



**ACADEMIC
REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS**

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

**COMPUTER SCIENCE AND
ENGINEERING (AI & ML)**

for

B.TECH FOUR YEAR DEGREE PROGRAMME

(Applicable for the batches admitted from 2020-2021)

AR - 20

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(An Autonomous Institution)**

Approved by AICTE,

Recognized Under 2(f) & 12(b) of UGC Permanently
Affiliated to JNTU Kakinada

K.Kotturu, Tekkali, Srikakulam -532201, Andhra Pradesh.

Vision of the Institute

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

Mission of the Institute

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that the efficiency for employability increases on a continued basis.

Vision of the Department

To become a pioneer in providing high quality education and research in the area of computer science and engineering.

Mission of the Department

- M1: Enrich society and advance computer science and engineering by preparing graduates with the knowledge, ability, and skill to become innovators and leaders who are able to contribute for the aspirations of the country and society.**
- M2: Benefit humanity through research, creativity, problem solving, and application development.**
- M3: Share knowledge and expertise to benefit the country, the region, and beyond while inspiring people to engage in computing fields.**

The **Programme Educational Objectives (PEOs)** for our Computer Science and Engineering program are to produce graduates who will:

PEO1. Be employed as a practicing engineer in fields such as design, development, testing and research or undertake higher studies.

PEO2. Engage in lifelong self-directed learning, a capacity that is vital for success in today's global and rapidly changing engineering environment.

PEO3. Create new methods / processes to meet the society needs with their knowledge.

PEO4. Conduct themselves as ethical and responsible professionals with good communication skills and demonstrate leadership skills

PROGRAM OUTCOMES (POs):

Engineering Graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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.
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.
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.
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.

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.
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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
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):

By the completion of Computer Science program the student will be able to:

- PSO1. Apply mathematical foundations, algorithmic principles, and theoretical computer science in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**
- PSO2. Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems.**
- PSO3. Use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations**

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Academic Regulations 2020 (AR20) for B. Tech

(Effective for the students admitted into I year from the Academic Year 2020-21 onwards)

1. Award of B.Tech. Degree:

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

Registered for **160** credits and he/she must secure total **160** credits.

Students, who fail to complete their four-year course of study within **8** years or fail to acquire the **160** Credits for the award of the degree within **8** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Courses of study:

The following courses of study are offered at present with specialization in the B.Tech Course.

S. No.	Branch Code-Abbreviation	Branch
01	01-CE	Civil Engineering
02	02-EEE	Electrical and Electronics Engineering
03	03-ME	Mechanical Engineering
04	04-ECE	Electronics and Communication Engineering
05	05-CSE	Computer Science and Engineering
06	12-IT	Information Technology
07	42-CSE (AI&ML)	CSE (Artificial Intelligence and Machine Learning)

And any other course as approved by the authorities of the University from time to time.

3. Credits (Semester system from I year onwards):

S. No	Course	Credits
1	Mandatory Course	0
2	Theory Course	3
3	Laboratory Course	1.5
4	Integrated Course	4.5
5	Interdisciplinary/Open Elective Course	3
6	Skill-Oriented/Skill-Advanced/Soft Skills Course	2
7	Internship	1.5/03
8	Project work	12

4. Interdisciplinary/Open Electives:

There is one interdisciplinary elective in III year II semester and one open elective in IV year I semester. The student can choose any one interdisciplinary elective/open elective courses offered in the respective semester. The pattern of Midterm examinations and End examinations of these courses is similar to regular theory courses and the valuation is purely internal.

5. MOOCs:

Explore all possibilities to run at least one subject in every semester from II year I semester onwards as a MOOCs.

6. NCC/NSS activities:

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 II year I semester or II year II semester. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. 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.

7. Evaluation Methodology:

The performance of a student in each semester shall be evaluated with a maximum of **100** marks for theory course, laboratory and other courses. The project work shall be evaluated for **200** marks.

7.1 Mandatory Courses:

Mandatory course is one among the compulsory courses and does not carry any Credits. The list of mandatory courses is shown below:

- Induction Program
- Constitution of India
- Environmental Science
- Human Values

No marks or letter grade shall be allotted for all mandatory non-credit courses.

