE STRUCTURE

&

SYLLABUS

DEPARTMENT OF Computer Science & Engineering
(Artificial Intelligence and Machine Learning)

I B.TECH - I SEMESTER

Course Code	Title	Credits	L	T	P	Internals	Externals	Total
20HS1101	Communicative English I	3	3	0	0	30	70	100
20BS1101	Calculus and Linear Algebra	3	3	0	0	30	70	100
20BS1102	Engineering Chemistry	3	3	0	0	30	70	100
20ES1105	Digital Logic Design	3	3	0	0	30	70	100
20ES1106	Programming for Problem Solving using C	3	3	0	0	30	70	100
20HS1151	Communicative English I Lab	1.5	0	0	3	15	35	50
20BS1151	Engineering Chemistry Lab	1.5	0	0	3	15	35	50
20ES1154	Programming for Problem Solving using C Lab	1.5	0	0	3	15	35	50
20MC1101	Life Science for Engineers	0	2	0	2	30	70	100
	Total	**19.5**	**15**	**0**	**9**	**285**	**525**	**750**

L - Lecture T - Tutorial P - Practical

I B.TECH - II SEMESTER								
Course Code	Title	Credits	L	T	P	Internals	Externals	Total
20HS1201	Communicative English-II	3	3	0	0	30	70	100
20BS1203	Engineering Physics	3	3	0	0	30	70	100
20BS1204	Engineering Mathematics - II (Probability & Statistics)	3	3	0	0	30	70	100
20BS1207	Discrete Mathematical Structures	3	3	0	0	30	70	100
20ES1205	Python Programming	3	3	0	0	30	70	100
20HS1251	Communicative English-II Lab	1.5	0	0	3	15	35	50
20BS1252	Engineering Physics Lab	1.5	0	0	3	15	35	50
20ES1255	Python Programming Lab	1.5	0	0	3	15	35	50
	Total	**19.5**	**15**	**0**	**9**	**195**	**455**	**650**
	L - Lecture T - Tutorial P - Practical							

II B.TECH - I SEMESTER								
Course Code	Title	Credits	L	T	P	Internals	Externals	Total
20ES1306	Computer Organization	3	3	0	0	30	70	100
20ES1307	Foundations of Artificial Intelligence	3	3	0	0	30	70	100
20AM3301	Operating Systems	3	3	0	0	30	70	100
20AM3302	Object Oriented Programming through Java	3	3	0	0	30	70	100
20AM3303	Data Structures	3	3	0	0	30	70	100
20SO8357	Foundations of Competitive Programming	2	1	0	2	15	35	50
20ES1357	Programming for Artificial Intelligence Lab	1.5	0	0	3	15	35	50
20AM3351	Object Oriented Programming through Java Lab	1.5	0	0	3	15	35	50
20AM3352	Data Structures Lab	1.5	0	0	3	15	35	50
20AM3391	Community Service Project	4	0	0	0	--	100	100
	Total	**25.5**	**16**	**0**	**11**	**295**	**505**	**800**
	L - Lecture T - Tutorial P - Practical							

II B.TECH - II SEMESTER

Course Code	Title	Credits	L	T	P	Internals	Externals	Total
20BS1403	Formal Languages and Automata Theory	3	3	0	0	30	70	100
20AM3401	Software Engineering	3	3	0	0	30	70	100
20AM3402	Database Management Systems	3	3	0	0	30	70	100
20AM3403	Design and Analysis of Algorithms	3	3	0	0	30	70	100
20ES1402	Internet of Things	3	3	0	0	30	70	100
20ES1452	Internet of Things Lab	1.5	0	0	3	15	35	50
20AM3452	Algorithms Lab	1.5	0	0	3	15	35	50
20AM3451	Database Management Systems Lab	1.5	0	0	3	15	35	50
20SO8456	Advanced Competitive Programming	2	1	0	2	--	50	50
20MC1402	Environmental Sciences	0	2	0	0	100	--	100
	NSS/NCC	0	0	0	2	--	--	--
	Total	**21.5**	**18**	**0**	**13**	**195**	**505**	**800**
	Honors							
20AM6421	Advanced Data Structures	2	1	0	2	--	50	50
	L - Lecture T - Tutorial P - Practical							

PVP20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA-520007

I B.Tech – I Sem CSE (AI&ML)
COMMUNICATIVE ENGLISH I

Course Code	20HS1101	**Year**	I	**Semester**	I
Course Category	Humanities	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Examination**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the concept of LSRW and basic grammar	**L2**
CO2	Apply grammar to various situations	**L3**
CO3	Practice different styles of Reading and Comprehending	**L3**
CO4	Illustrate the text to process the information for various purposes.	**L4**
CO5	Reframe the text for effective communication.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1														
CO2										3		3		
CO3									3	3		3		
CO4										3		3		
CO5									3	3		3		

Syllabus		
Unit No.	**Contents**	**Mapped CO's**
I	**Reading:** Skimming to get the main idea of a text; Scanning to look for specific pieces of information. **Reading for Writing:** Beginnings and endings of paragraphs - Introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Content words and function words; Word forms: Verbs, Nouns, Adjectives and Adverbs; Nouns: countable and uncountable; singular and plural; Basic sentence structures; Simple Question form - wh-questions; Word order in sentences.	**CO1,CO3, CO5**
II	**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraphtogether. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; Mechanics of writing - punctuation, capital letters. **Grammar and Vocabulary:** Cohesive devices - linkers, sign posts and transition signals; Use of articles and zero article; prepositions One word substitutes	**CO1,C02, CO5**
III	**Reading:** Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. **Grammar and Vocabulary:** Verbs - Tenses; Subject-verb agreement; Direct And Indirect speech, Reporting verbs for academic purposes. Idiomatic expressions	**CO1,CO3, CO4,CO5**
IV	**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; Degrees of comparison; Use of antonyms **Correction of sentences**	**CO1,CO2, CO4,CO5**
V	**Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences **Grammar and Vocabulary:** Editing short texts – Identifying and correcting common errors in grammar and usage (Articles, Prepositions, Tenses, Subject-verb agreement) **Prefixes/suffixes**	**CO1,CO3, CO5**

Learning Resources
Text Books
1. Prabhavathy Y, M.Lalitha Sridevi, Ruth Z. Hauzel, "English all Round 1: Communication skills for Undergraduate students", Orient Black Swan, 2019
Reference Books
1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014. 2. SkillfulLevel2Reading&WritingStudent'sBookPack(B1)MacmillanEducational. 3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012
e- Resources & other digital material
Grammar/Listening/Writing: 1language.com;http://www.5minuteenglish.com/https://www.englishpractice.com/ **Grammar/Vocabulary:** English LanguageLearningOnline; http://www.bbc.co.uk/learningenglish/ http://www.betterenglish.com/; http://www.nonstopenglish.com/ https://www.vocabulary.com/; BBC VocabularyGames Free Rice Vocabulary Game **Reading:** https://www.usingenglish.com/comprehension/; https://www.englishclub.com/reading/short- stories.htm; https://www.english-online.at/ **All Skills:** https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/ **Online Dictionaries:** Cambridge dictionary online;MacMillandictionary; Oxford learner'sdictionaries

PVP20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA-520007

I B.Tech – I Sem CSE (AI&ML)

CALCULUS AND LINEAR ALGEBRA

Course Code	20BS1101	**Year**	I	**Semester**	I
Course Category	Basic Science	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Examination**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	**Understand** the basic concepts of calculus and linear algebra	**L2**
CO2	**Apply** the echelon form to obtain the solution of system of linear equations eigenvectors of a matrix.	**L2**
CO3	**Apply** the concepts of calculus to find the series expansion and extreme of a given function, area enclosed by plane curves and volume of the solids.	**L3**
CO4	**Analyze**the solution set of linear system of equations and nature of the quadratic forms.	**L4**
CO5	**Analyze**the behavior of functions using mean value theorems, extreme of the given function and limits of integration.	**L4**
CO6	**Apply** the concepts of calculus and linear algebra to the given problem and submit a report	

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1													1	1
CO2	3								2	2			1	1
CO3	3								2	2			1	1
CO4		3											1	1
CO5		3											1	1
CO6	3								2	2			1	1

Syllabus		
Unit No.	**Contents**	**Mapped CO's**
I	**Matrices-Linear System of Equations:** Rank of a matrix by Echelon form, Normal form, PAQ form, solving system of homogeneous and non-homogeneous linear equations.	**CO1,CO2, CO4,CO6**
II	**Eigen values and Eigen Vectors:** Eigen values, Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalization of a matrix, quadratic forms and nature of the quadratic forms.	**CO1,CO2, CO4,CO6**
III	**Mean Value Theorems:** Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proofs).	**CO1,CO3, CO5,CO6**
IV	**Multivariable Calculus:** Functions of several variables, Jacobian, Functional dependence, maxima and minima of functions of two variables, method of Lagrange's multipliers.	**CO1,CO3, CO5,CO6**
V	**Multiple Integrals:** Double integrals, change of order of integration, double integration in polar coordinates, Triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, volume as triple integral. **Application-** Areas enclosed by plane curves.	**CO1,CO3, CO5,CO6**

Learning Resources
Text Books:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44/e, 2019. 2. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006
Reference Books:
1. N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 2008.
e- Resources & other digital material:
1. https://nptel.ac.in/courses/111/108/111108157/ 2. https://www.nptel.ac.in/courses/111/104/111104125/ 3. https://youtu.be/xDSejIvZmg4 4. http://202.53.81.118/ -> PVPSIT FED-Moodle

PVP20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA-520007

I B.Tech – I Sem CSE (AI&ML)
ENGINEERING CHEMISTRY

Course Code	20BS1102	**Year**	I	**Semester**	I
Course Category	Basic Science	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Examination**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic principles related to renewable energy sources, energy systems, metal finishing and materials	**L2**
CO2	Apply the knowledge of energy transformation principles to classify and describe the working of electrodes and cells	**L3**
CO3	Apply suitable methods for metal finishing and advanced techniques for the characterization of nano materials	**L3**
CO4	Analyze the performance of different electrochemical techniques, energy conversion systems, polymers and nano materials in their respective applications	**L4**
CO5	Make an effective report on various concepts and technologies related to Engineering chemistry.	

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1														
CO2	3						1					1	1	
CO3	3						1					1	1	
CO4	3						1					1	1	
CO5	3						1			2		1	1	

Syllabus		
Unit No.	**Contents**	**Mapped CO's**
I	**ELECTROCHEMICAL ENERGY SYSTEMS** Introduction-Origin of electrode potential, Electrode Potentials, Measurement of Electrode Potentials, Nernst Equation for a single electrode, EMF of a cell, Types of Electrodes or Half Cells-Hydrogen and Calomel electrode, Electrochemical Cell, Galvanic Cell vs Electrolytic Cell, Electrochemical conventions, Types of Ion Selective Electrodes- glass membraneelectrode,polymermembraneelectrodes,solidstateelectrodes, gas sensing electrodes (classification only), Concentration Cells.	**CO1,CO2, CO4,CO5**
II	**BATTERY TECHNOLOGY** Basic concepts, battery characteristics, classification of batteries, Important applications of batteries, Classical batteries-dry/Leclanche cell, Modern batteries-zinc air, lithium cells-Li Mno2 cell- challenges of battery technology. Fuel cells- Introduction - classification of fuel cells – hydrogen and oxygen fuel cell, propane and oxygen fuel cell- Merits of fuel cell.	**CO1,CO2, CO4,CO5**
III	**RENEWABLE SOURCES OF ENERGY** Introduction- sources of renewable energy Solar energy – Introduction - Physical and Chemical properties of Silicon- Production of Solar Grade Silicon from Quartz - Doping of Silicon- p and n type semi conductors- PV cell / solar cell- Manufacturing of Photovoltaic Cells using Chemical Vapor Deposition Technique-applications of solar energy	**CO1,CO2, CO4,CO5**
IV	**METAL FINISHING** Technological importance of metal finishing, methods of metal finishing, manufacturing of electronic components, electrochemical techniques of forming, machining and etching, electrolytic cell, principle of electroplating, nature of electrodeposits, electroplating process, Electroplating of chromium, gold etc. Electroless plating of copper,nickel	**CO1,CO3, CO4,CO5**
V	**POLYMERS & NANOMATERIALS** Polymers: Introduction thermoplastic and thermo setting resins, Preparation, properties and uses of polystyrene and Polyphosphazines., differences between Nanomaterials: Introduction to nanomaterial: nanoparticles, nanocluster, carbon nanotube (CNT) and nanowires. Chemical synthesis of nanomaterials: sol-gel method. Characterization: Principle and applications of scanning electron microscope (SEM) and transmission electron microscope (TEM).	**CO1,CO3, CO4,CO5**

Learning Resources
Text Books:
1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, DhanapatRai& Sons, Delhi(2014). 2. B.K. Sharma, Engineering Chemistry, Krishna Prakashan,Meerut. 3. O G Palanna, Engineering Chemistry, Tata McGraw Hill(2009).
Reference Books:
1. Sashichawla, A Textbook of Engineering Chemistry, DhanapathRai and sons,(2003) 2. B.S Murthy and P. Shankar, A Text Book of NanoScience andNanoTechnology, University Press(2013). 3. S.S. Dara, A Textbook of Engineering Chemistry, S.Chand& Co,(2010) 4. N.Krishna Murthy and Anuradha, A text book of EngineeringChemistry, M murthyPublications(2014). 5. K. SeshaMaheshwaramma and Mridula Chugh, Engineering Chemistry, PearsonIndia Edn services,(2016).
e- Resources & other digital material:
1. https://nptel.ac.in/courses/105105178 2. http://202.53.81.118/course/view.php?id=82

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA-520007

I B.Tech – I Sem CSE (AI&ML)

DIGITAL LOGIC DESIGN

Course Code	20ES1105	**Year**	I	**Semester**	I
Course Category	Engineering Sciences	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Elementary Mathematics
Continuous Internal Evaluation	30	**Semester End Examination**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts of digital circuits.	**L2**
CO2	Apply minimization techniques to simplify Boolean expressions.	**L3**
CO3	Apply the principles of digital electronics to design combinational and sequential circuits.	**L3**
CO4	Analyze the functionality of combinational circuits and sequential circuits.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	2													
CO3	3													
CO4		2										1		