7.2 Theory course (100 marks):

For theory course, the distribution shall be **40** marks for internal midterm evaluation and **60** marks for the External End Examinations. Out of **40** internal midterm marks, **25** marks are allotted for descriptive exam, **10** marks for two assignments (**5** marks for each assignment) or one case study (group-wise), and **5** marks for objective test.

7.2.1 Pattern for Internal Midterm Examinations (25 marks):

For theory courses of each semester, there shall be **2** Midterm exams. Each descriptive exam is to be held for **30** marks and will be scaled down to **25** marks, with the duration of **90** minutes.

For final calculation of internal marks, weightage of **70%** will be given to the student who performed well either in first Midterm or second Midterm and **30%** weightage will be given to other Midterm examination.

Midterm paper contains three descriptive type questions with internal choice. Each question carries **10** marks ($3 \times 10 = 30M$). The first Midterm examination will be conducted usually after 8 weeks of instruction or after completion of 50% syllabus (i.e. first 3 Units), and the second Midterm examination will be conducted usually at the end of instruction after completion of remaining 50% syllabus (i.e. remaining 3 Units).

7.2.2 Objective test (5 marks):

For theory courses of each semester, there shall be **2** Objective tests to be conducted along with Midterm exam. Each Objective test is to be held for **10** marks with the duration of **10** minutes and will be scaled down to **5** marks.

For final calculation of objective test marks, weightage of **70%** will be given to the student who performed well either in first objective test or second objective test and **30%** weightage will be given to other objective test.

7.2.3 Pattern for External End Examinations (60 marks):

The question paper shall have descriptive type questions for **60** marks. There shall be one question from each unit with internal choice. Each question carries **10** marks. Each course shall consist of six units of syllabus. The student should answer total **6** questions. ($6 \times 10M = 60M$)

7.3 Laboratory Course (100 marks):

For laboratory course, there shall be continuous evaluation during the semester for **40** internal marks and **60** semester end examination marks. Out of the **40** marks for internal, **25** marks for day-to-day evaluation, **5** marks for record and **10** marks to be awarded for internal laboratory written test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.

For the course Engineering Graphics and Design, the distribution shall be **40** marks for internal evaluation (**20** marks for day-to-day evaluation, and **20** marks for internal tests) and **60** marks for end examination.

For the award of marks for internal tests, weightage of **70%** will be given to the student who performed well either in first test or second test and **30%** weightage will be given to other test.

7.4 Integrated Course (100 marks):

Integrated courses are exclusively designed to provide a unique learning experience of layered learning where students have a chance to practice while learning. These courses are designed by blending both theory and laboratory components one over the other.

Assessment for **100** marks as given below:

Category	Marks	Assessment
Internal	20	Internal assessment of Laboratory carried out for 40 marks will be scaled down to 20 marks.
	20	Internal assessment of Theory carried out for 40 marks will be scaled down to 20 marks.
End examination	40	End examination of Laboratory carried out for 60 marks will be scaled down to 40 marks.
	20	End examination of Theory carried out for 60 marks will be scaled down to 20 marks.

For Integrated courses, the evaluation of Theory and Laboratory are carried out separately as per evaluation method given in 7.2 and 7.3.

A candidate shall be declared to have passed in integrated course if he/she secures a minimum of **40%** aggregate marks i.e. **40** out of **100** (Internal & Semester-end examination marks put together), subject to a minimum of **35%** marks i.e. **21** marks out of **60** in semester-end examination; in addition to that he/she has to secure minimum of **14** marks (out of **40**) in Laboratory end examination and minimum of **7** marks (out of **20**) in Theory end examination.

7.5 Skill Oriented/Skill Advanced Course (100 marks):

Out of a total of **100** marks for the Skill-Oriented/Skill-Advanced Course, **40** marks shall be for the internal evaluation and **60** marks for semester-end examination.

The internal evaluation shall be made on the basis of seminar given by each student on the topic of his/her Skill-Oriented/Skill-Advanced Course, which was evaluated by internal committee constituted by HOD.

The semester-end examination (Viva-Voce) shall be conducted by the committee, consists of an External examiner, Head of the department and Internal supervisor of the Skill-Oriented/Skill-Advanced Course.

7.6 Soft Skills (100 marks):

Soft skills shall be evaluated for **100** marks: **40** marks for day-to-day evaluation and **60** marks on the basis of end examination and the valuation is purely internal.

7.7 Internship (100 marks):

All the students shall undergo internship for a period minimum of **6** weeks after II year II Semester and III year II Semester. Students have an option of choosing their own industry related to their respective branches.

Self study report for the internship of II year II Semester shall be submitted and evaluated during the III year I Semester and Self study report for the internship of III year II Semester shall be submitted and evaluated during the IV year I Semester.

The Self study report will be evaluated for a total of **100** marks consisting of **40** marks for internal assessment and **60** marks for semester-end examination.

Internal assessment for **40** marks shall be done by the internship supervisor in the industry.

The semester-end examination (Viva-Voce) shall be conducted by the committee, consisting of an External examiner, Head of the department and Internal supervisor of the Internship.

7.8 Project (200 marks):

Out of a total of 200 marks for the Project, **80** marks shall be for Project Internal Evaluation and **120** marks for the semester-end Examination.

The Internal Evaluation shall be made on the basis of two seminars given by each student on the topic of his project which was evaluated by an internal committee. Out of **80** internal marks: **20** marks allotted for literature survey, **30** marks for results and analysis, **15** marks for first seminar (usually after 8 weeks) and **15** marks for second seminar (at the end of the semester).

The semester-end examination (Viva – Voce) shall be conducted by the committee, consisting of an External examiner, Head of the Department and Supervisor of the Project. The evaluation of project shall be made at the end of IV year.

7.9 Honors/Minor Programme:

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

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. Student can also opt for Industry-relevant tracks of any branch to obtain the Minor.

A Student shall be permitted to register for Honors/Minor program at the beginning of II year II semester provided that the student must have acquired a minimum of 8.0 CGPA upto the end of II year I semester without any backlogs. In case of the declaration of the semester results after the commencement of the II year II semester and if a student fails to score the required minimum of 8.0 CGPA, his/her registration for Honors/Minor program stands cancelled and he/she shall continue with the regular programme.

A CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog in order to keep the Honors/Minors registration active.

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 for B.Tech (Honors/Minor) program.

20 additional credits acquired are excluded from CGPA requirement for the award of B.Tech degree and CGPA requirement for the degree with Honors/Minor.

Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pool, with four courses, and each carrying 4 credits. The remaining 4 credits must be acquired through two MOOC courses, which shall be domain specific, each with a minimum duration of 8 weeks as recommended by the Board of Studies. If no grade is given to any MOOC course by the evaluator, then grade will be decided by the Department committee and ratified by Board of Studies and Academic Council.

The Committee constituted by the Principal will decide on the minimum enrolments for offering Honors/Minor program. If the minimum enrolment criterion is not met, then the students will be permitted to register for the equivalent MOOC courses as approved by the concerned Board of Studies.

A student shall be permitted to choose only courses as a part of Honors/Minor degree program that he/she has not studied in any form during the regular B.Tech program.

If a student drops or is terminated from the Honors/Minor 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 case a student fails to meet the CGPA requirement for Degree with Honors/Minor at any point of registration, he/she will be dropped from the list of students eligible for Degree with Honors/Minor and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet with a mention of the additional courses completed by them.

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

8. Attendance Requirements:

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

Condonation of shortage of attendance in aggregate up to **10%** (**65%** and above and below **75%**) in each semester with genuine reasons shall be approved by a committee duly appointed by the college. The condonation approved otherwise can be reviewed by the College Academic Committee.

A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. He/she may seek re-admission for that semester when offered next.

Shortage of Attendance below **65%** in aggregate shall in NO case be condoned. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled. A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

9. Minimum Academic Requirements:

9.1 Conditions for pass and award of credits for a course:

A candidate shall be declared to have passed in individual course if he/she secures a minimum of **40%** aggregate marks i.e. **40** out of **100** (internal & semester-end examination marks put together), subject to a minimum of **35%** marks i.e. **21** marks out of **60** in semester-end examination.

On passing a course of a programme, the student shall earn assigned credits in that Course.