Syllabus		Mapped CO's
Unit No	**Contents**	
I	**DigitalSystemsandBinaryNumbers:** Digital Systems, Binary Numbers, Number BaseConversions, Octal and Hexadecimal Numbers, Complements of Numbers, Arithmetic Addition and Subtraction, Binary codes - BCD, Excess-3, Gray codes and Binary Logic.	**CO1**
II	**BooleanAlgebra and Logic Gates:** Introduction, Basic Definitions, Axiomatic definition of Boolean Algebra, Basictheorems and properties of BooleanAlgebra,Boolean functions, Canonical and Standard Forms **Gate–LevelMinimization**: Introduction, Map Method-Three variable K-Map, Four Variable K-Map, Product of Sums Simplification, Don't Care Conditions	**CO1,CO2**
III	**CombinationalLogic:** Introduction, Combinational Circuit, Analysis Procedure,Design Procedure,Half adder & subtractor, Full adder & subtractor, Binary adder, Encoders, Decoders, Multiplexers,Demultiplexers.	**CO1, CO3, CO4**
IV	**SequentialLogic:**Introduction **Storage Elements: Latches** –SR **Storage Elements: Flip Flops**–SR, JK, D and T Flip Flops - Characteristic tables, Characteristic equation, Excitation tables, Conversions of Flip-flops	**CO1, CO3, CO4**
V	**RegistersandCounters:** Registers, Shift Registers -Serial Transfer, Serial Addition, Universal Shift Register **Ripple Counters**-Binary Ripple Counter, BCD Ripple Counter **Synchronous Counters**-Binary Counter, Up–Down Binary Counter, and BCD Counter.	**CO1, CO3, CO4**

Learning Resources
Text Books
1. Digital Design, M. Morris Mano, Michael D.Ciletti, Fifth Edition, 2013, Pearson.
References
1. Switching Theory and Finite Automata, Zvi. Kohavi, Niraj K. Jha, Third Edition, 2010, Cambridge, University Press. 2. Fundamentals of Digital circuits, A. Anand Kumar, ThirdEdition, 2013, PHI.
e-Resources & other digital material
1. https://nptel.ac.in/courses/106/108/106108099/http://nptel.ac.in/courses/117106086/1 2. https://nptel.ac.in/courses/117/105/117105080/ 3. https://www.udemy.com/course/digital-electronics-logic-design/ 4. https://learnabout-electronics.org/Digital/dig20.php 5. https://www.tutorialspoint.com/digital_circuits/digital_circuits_logic_gates.htm 6. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/

PVP20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA-520007

I B.Tech – I Sem CSE (AI&ML)

PROGRAMMING FOR PROBLEMSOLVING USING C

Course Code	20ES1106	**Year**	I	**Semester**	I
Course Category	Engineering Sciences	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Elementary Mathematics
Continuous Internal Evaluation	30	**Semester End Examinations**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the principles of problem-solving techniques and C constructs for solving problems.	**L2**
CO2	Develop algorithms and flowcharts for various problems.	**L3**
CO3	Apply the knowledge of C programming constructs for a given problem	**L3**
CO4	Analyze the given problem and use a suitable programming approach to develop solutions.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes& Strength of correlations (3:High,2:Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	2													
CO3	3													
CO4		2										1		

Syllabus		
Unit No.	**Contents**	**Mapped CO,s**
I	**Introduction to Programming:**Computer, Components of a computer, Computer Software, Generations of Programming Languages. **Algorithms:** Introduction, Examples. **Flowcharts:** Introduction, symbols, Examples.	**CO1,CO2**
II	**Introduction to C:**Introduction, Structure of C Program, A Simple CProgram, C-Tokens, Basic Data types, Variables, Constants, Input / Outputstatements,Operators, Type conversionandTypecasting. **Conditional Branching Statements:**if,if-else,if-else-ifStatementsand Switchcase.	**CO1,CO3**
III	**Iterative Statements:**while,foranddo-whileloops,Nestedloops,break goto and continue statements. **Arrays:**Declaration,Accessingarrayelements,Storingvalues,Operationsonarrays, Multi-dimensional arrays. **Strings:** Introduction,String manipulation functions.	**CO1,CO3**
IV	**Functions:**Introduction,Using Functions,Function declaration,FunctionDefinition and Functioncall,Types of functions, Parameter passing,Passing arrays to functions,Recursion, Storageclasses. **Pointers:** Declaration and Initialization of pointer variables, Pointer arithmetic,Pointers and arrays,Pointer to pointer,Array of pointers, Pointers and functions, Dynamic memory allocation.	**CO1,CO3, CO4**
V	**Structures:**Introduction,bitfields**,**nestedstructures,arrayofstructures,structures and functions, unions**.** **Files in C:**Using Files in C,Read data from files ,Writing data to files, Random access to files of records.	**CO1,CO3, CO4**

Learning Resources
Text Books
1.Programming in C, ReemaThareja, AICTE Edition, 2018, Oxford University Press.
Reference Books
1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R.F.Gilberg, Third Edition, 2007, Cengage Learning. 2. Programming in C, PradipDey, ManasGhosh, AICTE Edition, Oxford University Press. 3. The C Programming language, Brain W. Kernighan and Dennis Ritchie, Second Edition, Pearson Publications. 4. Programming with C, B. Gottfried, Third Edition, 2017, Schaum's outlines, McGraw Hill (India). 5. Problem Solving and Program Design in C, Jeri R. Hanly, Ellot B. Koffman, Seventh Edition, Pearson. 6. How to Solve it by Computer, R.G. Dromey, 2006, First edition, Pearson Education.
e- Resources & other digital material
1. https://www.geeksforgeeks.org/c-programming-language/ 2. https://www.greatlearning.in/academy/learn-for-free/courses/c-programming 3. https://onlinecourses.nptel.ac.in/noc22_cs101/course

PVP20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA-520007

I B.Tech – I Sem CSE (AI&ML)
COMMUNICATIVE ENGLISH I LAB

Course Code	20HS1151	**Year**	I	**Semester**	I
Course Category	Humanities	**Branch**	CSE(AI&ML)	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation	15	**Semester End Examination**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Acquire communication skills through various language learning activities	**L3**
CO2	Construct meaningful sentences and Paragraphs	**L3**
CO3	Analyze the text to develop comprehensive ability	**L4**
CO4	Prepare report based on the activity	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1									3	3		3		
CO2										3				
CO3										3		3		
CO4									3	3				

Syllabus		
Expt. No.	**Contents**	**Mapped CO's**
1	Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.	**CO1,CO4**
2	Asking and answering general questions on familiar topics such as home,family,work,studiesandinterests;introducingoneselfand others.	
3	Answering a series of questions about main idea and supporting ideas after listening to audio texts.	**CO1,CO2, CO4**
4	Discussion in pairs/ small groups on specific topics followed by short structured talks.	
5	Listening for global comprehension and summarizing what is listened to.	**CO1,CO3, C04**
6	Discussing specific topics in pairs or small groups and reporting what is discussed	
7	Making predictions while listening to conversations/transactional dialogues without video; listening with video	**CO1,CO4**
8	Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.	
9	Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.	**CO1,CO4**
10	Formal oral presentations on topics from academic contexts -without the use of PPT slides.	

Learning Resources
Text Books:
1. Prabhavathy Y, M.Lalitha Sridevi, Ruth Z. Hauzel, "English all Round 1: Communication skills for Undergraduate students", Orient Black Swan, 2019
Reference Books:
1. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018. 2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) MacmillanEducational. 3. Hewings, Martin. Cambridge Academic English (B2). CUP,2012
e- Resources & other digital material:
Grammar/Listening/Writing: 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/ **Listening:** https://learningenglish.voanews.com/z/3613; http://www.englishmedialab.com/listening.html **Speaking:** https://www.talkenglish.com/BBC; Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation ExercisesAll Skills: https://www.englishclub.com/; http://www.world-english.org/http://learnenglish.britishcouncil.org/ **Online Dictionaries:** Cambridge dictionary online;MacMillandictionary; Oxford learner'sdictionaries

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

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KANURU, VIJAYAWADA-520007

I B.Tech – I Sem CSE (AI&ML)
ENGINEERING CHEMISTRY LAB

Course Code	20BS1151	**Year**	I	**Semester**	I
Course Category	Basic Science	**Branch**	CSE(AI&ML)	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation	15	**Semester End Examination**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Demonstrate the working of instruments such as pH meter and Conduct meter	**L3**
CO2	Apply the acquired knowledge to determine the quantity of metal ions in a given solution	**L3**
CO3	Estimate the amount of active chlorine in bleaching powder	**L4**
CO4	Compare the viscosities and surface tension of different liquids	**L4**
CO5	Analyze different compounds and examine the preparation of different polymers	**L4**
CO6	Make an effective report based on experiments	

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3		1				3						1	
CO2	3		1				3						1	
CO3	3		1				3						1	
CO4	3		1				3						1	
CO5	3		1				3						1	
CO6	3		1				3			3			1	

Syllabus		
Expt. No.	**Contents**	**Mapped CO's**
1	Determination of strength of an acid by pH metric method	**CO1,CO6**
2	Determination of conductance by conducto metric method	
3	Determination of viscosity of a liquid	**CO4,CO6**
4	Determination of surface tension of a liquid	
5	Determination of chromium (VI) in potassium dichromate	**CO2,CO6**
6	Determination of Zinc by EDTA method	
7	Estimation of active chlorine content in Bleaching powder	**CO3,CO6**
8	Preparation of Phenol-Formaldehyde resin	**CO5,CO6**
9	Preparation of Urea-Formaldehyde resin	
10	Thin layer chromatography(paper chromatography)	

Learning Resources
Text Books:
1. N.KBhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, DhanpatRai Publishing Company (2007).
Reference Books:
1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
e- Resources & other digital material:
1. https://nptel.ac.in/courses/105105178/ 2. http://202.53.81.118/course/view.php?id=82

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA-520007

I B.Tech – I Sem CSE (AI&ML)

PROGRAMMING FOR PROBLEM SOLVING USING C LAB

Course Code	20ES1154	**Year**	I	**Semester:**	I
Course Category	Engineering Sciences	**Branch**	CSE(AI&ML)	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	-
Continuous Internal Evaluation	15	**Semester End Examination**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	Apply Structured Programming/C constructs for solving problems.	**L3**
CO2	Implement programs as an individual on different IDEs/ online platforms.	**L3**
CO3	Develop an effective report based on various programs implemented.	**L3**
CO4	Apply technical knowledge for a given problem and express it with effective oral communication.	**L3**
CO5	Analyze outputs using given constraints/test cases.	**L4**

Syllabus		
Expt. No.	**Contents**	**Mapped CO's**
1	Develop algorithms and flowcharts for various problems.	**CO1,CO2,CO3,CO4,CO5**
2	Programs to demonstrate Data Types, format specifiers and I/O Statements.	**CO1,CO2,CO3,CO4,CO5**
3	Programs to demonstrate the use of Operators in C and apply them in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
4	Programs to demonstrate the usage of decision control statements and apply them in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
5	Programs to demonstrate the usage of looping statements and applying them in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
6	Programs to demonstrate arrays' usage and application in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
7	Programs to demonstrate the usage of strings and apply them in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
8	Programs to demonstrate the usage of functions and apply them in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
9	Programs to demonstrate recursive functions' usage and application in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
10	Programs to demonstrate the usage of pointers and apply them in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
11	Programs to demonstrate the usage of structure and unions and apply them in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
12	Programs to demonstrate the usage of files and apply them in solving various problems.	**CO1,CO2,CO3,CO4,CO5**
13	Use Case-1	**CO1,CO2,CO3,CO4,CO5**
14	Use Case-2	**CO1,CO2,CO3,CO4,CO5**

Learning Resources
Text Books:
1. Programming in C, Reema Thareja, Oxford University Press, AICTE Edition, 2018.
Reference Books:
1. Computer Science: A Structured ProgrammingApproach using C, B. A. Forouzan and R. F. Gilberg, Third edition, Cengage Learning, 2007. 2. Programming in C, Pradip Dey, Manas Ghosh, Oxford University Press, AICTE Edition. 3. The C Programming Language, Brian W. Kernighan and Dennis Ritchie, Second Edition, Pearson Publications. 4. Programming with C, B. Gottfried, Third edition, Schaum's outlines, McGraw Hill (India), 2017. 5. Problem Solving and Program Design in C, Jeri R. Hanly, Ellot B. Koffman, Fifth edition,Pearson. 6. How to Solve it by Computer, R.G. Dromey, First edition, Pearson Education, 2006.
e- Resources & other digital material:
1. http://cprogramminglanguage.net/ 2. https://www.geeksforgeeks.org/c-programming-language/ 3. https://www.greatlearning.in/academy/learn-for-free/courses/c-programming 4. https://www.udemy.com/course/the-complete-c-programming/ 5. https://nptel.ac.in/courses/106/105/106105171

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA-520007

I B.Tech – I Sem CSE (AI&ML)
LIFE SCIENCES FOR ENGINEERS

Course Code	20MC1101	**Year**	I	**Semester**	I
Course Category	Mandatory	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	0	**L-T-P**	2-0-2	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Examination**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	**Apply** the concepts of biology to create tangible and economically viable engineering goods	**L3**
CO2	**Analyse** new technologies in Genetics biotechnology, pharmaceutical, medical and agricultural fields from the knowledge gained from DNA technology	**L4**
CO3	**Apply** the knowledge of biology to improve the living standards of societies	**L3**
CO4	**Apply** the basic knowledge of genetics and DNA technology for disease diagnostics and therapy	**L3**
CO5	**Analyse** new technologies in biotechnology, pharmaceutical, medical and agricultural fields from the knowledge gained from DNA technology	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3									2				
CO2					3					2				
CO3					3					2				
CO4					3	3				2				
CO5	3					3				2				

Syllabus		
Unit No.	**Contents**	**Mapped CO's**
I	**Introduction to Biology** Comparison of Biological organisms with manmade systems :Eye and Camera ,Flying bird and Aircraft Ultra structure of cell: Prokaryotes and Eukaryotes	**CO1**
II	**Bio-molecules** Structure and functions of proteins (antibodies) Structure and functions of nucleic acids Industrial applications- Enzymes and Fermentation	**CO1** **CO2**
III	**Bioenergetics and Cellular Respiration** Mechanism of photosynthesis Glycolysis TCA cycle Electron transport chain and Oxidative phosphorylation.	**CO3**
IV	**Genetics** Mendel'slaws Gene mapping Single gene disorders in humans	**CO3** **CO4**
V	**Recombinant DNA Technology** Recombinant vaccines, transgenic microbes, plants and animals. Animal cloning, biosensors, biochips.	**CO2** **CO5**