9.2 Method of Awarding Letter Grades and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table: Grading System for B.Tech. Programme

Percentage	Level	Letter Grade	Grade Points
$\geq 90\%$	Outstanding	A+	10
80 – 89%	Excellent	A	9
70 – 79%	Very Good	B	8
60 – 69%	Good	C	7
50 – 59%	Fair	D	6
40 – 49%	Satisfactory	E	5
$< 40\%$	Fail	F	0
-	Absent	Ab	0

9.3 Calculation of Semester Grade Points Average (SGPA) for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA.

The SGPA is calculated as below:

$$\text{SGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad (\text{for all courses passed in a semester})$$

Where CR = Credits of a Course

GP = Grade points awarded for a course

9.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for entire programme:

The CGPA is calculated as below:

$$\text{CGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad (\text{for the entire programme})$$

Where CR = Credits of a course

GP = Grade points awarded for a course

- Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- As per the AICTE regulations, conversion of CGPA into equivalent percentage as follows:
Equivalent Percentage = $(\text{CGPA} - 0.50) \times 10$

9.5 Award of Divisions:

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

9.6 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

9.7 Conditions for Promotion:

- (i) A student will be promoted to second year if he/she satisfies the minimum attendance requirement.
- (ii) A student shall be promoted from II to III year only if he fulfills the academic requirement of total **50%** credits (if the number of credits is in fraction, it will be rounded off to a lower digit) from regular and supplementary examinations of I year and II year examinations, irrespective of whether the candidate takes the examination or not.
- (iii) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** credits (if number of credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I Year, II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

10. Course pattern:

- (i) The entire course of study is of four academic years and each year will have TWO Semesters (Total EIGHT Semesters).
- (ii) A student is eligible to appear for the end examination in a subject, but when absent for it or failed in the end examinations he/she may appear for that subject's supplementary examinations, when offered.
- (iii) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester is offered after fulfillment of academic regulations. Whereas the academic regulations hold well with the regulations he/she first admitted.

11. Minimum Instruction Days:

The minimum instruction days for each semester shall be **90**.

12. There shall be no branch transfer after the completion of admission process.

13. General:

- (i) Wherever the words “he,” “him,” “his,” occur in the regulations, they include “she,” “her,” “hers” as well.
- (ii) The academic regulation should be read as a whole for the purpose of any interpretation.
- (iii) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.
- (iv) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

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Academic Regulations 2020 (AR20) for B. Tech (Lateral Entry Scheme)
(Effective for the students admitted into II year from the Academic Year 2021-22 onwards)

1. Award of B. Tech. Degree:

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

Registered for **121** credits and he/she must secure total **121** credits.

Students, who fail to complete their three-year course of study within **6** years or fail to acquire **121** Credits for the award of the degree within **6** academic years from the year of their admission shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Promotion Rule:

A lateral entry student will be promoted from II year to III year if he satisfies the minimum required attendance in II year.

A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** of credits (if the number of credits is in fraction, it will be rounded off to lower digit) from the II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

3. All other regulations as applicable for B. Tech. four- year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1	If the student possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phone with any student or students in or outside the exam hall with respect to any matter	Expulsion from the examination hall and cancellation of the performance in that subject only. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the student 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 student is appearing	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.
3	If the student impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester-end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the 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 student smuggles the answer book or additional sheet or takes out or arranges to send out the question paper or answer book or additional sheet during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student 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 student is also debarred for two consecutive semesters from class work and all semester-end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the seat.
5	If the student uses objectionable, abusive or offensive language in the answer script 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 student 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 walkout or instigates others to walk out or threatens the officer-in charge or any person on duty in or outside the examination hall or causes any injury to any of his relatives either by words 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 relatives, or indulges in any other act of misconduct or mischief which results in damage or destruction of property in the examination hall or any part of the	In case of students of the college, they shall be expelled from examination hall 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 students 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.

	college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination	
7	If the student leaves the exam hall taking away answer script or intentionally tears off 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 student 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 student 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 the seat.
8	If the student 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 student 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 student is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clauses 6, 7, 8	In case of student of the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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. Person(s) who do not belong to the college will be handed over to police and. a police case will be registered against them.
10	If the student 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 student 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.
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 student has already appeared including practical examinations and project work of that semester/year examinations.