Expt. No.	Name of the experiment	Mapped CO's
1	Dissect & mount different parts of plants using Microscope	**CO1**
2	Estimation of Proteins by using Biuret method	**CO2**
3	Estimation of enzyme activity.	**CO2**
4	Estimation of chlorophyll content in some selected plants.	**CO3**
5	Nitrogen Cycle: Estimation of Nitrates /Nitrites in soil by using Spectrophotometer	**CO3**
6	Mendal's laws and gene mapping	**CO4, CO5**

Learning Resources
Text Books
1. Biology for Engineers-Wiley Editorial 2. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018. 3. Biotechnology by U.Satyanarayana, Alliedand books Pvt. ltd. Kolkata
Reference Books
1. Alberts et al., The molecular biology of the cell, 6/e, Garland Science,2014. 2. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e,2012

PVP20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA-520007

I B.Tech – II Sem CSE (AI&ML)
COMMUNICATIVE ENGLISH II

Course Code	20HS1201	**Year**	I	**Semester**	II
Course Category	Humanities	**Branch**	CSE((AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand various Linguistic aspects	**L2**
CO2	Apply language to draft letters for various business purposes	**L3**
CO3	Interpret the text for information processing and effective communication.	**L3**
CO4	Analyze the data for report writing and précis writing.	**L4**
CO5	Relate advanced writing skills for better employability.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1														
CO2									3	3		3		
CO3									3	3		3		
CO4									3	3		3		
CO5									3	3		3		

Syllabus		
Unit No.	**Contents**	**Mapped CO's**
I	**Reading:** Reading for presenting - strategies to select, compile and synthesize information for presentation-Comprehending a wide range of texts -Reading to recognize academic style **Reading for Writing:** Paraphrasing - using quotations and in-text references; using academic style - avoiding colloquial words and phrases - Writing an essay after researching a topic - Citing the sources used **Grammar and Vocabulary:** Academic verbs in context; formal words and phrases-Awareness about Root words	**CO1,CO3, CO5**
II	**Reading:** Recognizing formal and informal styles -Recognizing the difference between facts and opinions - Identifying and understanding different perspectives **Writing:** Letter writing and e mail writing - Structure, Conventions and Etiquette – Informal, semi-formal and formal (enquiry, complaints, seeking permission, seeking internship - Re-draft a piece of text from a different perspective - Writing brief critical reviews of short texts. Communication skills-verbal /Non verbal **Grammar and Vocabulary:** Agreement: Subject-verb, Noun-pronoun; Editing short texts - Phrasal verbs - Phrasal prepositions - Avoiding clichés	**CO1,CO2, CO4, CO5**
III	**Reading:** Identifying claims, evidences, views/opinions, purpose, and stance/position -Understand the correlation between a talk and a reading text based on inferences made. **Writing:** Writing structured analytical and argumentative essays on general topics using suitable claims and evidences with the sources cited-Peer review of the essays written **Grammar and Vocabulary:** Language for different functions such as stating a point, expressing opinion, Agreeing/disagreeing, Adding information to what someone has stated, and asking for clarification - Modifiers and misplaced modifiers. Corporate grooming	**CO1, CO3, CO5**
IV	**Reading:** Reading varied text types - Structure and contents of a formal report - Sections in a report and understanding the purpose of each section- Significance of references **Writing:** Writing reports **Grammar and Vocabulary:** Active and passive voice - Use of passive verbs in academic writing- **Precis writing**	**CO1, CO3 CO4, CO5**
V	**Reading:** Reading for inferential comprehension **Writing:** Writing one's CV and cover letter - Applying for a job/internship **Grammar and Vocabulary:** Reinforcing learning - Edit one's writing to correct common errors in grammar and usage - Use appropriate vocabulary for speaking and writing – Various purposes, Jumbled sentences	**CO1, CO2, CO5**

Learning Resources
Text Books:
1. Prabhavathy Y, M.Lalitha Sridevi "English all Round2: Communication skills for Undergraduate students", Orient Black Swan, 2020
Reference Books:
1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014. 2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. 3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012(Student Book, Teacher Resource Book, CD & DVD)

e- Resources & other digital material:
Grammar/Listening/Writing: 1-language.com; http://www.5minuteenglish.com/ https://www.englishpractice.com/ **Grammar/Vocabulary**: English Language Learning Online; http://www.bbc.co.uk/learningenglish/ http://www.better-english.com/; http://www.nonstopenglish.com/ https://www.vocabulary.com/; BBC Vocabulary Games Free Rice Vocabulary Game **Reading:** https://www.usingenglish.com/comprehension/; https://www.englishclub.com/reading/short-stories.htm; https://www.english-online.at/ **All Skills**: https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/ **Online Dictionaries**: Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

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KANURU, VIJAYAWADA-520007

I B.Tech – II Sem CSE (AI&ML)

ENGINEERING PHYSICS

Course Code	20BS1203	**Year**	I	**Semester**	II
Course Category	Basic Science	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the electric, magnetic, optical communication and semiconductor principles in technical aspects.	**L2**
CO2	Apply the knowledge of Physics and optical Principles in optoelectronic devices.	**L3**
CO3	Apply basic laws of electromagnetism and materials for engineering applications.	**L3**
CO4	Analyze the theory of solids and deduce different analytical parameters.	**L4**
CO5	Examine the mechanism of electromagnetic, in sensors and semiconductor devices.	**L4**
CO6	Ability to understand the concepts of optical fibers, the theory of solids, laws of electromagnetism, principles of semiconductor devices and submit a report.	

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1														
CO2	3													
CO3	3													
CO4		3												
CO5		3												
CO6									2	2		2		

Syllabus		
Unit No.	**Contents**	**Mapped CO's**
I	**Fiber Optics:** Introduction, advantages of optical fibers, principle and structure, acceptance angle, numerical aperture, modes of propagation, classification of fibers, fiber optic communication, fiber optic sensors (Temperature, displacement and force), applications.	**CO1,CO2 CO5, CO6**
II	**Dielectric and Magnetic materials** **Dielectric-materials:** Introduction, electronic polarization, dielectric polarizability, susceptibility and dielectric constant, types of polarizations (Qualitative),frequency dependence of polarization, Lorentz field (quantitative), Clausius-Mossotti equation. **Magnetic materials:** Introduction, magnetic dipole moment, magnetization, magnetic susceptibility and permeability, origin of permanent magnetic moment, classification of magnetic materials, domain theory, hysteresis, soft and hard magnetic materials.	**CO1,CO3 CO4, CO6**
III	**Electromagnetics:** **Electrostatic field:** Electric potential, Coulombs law and Gauss law, derivation of Coulombs law from Gauss law, applications of Gauss law (line charge, thin sheet of charge and solid charged sphere), Gauss law of electrostatics in dielectric medium, Poisson's and Laplace equations. **Magnetostatic field:** Bio–Savart law, Faraday's and Ampere's laws in integral and differential form, displacement current, continuity equation and Maxwell's equations (qualitatively).	**CO1,CO3 CO5, CO6**
IV	**Semiconductor Physics** Introduction, origin of energy band, intrinsic and extrinsic semiconductors, generation and recombination, carrier concentration in intrinsic semiconductors, variation of Fermi level with temperature in intrinsic semiconductor, n-type and p-type semiconductors, carrier concentration in n type and p type semiconductors, variation of Fermi level with temperature in extrinsic semiconductors.	**CO1,CO3, CO4, CO6**
V	**Semiconductor Devices** Drift and diffusion currents in semiconductors, Hall effect and its applications, p-n junction diode formation and V-I characteristics, direct and indirect band gap semiconductors, construction and working of photodiode, LED, solar cell	**CO1, CO2, CO5, CO6**

Learning Resources
Text Books:
1. R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 8th Edition, 2001. 2. S. O. Pillai, Solid State Physics, New age international publishers, 7th edition (2016)
Reference Books:
1. A Text Book of Engineering Physics, M.N.Avadhanulu & P.G.Kshrisagar, S.Chand Publications, fourth edition, 2014. 2. Semiconductor Devices & Physics, S.M.Sze,Wiley, 2008. 3. Applied Physics, P.K. Palanai Swamy, Sci-Tech Publications. December, 2018 4. Engineering Physics, Dr.M.Arumugam, Anuradha Publications, Second edition, 2005. 5. Introduction To Electrodynamics, David.J.Griffths, Pearson Education India Learning Private Limited, Fourth edition, 2015.

e- Resources & other digital material:
1. http://physicsforidiots.com/physics/electromagnetism/ 2. https://www.arcelect.com/fibercable.htm 3. http://freevideolectures.com/Course/3048/Physics-of-Materials/36 4. https://www.iitk.ac.in/mse/electronic-materials-and-devices 5. https://link.springer.com/chapter/10.1007/978-3-319-48933-9_35

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I B.Tech – II Sem CSE (AI&ML)

PROBABILITY AND STATISTICS

Course Code	20BS1204	**Year**	I	**Semester**	II
Course Category	Basic Science	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts of probability and statistics.	**L2**
CO2	Calculate the measures of central tendencies, correlation and regression to the given data and apply appropriate probability distributions to the given problem	**L3**
CO3	Apply the concepts of testing hypothesis for large and small samples	**L3**
CO4	Connect the concepts of probability, correlation and regression to real life problems	**L4**
CO5	Identify appropriate test statistic to test given hypothesis for statistical decision	**L4**
CO6	Apply the concepts of probability and statistics to the given data and submit the report.	**L3**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1													1	1
CO2	3								2	2			1	1
CO3	3								2	2			1	1
CO4		3											1	1
CO5		3											1	1
CO6	3								2	2			1	1

Syllabus		
Unit No.	**Contents**	**Mapped CO's**
I	**Measures of Central Tendency and Probability:** **Measures of central tendency** : Mean, Median, Mode **Probability**: Probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem (without proof).	**CO1,CO2, CO4,CO6**
II	**Random Variable and Probability Distributions:** Random variables (discrete and continuous), probability density functions, probability distribution - Binomial, Poisson and normal distribution-their properties (mathematical expectation and variance).	**CO1,CO2, CO4,CO6**
III	**Correlation, Regression:** Correlation, correlation coefficient, rank correlation, regression, lines of regression, regression coefficients, principle of least squares and curve fitting (straight Line, parabola and exponential curves).	**CO1,CO2, CO4,CO6**
IV	**Testing of Hypothesis and Large Sample Tests:** Formulation of null hypothesis, alternative hypothesis, the critical region, two types of errors, level of significance. **Large Sample Tests**: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems	**CO1,CO3 CO5,CO6**
V	**Small Sample Tests:** Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$- test for independence of attributes.	**CO1,CO3, CO5,CO6**

Learning Resources
Text Books:
1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012. 2. Dr.T.K.V. Iyengar, Dr.B.Krishna Gandhi, S. Ranganatham, Dr. M.V.S.S.N. Prasad, Probability & Statistics, Publications: S.Chand, 4th Revised Edition, 2012.
Reference Books:
1. S. Ross, A First Course in Probability, Pearson Education India, 2002. 2. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008
e- Resources & other digital material:
1. https://nptel.ac.in/courses/111/106/111106150/ 2. https://nptel.ac.in/courses/111105035 3. http://202.53.81.118/ -> PVPSIT FED-Moodle

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I B.Tech – II Sem CSE (AI&ML)

DISCRETE MATHEMATICAL STRUCTURES

Course Code	20BS1207	**Year**	I	**Semester**	II
Course Category	Basic Science Course	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Basic Mathematics
Continuous Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the fundamental concepts of discrete mathematical structures	**L2**
CO2	Apply Normal forms/Rules of Inference for solving suitable problems.	**L3**
CO3	Apply the method of characteristic roots for solving different recurrence relations.	**L3**
CO4	Analyze various graph techniques to construct a tree.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2													
CO2	3													
CO3	3													
CO4		2										1		

Unit No.	Syllabus Contents	Mapped CO's
I	**Mathematical Logic:** Introduction-Statements and Notations-Connectives(Negation,Conjunction,Disjunction)-Statement formulas and Truth Tables, Conditional and Bi-conditional, Well-Formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implication, Functionally Complete Sets of Connectives, Other Connectives. **Normal Forms:** Disjunctive Normal Forms (DNF), Conjunctive Normal Forms (CNF), Principal of Disjunctive Normal Forms (PDNF), Principal of Conjunctive Normal Forms (PCNF).	**CO1, CO2**
II	**Theory of Inference for Statement Calculus:** Validity using Truth Tables-Rules of Inference – Consistency of Premises **Predicate calculus:** Introduction to Predicates - Statement functions, Variable and Quantifiers- Predicate Formulas-Free and Bound Variables-Universe of Discourse.	**CO1,CO2**
III	**Recurrence Relations**-The Method of Characteristic Roots-Solutions in Inhomogeneous Recurrence Relation.	**CO1,CO3**
IV	**Relations and Directed Graphs**-Special Properties of Binary Relations-Equivalence Relations- Ordering Relations, Lattices, Operations on Relations- Paths and Closures-Directed Graphs and Adjacency Matrices	**CO1,CO4**
V	**Graphs-** Basic Concepts- Isomorphism's and Sub graphs-Trees and Their Properties - Spanning Trees-Planar Graphs-Euler's Formula- Multi-graphs and Euler Circuits-Hamiltonian Graphs- Chromatic Numbers.	**CO1,CO4**

Learning Resources
Text Books
1. Discrete Mathematical Structures with Applications to Computer Science, J P Trembly and R Manohar, 1988, McGraw-Hill **(Unit-I,II)** **2.** Discrete Mathematics for Computer Scientists & Mathematicians, Joe L. Mott. Abraham Kandel and Theodore P. Baker, Second Edition, 2017, PHI. **(Unit-III,IV,V)**
References
1. Discrete Mathematics and its Applications, Kenneth H. Rosen, Seventh Edition, 2017, McGraw-Hill.
e-Resources & other digital material
1. https://www.geeksforgeeks.org/engineering-mathematics-tutorials/ **2.** https://www.tutorialspoint.com/discrete_mathematics/index.htm **3.** http://www.alas.matf.bg.ac.rs/~mi10164/Materijali/DS.pdf **4.** https://nptel.ac.in/courses/111107058/

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I B.Tech – II Sem CSE (AI&ML)

PYTHON PROGRAMMING

Course Code	20ES1205	**Year**	I	**Semester**	II
Course Category	Engineering Sciences	**Branch**	CSE (AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the Features and Constructs of Python Programming Language for solving problems.	**L2**
CO2	Apply the knowledge of Python constructs for developing programs.	**L3**
CO3	Apply suitable control constructs, functions, and strings for solving problems.	**L3**
CO4	Analyze the given problem and use suitable structure (Lists, Tuple and Dictionaries) for developing the solutions.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2													
CO2	3													
CO3	3													
CO4		2										1		

Syllabus		
Unit No.	**Contents**	**Mapped CO's**
I	**Introduction:** History, Features, Future of Python, Writing and Executing, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators, Expressions, Other data types, Operations on strings, Type Conversion.	**CO1, CO2**
II	**Decision Control Statements:** Introduction to Decision Control Statements, Selection/Conditional Branching Statements, Basic Loop Structures/Iterative Statements, Nested Loops, Break Statement, Continue Statement, pass statement, else statement used with Loops.	**CO1, CO2**
III	**Functions and Modules:** Introduction, Function Definition, Function Call, Variable Scope and Lifetime, return statement, More on Defining Functions, Lambda Functions or Anonymous Functions, Documentation Strings, Recursive Functions, Modules, Packages in Python, Standard Library Modules, Function Redefinition**.**	**CO1, CO3**
IV	**Python String:** Introduction**,** Concatenating, Appending and Multiplying Strings, Strings are Immutable, String Formatting Operator, Built-in String Methods and Functions, Slice Operation, ord() and chr() Functions, in and not in operators, Comparing Strings, Iterating String, The String Module, Regular Expressions, Metacharacters in Regular Expression.	**CO1, CO3**
V	**Lists:** Access values, Updating Values, Nested Lists, Cloning Lists, Basic List Operations, List Methods. **Tuple:** Creating, Utility, Accessing Values, Updating, Deleting Elements, Basic Tuple Operations, Tuple Assignment, Tuples of Returning Multiple Values, Nested Tuples, List Comprehension and Tuples, Variable-length Argument Tuples, Advantages of Tuple Over List. **Dictionaries:** Creating, Accessing Values, Adding and Modifying an Item in a Dictionary, Modifying an Entry, Deleting Items, Sorting Items, Looping Over a Dictionary, Nested Dictionaries, Built-in Dictionary Functions and Methods, Difference between a List and a Dictionary, List vs Tuple vs Dictionary.	**CO1, CO4**

Learning Resources:
Text Books:
1. Python Programming: Using Problem Solving Approach, Reema Thareja, 2017, Oxford UniversityPress.

References:
1. Core Python Programming, R. Nageswara Rao, 2018, Dreamtech press. 2. Programming with python, T R Padmanabhan, 2017, Springer.
e- Resources & other digital material:
1. https://nptel.ac.in/courses/106106182 2. https://www.w3schools.com/python/default.asp

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I B.Tech – II Sem CSE (AI&ML)
COMMUNICATIVE ENGLISH II LAB

Course Code	20HS1251	**Year**	I	**Semester**	II
Course Category	Humanities	**Branch**	CSE(AI&ML)	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Hone employability skills	**L3**
CO2	Develop an ability of making discussions, inferences and presentations	**L3**
CO3	Refine communication skills through various strategies	**L4**
CO4	Process the information in different contexts	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1									3	3		3		
CO2									3	3		3		
CO3									3	3		3		
CO4									3	3		3		

Syllabus		
Expt. No.	**Contents**	**Mapped CO's**
1	Listening for presentation strategies and answering questions on the speaker, audience, and key points	**CO1, CO2, CO4**
2	Formal presentations using PPT slides (individual)	
3	Relating a reading text to a talk/presentation – understanding different perspectives and drawing inferences	**CO1, CO2, CO4**
4	Formal team presentations using PPT slides/audio- visual aids	
5	Identifying views and opinions expressed by different speakers while listening to discussions	**CO1, CO3, C04**
6	Group discussion on general topics	
7	Processing of information using context clues while listening to talks/lectures	**CO1, CO3, CO4**
8	Role plays – people from various fields of work	
9	Processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge	**CO1, CO3, CO4**
10	Mock interviews for jobs/internships	

Learning Resources
Text Books:
1. Prabhavathy Y, M.Lalitha Sridevi. "English all Round 2: Communication skills for Undergraduate Learners", Orient Black Swan, 2020
Reference Books:
1. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012
e- Resources & other digital material:
Grammar/Listening/Writing: 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/ **Listening:** https://learningenglish.voanews.com/z/3613; http://www.englishmedialab.com/listening.html **Speaking:** https://www.talkenglish.com/BBC; Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation Exercises **All Skills:** https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/ **Online Dictionaries:** Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

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I B.Tech – II Sem CSE (AI&ML)

ENGINEERING PHYSICS LAB

Course Code	20BS1252	**Year**	I	**Semester**	II
Course Category	Basic Science	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Demonstrate the importance of dielectric material and measure magnetic parameters.	**L3**
CO2	Identify the type of semiconductor using hall effect and measure the energy band gap.	**L3**
CO3	Examine the characteristics of photodiode, p-n junction diode and solar cell.	**L4**
CO4	Assess the intensity of the magnetic field of circular coil carrying current with distance and measure resistance using four probe method	**L4**
CO5	Estimate the acceptance angle of an optical fiber and numerical aperture.	**L4**
CO6	Summarize and tabulate the experimental observations and output.	

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3			3								2		
CO2	3			3								2		
CO3	3			3								2		
CO4	3			3								2		
CO5	3			3								2		
CO6	3			3								2		

Syllabus		
Expt. No.	**Contents**	**Mapped CO's**
1	Determine the Dielectric Constant of various Solid samples.	**CO1,CO6**
2	Determine the Magnetic Susceptibility by Gouy's Method.	
3	Determine the Hall Coefficient using Hall Effect experiment.	**CO2,CO6**
4	Determine the Energy Band gap of a Semiconductor.	
5	Study the characteristic curves of a Photo Diode.	**CO3,CO6**
6	Illustrate the V-I the characteristics of P-N junction Diode.	
7	Draw the V-I characteristics of a Solar Cell.	
8	Determine The Magnetic Field along the axis of a Circular Coil carrying current.	**CO4,CO6**
9	Determine the Resistivity of Semiconductor by Four Probe Method.	
10	Determine the Numerical Aperture of a given Optical Fibre and Find its Acceptance Angle.	**CO5,CO6**

Learning Resources
Text Books:
1. RamaraoSri, Choudary Nityanand and Prasad Daruka, "Lab Manual of Engineering Physics" Vth ed., Excell Books, 2010
Reference Books:
1. Semiconductor Devices & Physics, S.M.Sze,Wiley,2008.
e- Resources & other digital material:
1. https://nptel.ac.in/courses/115/105/115105120/ 2. https://nptel.ac.in/courses/115/107/115107095/ 3. https://nptel.ac.in/courses/115/104/115104109/ 4. http://www.physicsclassroom.com/The-Laboratory 5. https://www.vlab.co.in/broad-area-physical-sciences 6. https://www.niser.ac.in/sps/teaching-laboratories

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I B.Tech – II Sem CSE (AI&ML)
PYTHON PROGRAMMING LAB

Course Code	20ES1255	**Year**	I	**Semester**	II
Course Category	Engineering Sciences Lab	**Branch**	CSE (AI&ML)	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	-
Continuous Internal Evaluation :	15	**Semester End Evaluation:**	35	**Total Marks:**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Apply knowledge of Python constructs for developing programs/applications.	**L3**
CO2	Conduct experiments as an individual or team member by using different IDEs/ online platforms of Python programming.	**L3**
CO3	Develop an effective report based on various programs implemented.	**L3**
CO4	Apply technical knowledge for a given problem and express it with effective oral communication.	**L3**
CO5	Analyze outputs using given constraints/test cases.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2					2				1					
CO3										2				
CO4	2									1				
CO5		2										1		

Syllabus		
Expt. No.	**Contents**	**Mapped CO's**
1	Explore Python IDE.	**CO1,CO2,CO3,CO4,CO5**
2	Apply Python programming basic constructs for developing the programs.	**CO1,CO2,CO3,CO4,CO5**
3	Python Programs to demonstrate decision-making and branching (Selection)	**CO1,CO2,CO3,CO4,CO5**
4	Python programs to demonstrate iterative statements.	**CO1,CO2,CO3,CO4,CO5**
5	Python programs to demonstrate functions	**CO1,CO2,CO3,CO4,CO5**
6	Python programs to perform operations on strings with built-in functions.	**CO1,CO2,CO3,CO4,CO5**
7	Python programs to perform operations on regular expressions with built-in functions.	**CO1,CO2,CO3,CO4,CO5**
8	Python programs to apply various structures (Lists, Tuple and Dictionaries) for developing the programs.	**CO1,CO2,CO3,CO4,CO5**
9	Installation of different packages.	**CO1,CO2,CO3,CO4,CO5**
10	Explore the NumPy package	**CO1,CO2,CO3,CO4,CO5**
11	Explore the Pandas package	**CO1,CO2,CO3,CO4,CO5**
12	Use Case-1	**CO1,CO2,CO3,CO4,CO5**
13	Use Case-2	**CO1,CO2,CO3,CO4,CO5**
14	Use Case-3	**CO1,CO2,CO3,CO4,CO5**

Learning Resources
Text Books
1. Python Programming: Using Problem Solving Approach, ReemaThareja, 2017, Oxford University Press.
References
1. Core Python Programming, R. NageswaraRao, 2018, Dreamtech press. 2. Programming with python, T R Padmanabhan, 2017, Springer.
e-Resources & other digital material
1. https://nptel.ac.in/courses/106106182 2. https://www.w3schools.com/python/default.asp

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
KANURU, VIJAYAWADA
II B.Tech – I Sem CSE (AI&ML)
Computer Organization

Course Code	20ES1306	**Year**	II	**Semester**	I
Course Category	Engineering Sciences	**Branch**	CSE (AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Digital Logic Design
Continuous Internal Evaluation:	30	**Semester End Examination:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic functional units of a computer system and its organization.	**L2**
CO2	Apply appropriate instructions for processing various types of computer operations.	**L3**
CO3	Apply various types of organizations on registers.	**L3**
CO4	Analyze memory hierarchy, I/O communication and pipelining.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Moderate, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4		2										1		

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Register Transfer and Micro-Operations:** Register Transfer Language, Register Transfer, memory Transfers, Bus construction with Multiplexers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.	**CO1,CO2,CO3**
II	**Basic Computer Organization:** Computer Registers, Instruction codes, Timing and Control, Instruction Cycle, Memory- Reference Instructions, Input- Output and Interrupt.	**CO1,CO2,CO3**
III	**Central Processing Unit:** General registers Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control.	**CO1,CO3**
IV	**Computer Arithmetic:** Introduction, Addition and Subtraction, Booth Multiplication Algorithm. **Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory, Virtual Memory.	**CO1, CO2,CO4**
V	**Input-Output Organization:** Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor. **Pipeline and Parallel Processing:** Parallel processing, Pipelining, Arithmetic pipeline, Instruction pipeline.	**CO1,CO4**

Learning Resources

Text Books

1. Computer System Architecture, Morris M. Mano, Third Edition, 1992, Pearson.

References

1. Computer Organization and Architecture, William Stallings, Eighth Edition, 2010, PHI.
2. Computer Organization, Carl Hamachar, Vranesic, 2002, McGraw Hill.

e- Resources and other Digital Material

1. https://nptel.ac.in/courses/106105163
2. https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/
3. https://www.udemy.com/course/introduction-to-computer-organization/

PVP20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
KANURU, VIJAYAWADA
II B.Tech – I Sem CSE (AI&ML)
FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

Course Code	20ES1307	**Year**	II	**Semester**	I
Course Category	Engineering Sciences	**Branch**	CSE (AI & ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Discrete Mathematical Structures, Probability and Statistics
Continuous Internal Evaluation:	30	**Semester End Examination:**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts of Artificial Intelligence.	**L2**
CO2	Apply the principles of AI in solutions that require problem solving and knowledge representation.	**L3**
CO3	Apply Planning and Learning for solving AI problems.	**L3**
CO4	Analyze the different AI Techniques for solving a given problem.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1													
CO2	3													
CO3	3													
CO4		3	1						1	1		1		

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction**: Definition of AI, History of AI, Foundations of AI, Applications of AI. **Intelligent agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, Structure of agents.	**CO1**
II	**Problem Solving Techniques:** **Solving Problems by Searching:** Problem-Solving Agents: Well-defined problems and solutions, formulating problems, Searching for Solutions: Infrastructure for search algorithms, Measuring problem-solving performance. **Uninformed Search Strategies**: Breadth first search, depth first Search **Informed (Heuristic) Search Strategies**: Hill climbing, A* Algorithm, Alpha-Beta Pruning.	**CO1,CO2,CO4**
III	**Knowledge Representation:** **Logical Agents:** Knowledge Based Agents, Logic, Propositional logic: Syntax, Semantics, A simple knowledge base, A simple inference procedure**,** first order logic: Syntax and Semantics in First order Logic, Using first order logic. **Inference in first order logic**: propositional vs. First order inference, Unification and Lifting, Forward chaining, Backward chaining, Resolution	**CO1, CO2, CO4**
IV	**Planning:** Definition of classical planning, planning with state space search: Forward (progression) state-space search, backward (regression) relevant-states search, Heuristics for planning, planning graphs, Analysis of planning approaches, Hierarchical planning, and Multi Agent Planning.	**CO1,CO3, CO4**
V	**Learning:** Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and choosing best hypothesis, The theory of learning, Regression and Classification with Linear models. **Artificial Neural Networks**: Neural network structures, Single-layer feed-forward neural networks (perceptron's), Multilayer feed-forward neural networks, Learning in multilayer networks, Learning neural network structures.	**CO1,CO3, CO4**
Learning Resources		
Text Books		
1**.** Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, Third Edition, Prentice Hall.		
References		
1. A Classical Approach to Artificial Intelligence, M.C. Trivedi, 2019, Khanna Book Publishing. 2. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata McGraw Hill. 3. Artificial Intelligence Saroj Kaushik, Cengage Learning India, 2011.		
e-Resources & other digital material		
1. https://nptel.ac.in/courses/106105077 2. https://nptel.ac.in/courses/106105078 3. https://nptel.ac.in/courses/106106126 4. https://www.coursera.org/learn/introduction-to-ai		

PVP20

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KANURU, VIJAYAWADA-520007

II B.Tech – I Sem CSE (AI&ML)