ADITYA INSTITUTE OF TECHNOLOGY & MANAGEMENT, TEKKALI – 532201

(An Autonomous Institution)

*B.Tech COURSE STRUCTURE (AR – 20)**Department of CSE (AI & ML)***I YEAR I SEMESTER**

Category	Code	Theory/Lab	L	T	P	C
MC	20MCT101	Induction Program	3 weeks			0
HSSC	20HST101	English	3	0	0	3
BSC	20BST101	Linear Algebra and Calculus	2	1	0	3
BSC	20BST107	Chemistry	3	0	0	3
ESC	20ESI102	Programming for problem solving	3	0	3	4.5
ESC	20ESL103	Engineering Graphics & Design	1	0	4	3
HSSC	20HSL101	Language Proficiency Lab	0	0	3	1.5
BSC	20BSL102	Chemistry Lab	0	0	3	1.5
Total			12	1	13	19.5

I YEAR II SEMESTER

Category	Code	Theory/Lab	L	T	P	C
MC	20MCT103	Constitution of India	2	0	0	0
BSC	20BST102	Differential Equations	2	1	0	3
BSC	20BST105	Applied Physics	3	0	0	3
PC	20CST101	Data Structures and Algorithms	3	0	0	3
ESC	20EST101	Basic Electrical Engineering	3	0	0	3
ESC	20ESL104	IT Workshop	1	0	4	3
BSC	20BSL101	Physics Lab	0	0	3	1.5
ESC	20ESL101	Basic Electrical Engineering Lab	0	0	3	1.5
PC	20CSL101	Data Structures and Algorithms Lab	0	0	3	1.5
Total			14	1	13	19.5

Category	Subjects (T/L)	Credits
Mandatory Courses	2/0	0
Humanities and Social Science Courses	1/1	4.5
Basic Science Courses	4/2	15
Engineering Science Courses	2/4	15
Professional Core Course	1/1	4.5
Total	10/8	39

I: Integrated theory

English
(Common to all Branches)

Subject Code: 20HST101

L	T	P	C
3	0	0	3

Course Objectives

- To enable students build vocabulary appropriate to their levels and to make students understand printed texts of different genres
- To enhance basic writing skills of the students in different forms of written communication
- To assist students implicitly synthesize the rules of grammar for the production of accurate sentences
- To help students learn rules of using punctuation marks and prepositions appropriately in writing
- To aid students acquire appropriate and adequate letter writing skills
- To get students develop reading skills and enhance their essay writing skills

Course Outcomes

1. Students will be able to comprehend printed texts of different genres more easily and they will be able to make appropriate word choice.
2. Students will be able to write short texts masterly.
3. Students will be able to construct grammatically correct sentences.
4. Students will be able to use punctuation marks and prepositions correctly in speech and writing.
5. Students will be able to communicate through letters and emails effectively.
6. Students will be able to comprehend unfamiliar passages, and will be able to write *essays*.

Unit – I *Father's Help* by R K Narayan
Synonyms and Antonyms — One-word substitutes

Unit – II *My Early Days* by A P J Abdul Kalam
Tense— Voice — *If* clauses

Unit – III *The Road Not Taken* by Robert Frost
Reported Speech—Degrees of Comparison — Simple, Compound, Complex Sentences

Unit – IV *Politics and the English Language* by George Orwell
Punctuation —Prepositions

Unit–V *Mother's Day* by J. B. Priestly
Letter Writing — E-mail Writing

Unit – VI *Chipko Movement*
Reading Comprehension—Essay Writing

Text Books

1. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
2. *Practical English Usage*. Michael Swan. Oxford University Press. 1995.
3. *Study Writing*. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
4. *Hugging the Trees: The Story of the Chipko Movement*. Thomas Weber. Viking Publishers, New Delhi, 1988.

Linear Algebra and Calculus
(Common to all Branches)

Subject Code : 20BST101

L	T	P	C
2	1	0	3

Course Objectives:

- Understand the process of calculation of rank, solution of System of Linear Homogeneous and Non Homogeneous equations by Gauss Elimination method.
- Learn the process of calculating the Eigen values, Eigenvectors and Quadratic Forms.
- Understand the concepts of multiple integrals and their usage.
- Learn the properties of Gamma and Beta Functions, their relation and evaluation of improper integrals.
- Understand the concepts of gradient, divergence, curl of scalar and vector point functions.
- Understand and calculate Line Integral, Surface Integral, Volume Integral, concepts of Green's, Stokes and Gauss Divergence theorems in converting one integral form to another

Course Outcomes:

The student will be able to:

1. Calculate the rank and solve linear homogeneous and non homogeneous equations by Gauss Elimination method.
2. Calculate eigen values, eigen vectors and estimate the nature of the matrix..
3. Evaluate multiple integral in both Cartesian and polar coordinates.
4. Apply Beta and Gamma functions to solve improper integrals.
5. Calculate gradient, divergence, curl of a scalar and vector point functions and derive vector identities.
6. Solve a Line Integral, Surface Integral, Volume Integral, apply Green's, Stokes and Gauss Divergence theorems in converting one integral form to another.