OPERATING SYSTEMS

Course Code	20AM3301	**Year**	II	**Semester**	I
Course Category	PCC	**Branch**	CSE (AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Examination**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the structure and functionalities of operating systems	**L2**
CO2	Apply different algorithms of CPU scheduling, Page replacement and disk scheduling	**L3**
CO3	Apply various concepts to solve the problems related to process synchronization and Deadlocks.	**L3**
CO4	Analyze and interpret the functionalities of the operating system.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	3													
CO3	2													
CO4		3							1	1		1		

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Overview: Introduction**: What Operating Systems Do, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations **Operating System Structures:** Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls.	**CO1**
II	**Process Management:** Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication. **Threads:** Overview, Multithreading Models. **Process Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms (First-Come First-Served Scheduling, Shortest-Job-First Scheduling, Priority Scheduling, Round-Robin Scheduling.)	**CO1,CO2,CO4**
III	**Process Synchronization:** Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors. **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	**CO1, CO3,CO4**
IV	**Memory Management:** **Main Memory:** Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, and Structure of the Page Table. **Virtual Memory:** Background, Demand Paging, Copy-on-Write, Page Replacement, Basic Page Replacement, FIFO Page Replacement, Optimal Page Replacement, LRU Page Replacement, Thrashing.	**CO1, CO2,CO4**
V	**Storage Management:** **File–System Interface:** File Concept, Access Methods, Directory and Disk Structure. **File–System Implementation:** File-System Structure, File- System Implementation, Directory Implementation, Allocation Methods. **Mass-Storage Structure**: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling: FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, C-SCAN Scheduling, LOOK Scheduling, Selection of a Disk-Scheduling Algorithm.	**CO1, CO2,CO4**

Learning Resources
Text Books:
1. Operating System Concepts, Abraham Silberchatz, Peter Baer Galvin, Greg Gagne, Ninth Edition, 2016, Wiley India.
Reference Books:
1. Operating Systems - Internal and Design Principles, William Stallings, Ninth Edition, 2018, Pearson. 2. Operating Systems - Harvey M.Deitel, Paul J Deitel and David R.Choffnes , Third Edition, 2019, Pearson. 3. Operating Systems - A Concept based Approach- D.M. Dhamdhere, Second Edition, 2010, McGraw Hill.

e- Resources & other digital material:
1.https://onlinecourses.nptel.ac.in/noc19_cs50/ 2.https://archive.nptel.ac.in/courses/106/105/106105214/ 3.https://www.youtube.com/watch?v=MaA0vFKtew&list=PLLDC70psjvq5hIT0kfr1sirNuees0NIbG&index=1

PVP20

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KANURU, VIJAYAWADA-520007

II B. Tech – I Sem CSE (AI&ML)

Object Oriented Programming through JAVA

Course Code	20AM3302	**Year**	II	**Semester**	I
Course Category	PCC	**Branch**	CSE (AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Programming for Problem Solving using C
Continuous Internal Evaluation:	30	**Semester End Exam:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the fundamental concepts of Object-Oriented Programming & constructs ofJava programming language.	**L2**
CO2	Apply object-oriented programming principles for solving problems.	**L3**
CO3	Apply the collection framework to implement various data structures	**L3**
CO4	Analyze proper exception handling mechanism to avoid abnormal termination of Program.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	3													
CO3	1											1		
CO4		1										1		

PVP20

Syllabus		Mapped CO
Unit No.	**Contents**	
I	**Fundamentals of OOP and Java** **Java Basics** -Need of OOP, Procedural Languages vs. OOP, Principles of OOP Languages, Java Virtual Machine, Java Features. **Java Programming constructs-** Variables, Data types, Identifiers, Keywords, Operators, Control Statements, Arrays. **String Handling-** String Class, String Buffer Class and String Tokenizer Class.	**CO1, CO2**
II	**Class Fundamentals and Inheritance** **A Closer Look at Methods and Classes-** Class Fundamentals, Declaring Objects, Methods, Constructors, Static Keyword, this keyword, Overloading methods, and constructors. **Inheritance-** Basics, Types of Inheritance, Member access rules, Implementation of Inheritance. **Polymorphism-** Overloading, Method overriding, using super keyword, Dynamic Method Dispatch, Abstract Classes, Final Keyword.	**CO1, CO2**
III	**Interfaces and Packages** **Interfaces-** Differences between Classes and Interfaces, Defining an Interface, Implementing Interfaces, variables in interfaces and extending interfaces. **Packages-** Defining, Creating and Accessing a Package, Access Controls, Object class, Wrapper Classes.	**CO1, CO2**
IV	**Exception Handling and Multithreading** **Exception Handling-** Exception Handling Fundamentals, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, User-defined exceptions. **Multithreading -** Introduction to Multitasking, Thread Life Cycle, Creating Threads, Synchronizing threads.	**CO1, CO2, CO4**
V	**The Collection Framework** **Collection Framework-** Need for Collection Framework, Hierarchy of Collection Framework, Array List, Importance of methods like Hash code()and equals(). **Collection objects-** sets, lists, stacks, queues, maps.	**CO1, CO2, CO3**

Learning Resources
Text Books
1. Java - The Complete Reference, Herbert Schildt, Ninth Edition, 2014, McGraw -Hill.
References
1. Programming in Java, Sachin Malhotra, Saurabh Choudhary, Second Edition, 2018, Oxford. 2. Head First Java, Bert Bates, Kathy Sierra, Second Edition, 2005, O'Reilly. 3. Core Java an Integrated Approach, Dr. R. Nageswara Rao, 2017, Dreamtech. 4. Object Oriented Programming through Java, P. Radha Krishna, 2007, Universities Press.
e- Resources and other Digital Material
1. https://nptel.ac.in/courses/106/105/106105191/ 2. https://www.udemy.com/course/java-tutorial/ 3. https://www.decodejava.com/ 4. https://www.codecademy.com/learn/learn-java 5. https://www.w3schools.com/java/

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KANURU, VIJAYAWADA-520007

II B.Tech – I Sem CSE (AI & ML)

Data Structures

Course Code:	20AM3303	**Year:**	II	**Semester:**	I
Course Category:	Engineering Sciences	**Branch:**	CSE(DS, AI&ML)	**Course Type:**	Theory
Credits:	3	**L-T-P:**	3-0-0	**Prerequisites:**	Programming for Problem Solving Using C
Continuous Internal Evaluation:	30	**Semester End Examinations:**	70	**Total Marks:**	100

COURSE OUTCOMES		
Upon successful completion of the course, Student will be able to		
CO1	Understand the classification of various data structures and the algorithm complexity.	**L2**
CO2	Apply suitable searching, sorting algorithms for various applications.	**L3**
CO3	Apply suitable data structure to solve the problems	**L3**
CO4	Analyze the problem to construct an algorithm using suitable data structure	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes &

Strength of correlations (3:High, 2:Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS01**
CO1	1													
CO2	1													
CO3	3													
CO4		3							1	1		1		

Unit No.	COURSE CONTENTS	Mapped CO
UNIT-1	**Introduction:** Introduction to Data Structures, Basic Terminology, Classification of Data Structures, Operations on Data Structures, Abstract Data Type, Time and Space Complexity. **Sorting and Searching:** Searching- Linear and Binary search algorithms. Sorting- Bubble, Insertion, Selection, Merge, Quick sort algorithms.	**CO1,CO2**
UNIT-II	**Linked lists:** Single linked list, double linked list, circular linked list, and operations on Linked List(Creating, Inserting and Deleting new node, Traversing, Searching)	**CO1,CO3, CO4**
UNIT-III	**Stacks:** Introduction, Array Representation and Implementation, Operations, linked Representation, Operations on a linked stack. **Queues:** Introduction, Array Representation, linked list implementation, Operations	**CO1,CO3, CO4**
UNIT-IV	**Trees:** Introduction- Terminology, representation of trees, binary trees, Properties of binary trees, binary tree representation, binary tree traversals In-order, preorder, post order, Binary search trees Definition, searching BST, insert into BST, delete from a BST.	**CO1,CO3, CO4**
UNIT-V	**Graphs:** Introduction, Terminology, directed graphs, Bi-connected components, Representation of graphs, Graph Traversal Algorithms: Breadth First Search (BFS), Depth First Search (DFS).	**CO1,CO3, CO4**

Learning Resources

Text Books

1. Data Structures Using C, Reema Thareja ,Second Edition, OXFORD University Press

References

1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Second Edition, 2002, Pearson.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third Edition, 2010, PHI.
3. Data Structures and Algorithms Made Easy by Narasimha Karumanchi, 2020, CareerMonk Publications.
4.Fundamental of Data Structures in C, Horowitz, Sahani, Anderson-Freed, Second Edition, 2008, Universities Press.
4. Classic Data Structures, Debasis Samantha, Second Edition, 2009, PHI.

e-Resources and other Digital Material

1. http://cse.iitkgp.ac.in/pds/
2. http://cmpe.emu.edu.tr/bayram/courses/231/LectureNotesSlides/IQBAL/Lecture%20Notes
3. https://www.geeksforgeeks.org/data-structures/
4. https://www.programiz.com/dsa
5. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
6. https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F
7. https://www.youtube.com/watch?v=S47aSEqm_0I&list=PLgj_VZKxRKrxgFyOutPJpoLFBaQMOpK

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

KANURU, VIJAYAWADA

Department of CSE (AI&ML)

II B.Tech – I Sem

Foundations of Competitive Programming

Course Code	20SO8357	**Year**	II	**Semester**	I
Course Category	SOC1	**Branch**	CSE (AI&ML)	**Course Type**	Theory
Credits	2	**L-T-P**	1-0-2	**Prerequisites**	Programming for Problem Solving using C
Continuous Internal Evaluation :	-	**Semester End Evaluation:**	50	**Total Marks:**	50

Syllabus – Course Contents	
Week 1	• Apply time and space complexity on Pseudo code • Identifying the Test cases and corner cases • Exercise: https://www.interviewbit.com/courses/programming/time-complexity
Week 2	• Exercise: Fill in the missing code, Code Magnets, Be the Compiler, Crosswords, Mixed Messages, and Pool Puzzle for analysis flow of code execution.
Week 3	• Implement programs using C++ Standard Template Library (STL): Containers, Iterators, functions, Algorithms
Week 4	• Apply STL to implement Vectors, Strings, Lists & Forward Lists operations
Week 5	• Apply STL to implement Stacks, Queue, Maps, Unordered maps, Set operations
Week 6	• Apply all basic bitwise operators like (OR, AND, NOT, XOR, Left Shift and Right Shift) and properties of each of these operators. Bitwise operations: Get & Set bits, clear & update bits, clear range of bits, replace bits in N by M, count set bits, bit masking • Exercise:https://www.hackerrank.com/domains/algorithms?filters%5Bsubdomains%5D%5B%5D=bit-manipulation
Week 7	• Apply binary search concepts to solve the problems
Week 8	• Apply recursion to generating all subsets and all Permutations and Logic building of Combination sum Problem
Week 9	• Apply Strings and Pattern Matching, Rabin-Karp Algorithm, Longest Prefix Suffix and KMP & Z-Algorithm, Suffix Array, and LCP Array to solve the problems
Week 10	• Apply liked list concepts to solve Recursive Reverse a Linked List, Iterative Reverse, Merge Two Sorted Linked Lists, Merge Sort on Linked List, Search, Middle Element, K-th list, Detect Cycle in a Linked List
Week 11	• Exercise problems on Linked List: ➢ https://www.hackerrank.com/domains/datastructures?filters%5Bsubdomains%5%5B%5D=linked-lists ➢ https://www.hackerearth.com/practice/data-structures/linked- list/singly-linked-list/practice-problems/
Week 12	• Apply stacks data structures to solve Balanced Parenthesis, Redundant Parenthesis, largest Rectangle, simple text editor

Week 13	• Exercise problems on Stacks : ➢ https://www.hackerrank.com/domains/data-structures?filters%5Bsubdomains%5D%5B%5D=stacks ➢ https://www.hackerearth.com/practice/data-structures/stacks/basics-of-stacks/practice-problems/
Week 14	• Apply Queue data structures to solve Queue using two stacks, Max Subarray (Sliding Window + Deque), Simplify Path, Simplify Path Code, Stock Span Problem, First Non-Repeating Character, Simplify Path
Week 15	• Exercise problems on Queues: ➢ https://www.hackerrank.com/domains/data-structures?filters%5Bsubdomains%5D%5B%5D=queues ➢ https://www.hackerearth.com/practice/data-structures/queues/basics-of-queues/practice-problems/
Week 16	Case Study

Learning Resources

Text Books

1. Guide to Competitive Programming; Learning and improving Algorithms Through Contests, Antti Laaksonen, Second Edition, 2020, Springer.
2. Programming Challenges: The Programming Contest Training Manual, Steven S. Skiene, 2006, Springer.
3. Introduction to Algorithms, Thomas H. Cormen, Third Edition, 2009, PHI Learning Pvt. Ltd.

e-Resources & other digital material

1. https://www.hackerrank.com
2. https://www.hackerearth.com
3. https://www.codeforces.com
4. https://www.codechef.com
5. https://www.leetcode.com
6. https://www.interviewbit.com
7. https://www.topcoder.com
8. https://www.geeksforgeeks.com
9. https://www.codewars.com

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
KANURU, VIJAYAWADA
II B.Tech – I Sem CSE (AI&ML)
PROGRAMMING FOR ARTIFICIAL INTELLIGENCE LAB

Course Code	20ES1357	**Year**	II	**Semester**	I
Course Category	ES Lab	**Branch**	CSE (AI & ML)	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Discrete Mathematical Structures
Continuous Internal Evaluation:	15	**Semester End Examination:**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Apply knowledge of agent architecture, searching and reasoning techniques for different applications.	**L3**
CO2	Implement programs as an individual on different IDEs/ online platforms	**L3**
CO3	Develop an effective report based on various programs implemented.	**L3**
CO4	Apply technical knowledge for a given problem and express it with effective oral communication.	**L3**
CO5	Analyze outputs with given constraints for a given problem.	**L4**

Syllabus		
Exp No.	**Contents**	**Mapped CO**
1	Exploring syntax and semantics of Prolog Programming	CO2,CO3,CO4,CO5
2	Apply various prolog programming techniques to implement recursive and iterative programs	CO2,CO3,CO4,CO5
3	Implement List manipulation operations in prolog	CO2,CO3,CO4,CO5
4	Implement Breadth first search and Depth first search algorithms	CO1,CO2,CO3,CO4,CO5
5	Implement A* search algorithm	CO1,CO2,CO3,CO4,CO5
6	Implement Alpha-beta algorithm	CO1,CO2,CO3,CO4,CO5
7	Create a knowledge base using propositional logic and perform various tasks.	CO1,CO2,CO3,CO4,CO5
8	Create a knowledge base using First-order logic statements and check various operations.	CO1,CO2,CO3,CO4,CO5
9	Chatbot Application	CO1,CO2,CO3,CO4,CO5
10	Use Case-1	CO1,CO2,CO3,CO4,CO5
11	Use Case-2	CO1,CO2,CO3,CO4,CO5

12	Use Case-3	CO1,CO2,CO3,CO4,CO5
13	Use Case-4	CO1,CO2,CO3,CO4,CO5
14	Use Case-5	CO1,CO2,CO3,CO4,CO5
Learning Resources		
Text Books		
1. Artificial Intelligence Saroj Kaushik, Cengage Learning India, 2011. 2. Prolog Programming for Artificial Intelligence, Ivan Bratko, Fourth Edition, Addison-Wesley. 2. Logic Programming with Prolog, Max Bramer, Second Edition, 2013, Springer		

PVP20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

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KANURU, VIJAYAWADA-520007

II B. Tech – I Sem CSE (AI&ML)

Object Oriented Programming through JAVA Lab

Course Code	20AM3351	**Year**	II	**Semester:**	I
Course Category	PCC Lab	**Branch**	CSE (AI&ML)	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Programming for Problem Solving using C
Continuous Internal Evaluation	15	**Semester End Examination**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	Apply object-oriented principles/ Java constructs for solving problems.	**L3**
CO2	Implement programs as an individual on different IDEs/ online platforms.	**L3**
CO3	Develop an effective report based on various programs implemented.	**L3**
CO4	Apply technical knowledge for a given problem and express it with effective oral communication.	**L3**
CO5	Analyze outputs using given constraints/test cases.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(3: Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1													3	
CO2					2				2					
CO3										3				
CO4										2				
CO5		1												

PVP20

Syllabus		
Expt. No.	**Contents**	**Mapped CO**
1	Implement the concept of classes and objects.	**CO1,CO2,CO3,CO4,CO5**
2	Use String and String Tokenizer classes to develop Java programs.	**CO1,CO2,CO3,CO4,CO5**
3	Implement the reusability concept through inheritance.	**CO1,CO2,CO3,CO4,CO5**
4	Implement the concept of Polymorphism.	**CO1,CO2,CO3,CO4,CO5**
5	Develop Java programs using Abstract Class.	**CO1,CO2,CO3,CO4,CO5**
6	Use interfaces to develop Java programs.	**CO1,CO2,CO3,CO4,CO5**
7	Create a package and access members from a package.	**CO1,CO2,CO3,CO4,CO5**
8	Apply Exception handling to build robust programs.	**CO1,CO2,CO3,CO4,CO5**
9	Apply Multithreading to run the task parallel	**CO1,CO2,CO3,CO4,CO5**
10	Apply Collection Framework to implement various data structures	**CO1,CO2,CO3,CO4,CO5**
11	Use Case -1	**CO1,CO2,CO3,CO4,CO5**
12	Use Case -2	**CO1,CO2,CO3,CO4,CO5**
13	Use Case-3	**CO1,CO2,CO3,CO4,CO5**
14	Use Case-4	**CO1,CO2,CO3,CO4,CO5**

Learning Resources
Text Books
1. Java - The Complete Reference, Herbert Schildt, Ninth Edition, 2014, McGraw -Hill.
References
1. Programming in Java, Sachin Malhotra, Saurabh Choudhary, Second Edition, 2018, Oxford. 2. Head First Java, Bert Bates, Kathy Sierra, Second Edition, 2005, O'Reilly. 3. Core Java an Integrated Approach, Dr. R. Nageswara Rao, 2017, Dreamtech. 4. Object Oriented Programming through Java, P. Radha Krishna, 2007, Universities Press.
e- Resources and other Digital Material
1. https://nptel.ac.in/courses/106/105/106105191/ 2. https://www.udemy.com/course/java-tutorial/ 3. https://www.decodejava.com/ 4. https://www.codecademy.com/learn/learn-java 5. https://www.w3schools.com/java/

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II B.Tech – I Sem CSE (AI&ML)

Data Structures Lab

Course Code	**20AM3352**	**Year**	II	**Semester:**	I
Course Category	PCC Lab	**Branch**	CSE(AI&ML)	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Programming for Problem Solvingusing C
Continuous Internal Evaluation	15	**Semester End Examination**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	Apply Linear and non-linear data structures for solving problems.	**L3**
CO2	Implement programs as an individual on different IDEs.	**L3**
CO3	Develop an effective report based on various programs implemented.	**L3**
CO4	Apply technical knowledge for a given problem and express it with effective oral communication.	**L3**
CO5	Analyze outputs using given constraints/test cases.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Medium, 1: Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS01**
CO1	3													
CO2					1				2					
CO3			3											
CO4										3				
CO5		2										1		

Syllabus		
Expt. No.	**Contents**	**Mapped CO**
1	Demonstrate recursive algorithms with examples.	**CO1,CO2,CO3,CO4,CO5**
2	Implement various searching techniques.	**CO1,CO2,CO3,CO4,CO5**
3	Develop programs for different sorting techniques	**CO1,CO2,CO3,CO4,CO5**
4	Implement and perform different operations on Single, Double and Circular Linked Lists.	**CO1,CO2,CO3,CO4,CO5**
5	Develop a program to perform operations of a Stack using arrays and linked Lists.	**CO1,CO2,CO3,CO4,CO5**
6	Develop programs to implement Stack applications.	**CO1,CO2,CO3,CO4,CO5**
7	Develop a program to perform operations of Linear Queue using arrays and linked Lists.	**CO1,CO2,CO3,CO4,CO5**
8	Implement Circular Queues.	**CO1,CO2,CO3,CO4,CO5**
9	Develop a program to represent a tree data structure.	**CO1,CO2,CO3,CO4,CO5**
10	Develop a program to demonstrate operations on Binary Search Tree.	**CO1,CO2,CO3,CO4,CO5**
11	Implement and perform different operations on Graph	**CO1,CO2,CO3,CO4,CO5**
12	Demonstrate Graph Traversal Techniques	**CO1,CO2,CO3,CO4,CO5**
13	Case Study -1	**CO1,CO2,CO3,CO4,CO5**
14	Case Study -2	**CO1,CO2,CO3,CO4,CO5**
15	Case Study -3	**CO1,CO2,CO3,CO4,CO5**
16	Case Study -4	**CO1,CO2,CO3,CO4,CO5**

Learning Resources

Text Books

1. Data Structures Using C, Reema Thareja, Second Edition, OXFORD University Press

e-Resources & other digital material

1. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2. http://www.algomation.com/algorithm/single-linked-list-insert-delete
3. http://www.algomation.com/algorithm/binary-tree-insert-delete-display
4. https://www.youtube.com/watch?v=AfYqN3fGapc
5. https://www.youtube.com/watch?v=7vw2iIdqHlM
6. http://littlesvr.ca/dsa-html5-animations/sorting.php

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II B. Tech – II Sem CSE (AI&ML)
Formal Language of Automata Theory

Course Code	20BS1403	**Year**	II	**Semester**	II
Course Category	BSC	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Discrete Mathematical Structures
Continuous Internal Evaluation:	30	**Semester End Examination:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the fundamental concepts of Formal Languages and Automata.	**L2**
CO2	Apply the knowledge of Automata Theory, Grammars & Regular Expressions for solving various problems.	**L3**
CO3	Apply different Turing machines techniques to solve problems.	**L3**
CO4	Analyze automata and their computational power to recognize languages.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2													
CO2	3													
CO3	2													
CO4		2										1		

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Automata:** Why study Automata Theory? The central Concepts of Automata Theory. **Finite Automata:** Deterministic Finite Automata, Non-Deterministic Finite Automata, Finite Automata with Epsilon Transitions, Finite Automata with Outputs (without conversions)	CO1, CO2, CO4
II	**Regular Expressions and Languages**: Regular Expressions, Finite Automata and Regular Expressions, Algebraic Laws for Regular expressions (without proofs). **Properties of regular Languages:** Proving Languages not to be regular, Closure properties of Regular Languages (without proofs), Equivalence and Minimization of Automata.	CO1, CO2
III	**Context–free grammars and Languages**: Context–free grammars, Parse trees, Ambiguity in grammars and Languages, **Properties of Context-free languages:** Normal Forms for Context Free Grammars, The Pumping Lemma for Context Free Languages	CO1, CO2
IV	**Pushdown Automata:** Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automaton.	CO1, CO2, CO4
V	**Turing Machines:** Problems that computer cannot solve, The Turing Machine, Programming Techniques for Turing Machine, Extensions to the Basic Turing Machine **Undecidability:** Recursively Enumerable Language, Universal Turing Machines (UTM), Halting Problem, Post Correspondence Problem, Church Hypothesis.	CO1, CO3, CO4

Learning Resources
Text Books
1. Introduction to Automata Theory, Languages and Computations, J.E.Hopcroft, R.Motwani and J.D Ullman, Third Edition, Pearson Education. 2. Theory of Computer Science, Automata languages and computation, Mishra, Chandra Shekaran, Second Edition, PHI.
Reference Books
1. Introduction of the Theory and Computation, Michael Sipser, 1997, Thomson Brokecole. 2. Elements of The theory of Computation, H.R.Lewis and C.H.Papadimitriou, Second Edition, 2003, Pearson Education/PHI. 3. Formal Languages and Automata Theory, Basavarj S. Anami, Karibasappa K.G, WILEYINDIA. 4. Introduction to Languages and the Theory of Computation, J.C.Martin, Third Edition, TMH, 2003.
e- Resources & other digital material
1. https://www.udemy.com/course/formal-languages-and-automata-theory-e/ 2. https://eecs.wsu.edu/~ananth/CptS317/ 3. https://nptel.ac.in/courses/106/103/106103070/ 4. https://nptel.ac.in/courses/106/106/106106049/ 5. https://nptel.ac.in/courses/111/103/111103016/ 6. https://nptel.ac.in/courses/106/105/106105196/

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II B. Tech – II Sem CSE (AI&ML)

SOFTWARE ENGINEERING

Course Code	20AM3401	**Year**	II	**Semester**	II
Course Category	PCC	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation:	30	**Semester End Exam:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the fundamentals of software engineering	**L2**
CO2	Apply various lifecycle activities for project development	**L3**
CO3	Apply Risk and Quality Management Strategies for project development	**L3**
CO4	Analyze the various requirements, design and Testing Techniques to select the appropriate techniques for the software project development	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: Substantial, 2: Moderate, 1: Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2													
CO2	3													
CO3	1													
CO4		3										1		

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction to Software Engineering:** The Nature of Software, The changing Nature of Software, Software Process, Software Engineering Practice, Software Development myths. **Process models:** Perspective process Models, Unified Process Model, Agile process model	**CO1,CO2**
II	**Requirements Engineering:** Requirements engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Analysis Model, Negotiating requirements. **Agile Requirements:** User Stories, Backlog Management. **Requirements Analysis:** Scenario Based Modeling.	**CO1,CO2, CO4**
III	**Design Engineering:** Design process, Design concepts, The Design Model. **Architectural design:** Software architecture, Architectural styles, Architectural Design, Agility and Architecture User interface design: Golden Rules	**CO1,CO2, CO4**
IV	**Software Testing Strategies:** A strategic approach to software testing, Test strategies for conventional software, Test strategies for Object-Oriented software, Validation Testing, System Testing, The art of Debugging. **Testing Conventional Applications:** Software testing fundamentals, White-Box testing, Basis path testing, Control structure testing, Black-Box testing Agile Testing, User Acceptance Test.	**CO1,CO2, CO4**
V	**Risk management:** Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan. **Software Quality Assurance:** Elements of SQA, SQA Tasks, Goals, and Metrics, Statistical Software Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, The SQA Plan. Agile approach to Risk and Quality Assurance	**CO1,CO3, CO4**

Learning Resources
Text Books
1. Software Engineering: A Practitioner's Approach, Roger S. Pressman, Bruce R. Maxim, Eighth edition, 2015, McGraw Hill, International Edition 2. Robert C. Martin, Agile Software Development, Principles, Patterns, and Practices Alan Apt Series (2011)
References
1. Software Engineering, Ian Sommerville, Seventh edition, 2004, Pearson, India 2. Software Engineering, K.K. Agarwal &Yogesh Singh, 2007, New Age International Publishers. 3. Software Engineering Principles and Practice, Waman S Jawadekar, 2004, McGraw-Hill. 4. Fundamentals of Software Engineering, Rajib Mall, Fourth edition, 2009, PHI. 5. Succeeding with Agile : Software Development Using Scrum, Pearson (2010)
e-Resources & other digital material
1.https://onlinecourses.nptel.ac.in/noc20_cs68 2.https://thedigitalprojectmanager.com 3.https://www.youtube.com/watch?v=GMOogBp3AAE&list=PL9P1J9q3_9fNfUBVYhFeoieHRnJg_vXxx&index=1

PVP 20

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II B.Tech – II Sem CSE (AI&ML)

Database Management Systems

Course Code	20AM3402	**Year**	II	**Semester**	II
Course Category	PCC	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Engineering Mathematics -1, Data Structures, Operating Systems.
Continuous Internal Evaluation :	30	**Semester End Examination:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts of database management systems	**L2**
CO2	Apply ER Model, Construct SQL or Relational Algebra operations to find solutions for a given application	**L3**
CO3	Apply normalization techniques to improve database design	**L3**
CO4	Analyze a real time scenario to use Conceptual and Relational data models for designing the database	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2												1	
CO2	3													
CO3	2													
CO4		2								1		1		