Unit – I

Linear System of Equations: *Matrices – Rank- echelon form – Normal form – System of Linear Homogeneous and Non Homogeneous equations – Gauss Elimination method- Applications- Matrix representation for a Graph- Current in an electrical circuit.* (8 hrs)

Unit – II

Eigen Values, Eigen Vectors, Quadratic Forms: *Eigen values – Eigenvectors – Properties (an over view)- Diagonalization- Quadratic Forms- Reduction of Quadratic Forms to Canonical Form- Rank-Nature-Index-Signature.* (8 hrs)

Unit – III

Multiple Integrals: *Double integral (Cartesian and polar form) -Change of order of integration - Change of variables (Cartesian to polar)- Triple integrals – Change of variables (Cartesian to spherical/cylindrical).* (8 hrs)

Unit – IV

Special functions: *Gamma and Beta Functions – Properties - Relation between Beta and Gamma functions-Evaluation of improper integrals.* (8 hrs)

Unit – V

Vector Differential Calculus: *Scalar and Vector point functions- Vector differentiation - Directional derivatives – Gradient, Curl and Divergence- Vector identities.* (8 hrs)

Unit – VI

Vector Integral Calculus: Vector Integration –Line Integral, Surface Integral, Volume Integral – Green Theorem, Stokes Theorem and Gauss Divergence theorem (without proofs with simple illustrations only). (8 hrs)

Text Books

1. B.V. Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi, 2014.
2. Dr.B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2015.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. **G.B. Thomas and R.L. Finney**, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. **Veerarajan T.**, Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. **D. Poole**, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. **N.P. Bali and Manish Goyal**, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Chemistry
(Common to all Branches)

Subject Code : 20BST107

L	T	P	C
3	0	0	3

Course Objectives:

The students will become familiar and understand about:

- Rationalise the importance of water for society and industrial needs.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- To become familiar in moulding methods of preparation of different types of plastic materials
- Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions.
- Rationalise reference electrodes and science of corrosion.
- Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Course Outcomes:

The course will enable the student to:

1. Rationalise the importance of water for society and industrial needs.
2. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
3. Differentiate different moulding techniques of plastic materials
4. Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions.
5. Rationalise the science of corrosion.
6. Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Unit – I

Water Technology Hardness of Water – Temporary and Permanent Hardness - Units of Hardness - Estimation of Hardness by EDTA Method - Problems on Temporary and Permanent Hardness - Disadvantages of Hard Water – Softening Methods of Hard Water- Zeolite or Permutit Process - Ion Exchange Process - Methods of Treatment of Water for Domestic Purposes – Sedimentation, Coagulation, Filtration, Disinfection - Sterilization, Chlorination, Break Point chlorination, Ozonisation. (9 lectures)

Unit – II

Spectroscopy Spectroscopy - Electronic Spectroscopy - Types of Electronic Transitions - Definition of Chromophore – Definition of Auxochrome – Absorption and Intensity Shifts - Introduction to I.R. Spectroscopy – Fingerprint Region – Introduction to NMR – Principle - Equivalent and Non-Equivalent Protons - Chemical Shift- Splitting – Coupling Constant. (8 lectures)

Unit – III

Polymers and Plastics Definitions of Polymer, Polymerization – Functionality – Degree of polymerization - Types of Polymerization (Addition and Condensation Polymerizations) - Plastics – Definition, Thermoplastics, Thermosetting Plastics – Compounding of Plastics – Moulding of

Plastics into Articles (Compression, Injection, Transfer and Extrusion Moulding Methods) - Preparation, Properties and Engineering Uses of PVC and Bakelite. *(7 lectures)*