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction to Databases:** Characteristics of the Database Approach, Advantages of using the DBMS Approach, A Brief History of Database Applications, Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System environment, Centralized and Client-Server Architecture for DBMSs.	**CO1**
II	**Conceptual Data Modeling:** High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher Than Two. Relational Database Design Using ER-to-Relational Mapping.	**CO1,CO2, CO4**
III	**Relational Model:** The Relational Model Concepts, Relational Model Constraints and Relational Database Schemas. Basic SQL: SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic retrieval Queries in SQL ,INSERT, DELETE AND UPDATE Statements in SQL More SQL: More complex SQL retrieval queries Advanced Queries, Specifying constraints as Assertions and Actions as Triggers, Views in SQL **Relational Algebra**: Unary Relational Operations: Select and Project, Relational Algebra Operations from Set Theory, Binary Relational Operations: Join and Division, Examples of Queries in Relational Algebra.	**CO1,CO2, CO4**
IV	**Database Design Theory and Normalization:** Functional Dependencies, Normal forms based on Primary Keys, General definitions of Second and Third Normal Forms , Boyce-Codd Normal Form, Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.	**CO1,CO3, CO4**
V	**Transaction Processing:** Introduction, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability & Serializability, Transaction Support in SQL. **Introduction to Concurrency Control:** Two-Phase Locking Techniques for concurrency control: Types of Locks and System Lock Tables, Guaranteeing Serializability by Two-Phase Locking. **Introduction to Recovery Protocols**: Recovery Concepts, No- UNDO/REDO Recovery Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging.	**CO1**
Learning Resources		
Text Books		
1. Fundamentals of Database Systems, Ramez Elmasri, ShamkantB. Navathe, Seventh edition, Pearson.		
References		
1. Data base System Concepts, Abraham Silberschatz, Henry F Korth, S. Sudarshan, Fifth Edition, McGraw Hill. 2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, Third Edition,TMH. 3. Introduction to Database Systems, C.J.Date, Eigth Edition , Pearson		
e-Resources and other Digital Material:		
1. https://nptel.ac.in/courses/106/105/106105175/ 2. https://onlinecourses.nptel.ac.in/noc21_cs04/ 3. https://nptel.ac.in/courses/106/106/106106093/		

PVP20

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II B.Tech -II SEM CSE(AI&ML)

Design and Analysis of Algorithms

Course Code	20AM3403	**Year**	II	**Semester**	II
Course Category	PCC	**Branch**	CSE(AI& ML)	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Discrete Mathematical Structures and Data Structures
Continuous Internal Evaluation :	30	**Semester End Examination:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the fundamental concepts of algorithm analysis and design techniques.	**L2**
CO2	Apply Divide and Conquer, Greedy techniques for solving problems.	**L3**
CO3	Apply Dynamic Programming, Back Tracking and Branch and Bound techniques for solving problems.	**L3**
CO4	Analyze the given problem using suitable design techniques and provide the feasible solution.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2													
CO2	3											1		
CO3		3										1		
CO4		3										1		

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction**: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving. Fundamentals of the Analysis of Algorithm Efficiency: Analysis framework and Asymptotic Notations and Basic Efficiency Classes, Amortized Analysis. Introduction to Brute Force Technique, Exhaustive Search.	**CO1,CO2**
II	**Divide and Conquer:** Introduction, Merge sort, Quick sort, Binary Search, Finding Maximum and Minimum, Strassen_s Matrix Multiplication.	**CO1,CO2,CO4**
III	**The Greedy Method:** Introduction, Huffman Trees and codes, Minimum Coin Change problem, Knapsack problem, Job sequencing with deadlines, Minimum Cost Spanning Trees, Single Source Shortest paths.	**CO1,CO2,CO4**
IV	**Dynamic Programming**: Introduction, 0/1 Knapsack problem, All pairs shortest paths, Optimal Binary search trees, Travelling salesman problem.	**CO1,CO3,CO4**
V	**Back Tracking:** Introduction, n-Queens problem, Sum of subsets, Hamiltonian cycle. **Branch and Bound:** Introduction, Assignment problem, Travelling Salesman problem. **Introduction to Complexity classes**: P and NP Problems, NP-Complete Problems.	**CO1,CO3,CO4**

Learning Resources

Text Books

1. Introduction to the Design & Analysis of Algorithms, Anany Levitin, Third Edition, 2011, Pearson Education.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2002, Pearson.
3. Algorithm Design Techniques, Narasimha Karumanchi, CareerMonk Publications, 2018.

References

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third Edition, 2012, MIT Press.
2. Fundamentals of computer algorithms, Ellis Horowitz, Sartaj Sahni, S. Rajasekharan, Second Edition, 2008, Universities Press.

e-Resources and other Digital Material

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://www.cmi.ac.in/~madhavan/
3. https://www.coursera.org/lecture/analysis-of-algorithms/resources-jMWPy
4. https://www.geeksforgeeks.org/fundamentals-of-algorithms/

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II B. Tech – II Sem (Common to CSE (AI&ML and Data Science))

INTERNET OF THINGS

Course Code:	20ES1402	**Year:**	II	**Semester:**	II
Course Category:	Engineering Sciences	**Branch:**	CSE(AI&ML)	**Course Type:**	Theory
Credits:	3	**L-T-P:**	3-0-0	**Prerequisites:**	-
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Summarize the genesis and impact of IoT applications and architectures in the real world.	**L2**
CO2	Apply diverse methods in deploying smart objects and connecting them to the network.	**L3**
CO3	Construct simple applications using Arduino.	**L3**
CO4	Analyze different protocols and select which protocol can be used for a specific application.	**L4**
CO5	Identify and develop a solution for a given application using APIs.	**L3**

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	The genesis of IoT, IoT and Digitization, IoT Impact-Connected roadways, Smart connected buildings, Convergence of IT and IoT, IoT Challenges, Comparing IoT Architectures - OneM2M IoT Architecture and IoTWF Architecture, A Simplified IoT Architecture.	**CO1, CO2**
II	Smart Objects: The Things in IoT- Sensors, Actuators, and Smart Objects, Sensor Networks-Advantages and Disadvantages, Communications Criteria-Range, Frequency bands, Power consumption, Topology, IoT Access Technologies- IEEE 802.15.4, IEEE 1901.2a, IEEE 802.11ah (only Standardization and Alliances, Physical Layer, MAC Layer and Topology)	**CO1, CO2**
III	Embedded Computing Basics- Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino- Developing on the Arduino, Some Notes on the Hardware, Openness.	**CO1, CO3**
IV	Communication in the IoT: Internet Principles, Internet Communications: An Overview- IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses- DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports- An Example: HTTP Ports, Other Common Ports, Application Layer Protocols- HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.	**CO1, CO4**
V	Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, other Protocols.	**CO1, CO5**
Learning Resources		
Text Books		

1. Designing the Internet of Thing, Adrian McEwen, Hakim Cassimally, 2012, Wiley Publications.
2. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, First Edition, Pearson Education.

Reference Books

1. Internet of Things: A Hands-On Approach, ArshdeepBahga, Vijay Madisetti, 2014, Universities Press.
2. Internet of Things, Srinivasa K G, 2017, CENGAGE Leaning India.

PVP20

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II B.Tech -II SEM CSE(AI&ML)

Algorithms Lab

Course Code	20AM3452	**Year**	II	**Semester**	II
Course Category	PCC Lab	**Branch**	CSE(AI& ML)	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	DataStructures, Programming for Problem solving using C
Continuous Internal Evaluation :	15	**Semester End Examination:**	35	**Total Marks:**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Apply different design techniques for solving problems.	**L3**
CO2	Implement programs as an individual on different IDEs/online platforms.	**L3**
CO3	Develop an effective report based on various programs implemented.	**L3**
CO4	Apply technical knowledge for a given problem and express it with effective oral communication.	**L3**
CO5	Analyze outputs using given constraints/test cases.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3											2		
CO2	3				2									
CO3										3				
CO4	2									2				
CO5		3												

Syllabus		
Expt No	**Contents**	**Mapped CO**
1.	Develop and implement an algorithm using Divide and Conquer strategy for a given set of problems.	**CO1,CO2,CO3,CO4,CO5**
2.	Make use of greedy method to implement a solution for a given problem.	**CO1,CO2,CO3,CO4,CO5**
3.	Develop and implement an efficient solution using Dynamic Programming.	**CO1,CO2,CO3,CO4,CO5**
4.	Use Backtracking design technique to implement a solution for a given problem.	**CO1,CO2,CO3,CO4,CO5**
5.	Decelop and implement an algorithm using Branch and Bound technique for solving a given problem.	**CO1,CO2,CO3,CO4,CO5**
6.	Case Study-1: Apply the most appropriate design technique to develop and implement an efficient solution for a given problem.	**CO1,CO2,CO3,CO4,CO5**
7.	Case Study-2: Develop and implement an optimal solution for a given problem by applying a suitable design technique.	**CO1,CO2,CO3,CO4,CO5**
8.	Case Study-1	**CO1,CO2,CO3,CO4,CO5**
9.	Case Study-2	**CO1,CO2,CO3,CO4,CO5**
10.	Case Study-3	**CO1,CO2,CO3,CO4,CO5**

Learning Resources

Text Books

1. Introduction to the Design & Analysis of Algorithms, Anany Levitin, Third Edition, 2011, Pearson Education.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2002, Pearson.
3. Algorithm Design Techniques, Narasimha Karumanchi, CareerMonk Publications, 2018.

e-Resources & other digital material

1. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2. https://littlesvr.ca/dsa-html5-animations/sorting.php
3. https://www.youtube.com/watch?v=AfYqN3fGapc

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II B.Tech – II Sem CSE (AI&ML)

Database Management Systems Lab

Course Code	20AM3451	**Year**	II	**Semester**	II
Course Category	PCC Lab	**Branch**	CSE (AI&ML)	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Programming for Problem Solving Lab
Continuous Internal Evaluation :	15	**Semester End Examination:**	35	**Total Marks:**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Apply database management techniques to solve problems	**L2**
CO2	Conduct experiments by using modern tools like MYSQL, Oracle	**L3**
CO3	Develop an effective report based on various constructs implemented.	**L3**
CO4	Apply technical knowledge for a given problem and express with an effective oral communication.	**L3**
CO5	Analyze outputs of queries for a given problem	**L4**

Syllabus		
Expt. No.	**Contents**	**Mapped CO**
1	Introduction to MySQL Workbench. How to use MySql Workbench to run SQL Statements.	**CO1,CO2,CO3, CO4,CO5**
2	Examples on i) DDL Commands: CREATE , ALTER, DROP and TRUNCATE a Table ii) Implementation of Constraints PRIMARY KEY, FOREIGN KEY,CHECK,NOT NULL,UNIQUE.	**CO1,CO2,CO3, CO4,CO5**
3	Examples on i) DML Commands. INSERT, UPDATE and DELETE ii) DCL Commands: COMMIT , ROLLBACK and SAVEPOINT.	**CO1,CO2,CO3, CO4,CO5**
4	Examples on retrieving data from a single table using i) SELECT statement ii) SELECT statement with where clause(Comparison Operators, AND, OR, NOT, IN, BETWEEN,LIKE) iii) ORDER BY clause(sort by column name) iv) LIMIT clause	**CO1,CO2,CO3, CO4,CO5**
5	Examples on Functions in MySQL: String, Numeric, Date, Time and Other Functions.	**CO1,CO2,CO3, CO4,CO5**
6	Examples on Summary Queries: Queries using Aggregate functions, GROUP By and Having Clauses, ROLLUP Operator.	**CO1,CO2,CO3, CO4,CO5**

7	Examples on Inner join, outer join using USING and NATURAL Keywords	**CO1,CO2,CO3, CO4,CO5**
8	Examples on SUB/SUMMARY Queries Using IN, ANY, SOME, ALL , EXISTS and NOT EXISTS functions	**CO1,CO2,CO3, CO4,CO5**
9	Examples on i) Creating INDEXES and VIEWS ii) INSERT,DELETE and DROP on VIEWS	**CO1,CO2,CO3, CO4,CO5**
10	Examples on i) Create and Call STORED PROCEDURE (IN, OUT, INOUT Parameters), Drop a STORED PROCEDURE. ii) Create, call and Drop a FUNCTION. iii) Create and Drop a TRIGGER	**CO1,CO2,CO3, CO4,CO5**
11	Use Case-1	**CO1,CO2,CO3, CO4,CO5**
12	Use Case-2	

Learning Resources

Text Books

1. Murach"s MySQL by JOEL MURACH, Shroff Publishers & Distributors Pvt.Ltd, June 2012.

References

1. The Complete Reference MYSQL,VikramVaswani, 2017, McGrawHill Education.
2. Fundamentals of Database Systems, Ramez Elmasri,ShamkantB. Navathe, Seventh edition, Pearson.

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

KANURU, VIJAYAWADA - 520007

II B.Tech – II Semester CSE (AI&ML)

Advanced Competitive Programming

Course Code	**20SO8456**	**Year**	II	**Semester**	II
Course Category	SOC2	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	2	**L-T-P**	1-0-2	**Prerequisites**	Foundations of Competitive Programming, Data Structures
Continuous Evaluation :	-	**Semester End Evaluation:**	50	**Total Marks:**	50

Syllabus – Course Contents	
Week 1	• Apply Binary Tree concepts to solve the Level Order Print, Tree Diameter Concept, Tree Diameter Optimized Code, Replace with Descendant Sum, Height of Tree, Height Balanced Tree Concept, Max Subset Sum Tree, Print At Level K, Nodes at Distance K, Nodes at Distance K Code, Vertical Order Print, Sorted Nodes at Distance K, Siblings Swap problems.
Week 2	Exercise problems on Binary Trees: • https://www.hackerrank.com/domains/datastructures?filters%5Bsubdomains%5D%5B%5D=trees • https://www.hackerearth.com/practice/data-structures/trees/binary-and-nary-trees/practice-problems/
Week 3	• Apply Binary Search Tree concepts to solve Minimum Height BST, Closest in BST, In order Successor in BST, IsBST, LCA, Shortest Tree Path
Week 4	Exercise problems on Binary Search Trees: • https://www.hackerearth.com/practice/data-structures/trees/binary-search-tree/practice-problems/ • https://www.hackerrank.com/domains/datastructures?filters%5Bsubdomains%5D%5B%5D=trees
Week 5	• Apply Priority Queue concepts to solve Sorting using Heap, Finding Cabs Implementation, Merging Ropes, Running Median, Running Median Class, Merging K-Arrays, Merge K-Sorted Arrays, problems
Week 6	Exercise problems on Priority Queue: • https://www.hackerrank.com/domains/datastructures?filters%5Bsubdomains%5D%5B%5D=heap • https://www.hackerearth.com/practice/data-structures/trees/heapspriority-queues/practice-problems/
Week 7	• Apply Hashing technique to solve Triplets in GP, Hashing with Slider, Triplets in GP Implementation, Counting Rectangles | Sets, Counting Rectangles Implementation, Counting Triangles | Unordered Maps, Counting Triangles Implementation, Anagrams in Substrings | Maps, Anagrams in Substrings Implementation Quick Brown Fox Implementation, Common Elements, First Repeating Letter, Break the chain, Minimum Bars, Group Anagrams, Longest k-sum Subarray problems
Week 8	Exercise problems on Hashing Technique: • https://www.hackerearth.com/practice/data-structures/hash-tables/basics-of-hash-tables/practice-problems/
Week 9	• Apply Graph data structure to solve Cycle Detection in Undirected Graph, Backedge Detection, Cycle Detection in Directed Graph, Board Game Implementation, Storing Weighted Graphs, Astronaut Pairs, Graph Sequence, Largest Island, Shortest Grid Path, Minimum Spanning Trees, Kruskal Algorithm Prims Algorithm, Explaining Dijkstra Algorithm, Bellman-Ford Algorithm and Floyd-Warshall Algorithm, Bipartite Graph Test