Unit – IV

Organic Reactions Types of Organic reactions: Addition - Electrophilic, Nucleophilic and Free radical - Substitution - Electrophilic, Nucleophilic (SN^1 and SN^2) and Free radical – Elimination (E_1 and E_2) – Rearrangement Reactions (Claisen, Pinacol Pinacolone Rearrangement). *(7 lectures)*

Unit – V

Corrosion and Its Control Definition of Corrosion – Theories of Corrosion (Chemical & Electrochemical) – Mechanism of Electrochemical Corrosion (Oxygen Absorption Type and Hydrogen Evolution Type) - Galvanic Series - Factors Influencing Corrosion – Corrosion Control Methods - Proper Designing, Modifying the Environment, Cathodic Protections – Sacrificial Anodic Protection and Impressed Current Cathodic Protection. Metallic (Anodic and Cathodic) Coatings – Methods of application on metals (Galvanizing and Tinning). *(9 lectures)*

Unit – VI

Green Chemistry & Energy Introduction to green chemistry – Definition and 12 principles of green chemistry. Types of energy sources – Renewable & Non-Renewable - Introduction to solar energy – harnessing of solar energy – photo voltaic cells – Concentrated Solar power plants. Introduction of Energy storage devices: Principle & mechanism of Batteries & Supercapacitors, Types of Batteries (Alkaline & Lead-Acid) - Difference between Batteries and Supercapacitors. *(8 lectures)*

Text Books

1. University chemistry, by B. H. Mahan
2. Elementary organic spectroscopy: principles and applications, by Y. R. Sharma
3. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
4. “Engineering Chemistry”, P. C. Jain and Monica Jain, Dhanpat Rai Publications, Co., New Delhi, 2004, 16th Edition

Reference books:

1. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
2. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
3. Physical Chemistry, by P. W. Atkins
4. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.
5. Concise Inorganic Chemistry: Fifth Edition by J.D. Lee

**Programming for Problem Solving
(Common to all Branches)**

Subject Code : 20ESI102

L	T	P	C
3	0	3	4.5

Course Objective

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcomes

1. Understand the fundamentals of C programming
2. Choose the loops and decision making statements to solve the problem
3. Make use of pointers to access arrays, strings and implements different operations on arrays, and work with textual information, characters and strings.
4. Apply programming to write modular programs, user defined functions to solve real time problems and allocate memory using dynamic memory management functions.
5. Create user defined data types including structures and unions to solve problems.
6. Implement files operations in C programming for a given application and able to handle errors during program execution.

Unit – I

Introduction to Programming: Introduction to components of Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Operator precedence, Structure of C program, Basic I/O statements.

Exercise Questions: 1

Ex 1: Write the C programs to calculate the following

- a) Area of triangle when sides are given.
- b) Program for Type Casting.
- c) Interchanging values of two variables.

Ex 2: Write the C programs to perform the following

- a) Read lower case character and convert into upper case.
- b) Find maximum of 3 values using conditional operator.
- c) Calculate area and perimeter of circle.

Unit – II

Control Structures: Decision statements: if, if-else, nested if and switch, **Iterative statements:** for, while, do while and nested loops **Branching:** Break, continue, goto.

Exercise Questions: 2

Ex 3: Write C programs for the following using decision making statements

- a) Program to find roots of quadratic equation.
- b) Find the Largest among 3 values.
- c) Calculate the grades of a student.

Ex 4: Write C programs for the following using Iterative Statements

- a) Arithmetical operations using switch-case.

- b) Read a number and display in reverse.
- c) Check for Armstrong number property

Ex 5:

- a) Generate Fibonacci series.
- b) Generate Prime numbers between two numbers.
- c) Write a program in C to display the pattern like right angle triangle using an asterisk

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Unit – III

Arrays: Definition, Types: 1D, Multi Dimensional arrays, declaration, initialization, accessing elements, Matrix operations and String Handling.

Pointers: Definition, Declaration, Initialization, Pointer arithmetic, Pointer to pointer, arrays and pointers, Dynamic memory allocation

Exercise Questions: 3

Ex 6: Implement the following using arrays

- a) Largest and smallest from a list of elements.
- b) Program for Linear Search.
- c) Program for Bubble Sort.