Week 10	Exercise problems on Graph data structure: • https://www.hackerrank.com/domains/algorithms?filters%5Bsubdomains%5D%5B%5D=graph-theory • https://codeforces.com/ • https://www.codechef.com/
Week 11	Apply Divide and Conquer to solve the problems • https://codeforces.com/ • https://www.codechef.com/ • https://leetcode.com/
Week 12	Apply Greedy Algorithms to solve the problems • https://www.hackerearth.com/practice/algorithms/greedy/basics-of-greedy-algorithms/practice-problems/ • https://www.hackerrank.com/domains/algorithms?filters%5Bsubdomains%5D%5B%5D=greedy • https://codeforces.com/ • https://www.codechef.com/ • https://leetcode.com/
Week 13	Apply Back Tracing Technique to solve the problems • https://codeforces.com/ • https://www.codechef.com/ • https://leetcode.com/
Week 14	Apply Dynamic Programming to solve the problems • https://www.hackerrank.com/domains/algorithms?filters%5Bsubdomains%5D%5B%5D=greedy&filters%5Bsubdomains%5D%5B%5D=dynamic-programming
Week 15	Apply Dynamic Programming to solve the problems • https://www.hackerearth.com/practice/algorithms/dynamic-programming/introduction-to-dynamic-programming-1/practice-problems/ • https://www.codechef.com/practice?end_rating=1199&group=all&itm_campaign=practice&itm_medium=navmenu&limit=20&page=0&search=&sort_by=difficulty_rating&sort_order=asc&start_rating=1000&tags=&topic=Dynamic%20Programming&video_editorial=0&wa_enabled=0
Week 16	Case Study

LEARNING RESOURCES

Text Books

1. Guide to Competitive Programming; Learning and improving Algorithms Through Contests, Antti Laaksonen, Second Edition, 2020, Springer.
2. Programming Challenges: The Programming Contest Training Manual, Steven S. Skiene, 2006, Springer.
3. Introduction to Algorithms, Thomas H. Cormen, Third Edition, 2009, PHI Learning Pvt. Ltd.

e-Resources & other digital material

1. https://www.hackerrank.com
2. https://www.hackerearth.com
3. https://www.codeforces.com
4. https://www.codechef.com
5. https://www.leetcode.com
6. https://www.interviewbit.com
7. https://www.topcoder.com
8. https://www.geeksforgeeks.com
9. https://www.codewars.com

PVP20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
(Autonomous)

KANURU, VIJAYAWADA-520007
II B.Tech – II Sem CSE(AI&ML)

ADVANCED DATA STRUCTURES

Course Code:	20AM6421	**Year:**	II	**Semester:**	II
Course Category:	Honors	**Branch:**	CSE(AI&ML)	**Course Type:**	Integrated
Credits:	4	**L-T-P:**	3-0-2	**Prerequisites:**	Data Structures
Continuous Internal Evaluation:	30	**Semester End Examination:**	70	**Total Marks:**	100

COURSE OUTCOMES		
Upon successful completion of the course, Student will be able to		
CO1	Apply Hashing, Disjoint sets and String Matching techniques for solving problems effectively.	**L3**
CO2	Apply the concepts of advanced Trees and Graphs for solving problems effectively.	**L3**
CO3	Analyze the given scenario and choose appropriate Data Structure for solving problems.	**L4**
CO4	Ability to conduct practical experiments to solve problems using an appropriate data structure.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Moderate, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	3													
CO3		3										2		
CO4		3			3							2		

Unit No.	SYLLABUS CONTENTS	Mapped CO
I	**Hashing –** General Idea, Hash Function, Separate Chaining, Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library, Universal Hashing, Extendible Hashing.	CO1,CO3, CO4
II	**Priority Queues (Heaps)** – Model, Simple implementations, Binary Heap: Structure Property, Heap Order Property, Basic Heap Operations: insert, delete, Percolate down, Other Heap Operations.	CO2,CO3, CO4
III	**Trees –** AVL: Single Rotation, Double Rotation, B-Trees. **Multi-way Search Trees –** 2-3 Trees: Searching for an Element in a 2-3 Tree, Inserting a New Element in a 2-3 Tree, Deleting an Element from a 2-3 Tree. **Red-Black Trees –** Properties of red-black trees, Rotations, Insertion, Deletion.	CO2,CO3, CO4
IV	**Graphs Algorithms –** Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.	CO2,CO3, CO4
V	**Disjoint Sets –** Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm. **String Matching –** The naive string-matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm.	CO1,CO3, CO4

Learning Resources

Text Books

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Edition, 2014, Pearson.
2. Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3rd Edition, 2009, The MIT Press.

References Text Book

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahani and Rajasekharam, 2nd Edition, 2009, University Press Pvt. Ltd.
2. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018.

e-Resources and other Digital Material

1. http://www.coursera.org/learn/advanced-data-structures/
2. https://nptel.ac.in/courses/106/106/106106133/
3. https://www.mooc-list.com/tags/advanced-data-structures
4. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms/

EXPT NO	CONTENTS	MAPPED CO
1	a) Implement various Hashing Techniques. b) Develop a solution to the given problem using Hashing Techniques. https://leetcode.com/tag/hash-table/ https://medium.com/@codingfreak/hashing-problems-in-data-structures-c41b77a5119a	**CO1, CO2,CO3,CO4**
2	a) Implement Binary Heap and its operations. b) Develop a solution to the given problem using Binary Heaps. https://leetcode.com/tag/heap-priority-queue/ https://leetcode.com/discuss/general-discussion/1113631/important-concepts-problems-in- priority-queueheaps	**CO1,CO2,CO3,CO4**
3	a) Implement AVL Trees and its operations. b) Develop a solution to the given problem using AVL Trees. https://www.hackerrank.com/contests/17cs1102/challenges/10-c-avl-tree-delete https://www.hackerrank.com/domains/data-structures?filters%5Bsubdomains%5D%5B%5D=balanced-trees	**CO1,CO2,CO3,CO4**
4	a) Implement 2-3 Trees and its operations. b) Develop a solution to the given problem using 2-3 Trees. https://leetcode.com/tag/tree/	**CO1,CO2,CO3,CO4**
5	a) Implement disjoint sets and its operations. b) Develop a solution to the given problem by using Disjoint set. https://www.hackerrank.com/domains/data-structures?filters%5Bsubdomains%5D%5B%5D=disjoint-set	**CO1,CO2,CO3,CO4**
6	a) Construct a graph from given degrees of all vertices b) Find K vertices in the graph which are connected to at least one of remaining vertices c) Find the remaining vertices of a square from two given vertices	**CO1,CO2,CO3,CO4**
7	Develop a solution to the given graph problem by choosing an effective algorithm. https://leetcode.com/tag/graph/ https://www.hackerrank.com/domains/algorithms/graph-theory/page/1	**CO1,CO2,CO3,CO4**
8	Develop a solution to search for a pattern string using String Search Techniques. https://www.hackerrank.com/domains/algorithms/strings/page/2 https://leetcode.com/tag/string-matching/	**CO1,CO2,CO3,CO4**
9	Use case-1	**CO1,CO2,CO3,CO4**
10	Use case-2	**CO1,CO2,CO3,CO4**

Learning Resources

Text Books

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Fourth Edition, 2014, Pearson.
2. Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third Edition, 2009, The MIT Press.

References

1. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018.
2. Data Structures and Algorithms Made Easy by Narasimha Karumanchi, 2020, CareerMonk Publications.
3. Advanced Data Structures, Peter Brass, Cambridge University Press, 2008.

e-Resources and other Digital Material

1. https://www.youtube.com/playlist?list=PLBlnK6fEyqRj9lld8sWIUNwlKfdUoPd1Y.
2. http://ocw.mit.edu/6-851S12/
3. https://nptel.ac.in/courses/106/106/106106133/
4. https://www.mooc-list.com/course/advanced-data-structures-edx

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KANURU, VIJAYAWADA-520007

II B. Tech – II Sem (Common to CSE (AI&ML and Data Science))

Internet of Things Lab

Course Code:	**20ES1452**	**Year:**	II	**Semester:**	II
Course Category:	ES Lab	**Branch:**	CSE (AI&ML)	**Course Type:**	Practical
Credits:	1.5	**L-T-P:**	0-0-3	**Prerequisites:**	
Continuous Internal Evaluation:	15	**Semester End Evaluation:**	35	**Total Marks:**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Develop various sensor interfacing using Arduino IDE	**L3**
CO2	Evaluate Wireless Control of Remote Devices	**L4**
CO3	Design and develop a Mobile Application which can interact with Sensors and Actuators.	**L5**
CO4	Make an effective report based on experiments.	**L3**

SYLLABUS		
Expt. No.	**CONTENTS**	**Mapped CO**
1	Digital I/O Interface – Blynk LED, Multicolour LED.	**CO1, CO4**
2	Digital I/O Interface - IR Sensor, Slot Sensor	**CO1, CO4**
3	Analog Read and Write - Potentiometer, Led Brightness Control.	**CO1, CO4**
5	Analog Read and Write -Temperature Sensor	**CO1, CO4**
6	Dc Motor Control - Dc Motor Speed and Direction Control.	**CO1, CO4**
7	Serial Communication - Device Control.	**CO1, CO4**
8	Fabrication and direction control of the wheeled robot using Arduino	**CO1, CO4**
9	Wireless Module Interface -Wifi.	**CO1, CO2,CO4**
10	Basic Android App Development using MIT App Inventor.	**CO1,CO3, CO4**
Learning Resources		
Text Books		
1. Invent To Learn: Making, Tinkering, and Engineering in the Classroom, Sylvia Libow Martinez, Gary S Stager, 2016, Constructing Modern Knowledge Press.		
References		
1. Arduino Cookbook, Michael Margolis, 2011, Oreilly.		

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)
KANURU, VIJAYAWADA-520007
II B. Tech – II Semester
(Common to CSE (AI&ML and Data Science))

ENVIRONMENTAL SCIENCES

Course Code	**20MC1402**	**Year**	II	**Semester**	II
Course Category	Mandatory course	**Branch**	CSE(AI&ML)	**Course Type**	Theory
Credits	0	**L-T-P**	2-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation:	**30**	**Semester End Evaluation**	**70**	**Total Marks:**	**100**

COURSE OUTCOMES

After successful completion of the course, the student will be able to

CO1	Apply advanced solutions to measure the threats and hazards in environment to link with human natural systems.(L3)
CO2	Analyze the ethical ,cultural and historical interactions between man and environment.(L4)
CO3	Analyze various environmental assets and record for better management(L4)
CO4	Analyze global issues to design and evaluate policies(L4)
CO5	Apply system concepts to methodological social and environmental issues(L3)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M: Medium, L:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2		2					3							
CO3		3					3							
CO4		2					3							
CO5	2													

UNIT NO	Contents	Mapped COs
I	**INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES** Introduction to environment: Definition, scope & importance, need for public awareness for resource conservation. Natural resources: Renewable and non renewable resources and associated problems. Forest resources: Uses, Reasons for over-exploitation, deforestation effects with case studies- Chipko movement / Narmada Bachavo Andholan. Water resources: Use and over – utilization of surface and ground water, floods, drought, conflicts over water, Big dams- benefits & problems. Mineral resources: Uses, environmental effects of extracting and using mineral	CO1 CO2

	resources with case studies-Uranium exploration in Jharkhand. Food resources: World food problems, Impacts of overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies-Pesticide effects in Kerala. Energy resources: Growing energy needs, use of renewable and non renewable energy sources, case studies.	
II	**ECOSYSTEMS AND BIODIVERSITY** Structure components of ecosystem: Biotic and Abiotic components. Functional components of an ecosystem: Food chains, Food webs, Ecological pyramids, Energy flow in the ecosystem, Biogeochemical cycle: Nitrogen, carbon, Phosphorus cycle & Ecological succession. Biodiversity: Definition, Levels of biodiversity: genetic, species and ecosystem diversity. Bio-geographical classification of India, Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega – diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In– situ and Ex-situ conservation of biodiversity.	CO1 CO2
III	**ENVIRONMENTAL POLLUTION AND CONTROL** Environmental Pollution: Definition, causes, effects and control measures of: Air Pollution, Water pollution, Soil pollution, Marine pollution, Thermal pollution, Nuclear hazards, Solid waste Management, e-waste, Pollution case studies- Delhi Smog / Ganga River Pollution / Taj Mahal Corrosion.	CO3
IV	**SOCIAL ISSUES AND GLOBAL ENVIRONMENT PROBLEMS AND EFFORTS** From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management, Remote sensing and GIS methods. Environmental ethics: Issues and possible solutions. Green building concept, Environmental Impact Assessment & Environmental Management Plans, Climate change: global warming, acid rain, ozone layer depletion.	CO4 CO5
V	**HUMAN POPULATION AND ENVIRONMENT LEGISLATION** Population growth, Environment and human health- HIV/AIDS,. Value Education. Women and Child Welfare. Role of Information Technology in Environment and human health. Environment Legislation-Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act & Environmental Protection Act.	CO4 CO5

Learning Recourses
Text Books
1. Anubha Kaushik and C.P. Kaushik, Text book of environmental studies New Age International Publisher (2014). 2. Erach Barucha, Text book of environmental studies for undergraduates courses, published by – University Grants Commission, University Press (2005) 3. Anindita Basak, Environmental Studies. Pearson (2009)
Reference Books
1. D.K. Asthana and Meera Asthana, A Text book of Environmental Studies, S. Chand (2010). 2. P.M Cherry Solid and Hazardous waste Management, CBS Publisher (2016). Charles H. Ecclestion, Environmental Impact Assessment, CRC Press (2011).