Ex 7: Implement the following using arrays

- a) Matrix addition.
- b) Matrix Multiplication.
- c) Program using string handling functions

Ex 8: Implement the following using DMA Functions

- a) Find the sum and average of list of elements using DMA Functions
- b) Implementation of call by reference and call by value.

Ex 9:

- a) Implement C Program using any numerical methods

Unit – IV

Functions: Definitions, Declaration, Types of Functions, Parameter passing, Passing Arrays to functions, Recursion, library functions, functions and pointers, and Storage classes,

Exercise Questions: 4

Ex 10:

- a) Factorial using recursion and non recursion.
- b) GCD using recursion and non recursion.
- c) To count the digits of a given number using recursion

Unit – V

Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays with in structures, pointer to structure, passing structure to function, nested structures, and unions.

Exercise Questions: 5**Ex: 11**

- a) Implementation of array of structure
- b) Demonstration of Union

Unit – VI

Files: Definition, Types of files, Opening modes, File IO Functions, Random access functions, Preprocessor directives.

Exercise Questions: 6**Ex 12:**

- a) Copy the contents of one file into another.
- b) Count the number of characters, words and lines in a file.

Text Books

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2nd Edition, PHI.
2. Behrouz A. Forouzan, “A Structured Approach Using C” Richard F. Gilberg 3rd Edition
3. G.S.N Murty, S Vishnu Murty, “Problem solving Through ‘C’- User Friendly Approach”, First Edition, MANTECH Publication Pvt.Ltd., 2021

References

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Web Links:

1. <https://www.tutorialspoint.com> › Cprogramming › C – Home
2. <https://www.programiz.com/c-programming>

Engineering Graphics & Design
(Common to all Branches)

Subject Code : 20ESL103

L	T	P	C
1	0	4	3

Course Objectives:

- Able to develop drawing skills.
- To draw orthographic views from the given isometric view and vice versa
- To understand the fundamentals of computer aided design and drafting

Course Outcomes:

1. Draw projection of points and straight lines in first angle projection.
2. Project plane surfaces and simple solids inclined to one reference plane.
3. Convert orthographic views into isometric projections and vice-versa.
4. Draw basic lines and profiles with commonly used operations in drafting software.
5. Generate 2D drawings along with dimensioning in drafting software.

List Of Exercises

PART-A: Conventional Engineering drawing

- 1 Projections of points
- 2 Projections of straight lines inclined to one reference plane only.
- 3 Projections of planes inclined to one reference plane only.
- 4 Projections of simple solids inclined to one reference plane only.
- 5 Conversion of isometric views into orthographic views
- 6 Conversion of orthographic views into isometric views.

PART-B: Basic Computer aided engineering drawing (2-D drawings)

1. Commands – Axes, Coordinate points, Creation of lines, Polylines, Square, Rectangle, Polygons, Spines, Circles, Ellipse, Text.
2. Move, Copy, Offset, Mirror, Rotate, Trim, Extend, Break, Chamfer, Fillet, Curves.

Note: Six Exercises are to be completed by using AutoCAD software

Text Books:

1. Engineering Drawing, N. D. Bhatt, V. M. Panchal, Charotar Pub.
2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Pub.

Reference Books:

1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Pub.
2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Pub.

**Language Proficiency Lab
(Common to all Branches)**

Subject Code : 20HSL101

L	T	P	C
0	0	3	1.5

Course Objectives

- To enable students develop neutralized accent
- To assist students utter words intelligibly
- To enhance the ability of students to speak spontaneously
- To help students converse aptly as the context demands
- To get students acquire perceptive abilities in professional conversations
- To aid students grasp and interpret information provided in graphs and tables

Course Outcomes

1. Students will be able to recognize differences among various accents and speak with neutralized accent.
2. Students will be able to pronounce words accurately with the knowledge of speech sounds and use appropriate rhythm and intonation patterns in speech.
3. Students will be able to speak extemporaneously about anything in general.
4. Students will be able to generate dialogues for various situations.
5. Students will be able to present posters perceptively and concisely.
6. Students will be able to comprehend and interpret data provided in graphs and tables.

Course Syllabus**Unit – I**

Listening Comprehension of Audio and Video clips of different accents

Unit – II

Pronunciation—Intonation—Stress—Rhythm

Unit – III

JAM — Narration of an Event

Unit – IV

Situational Dialogues

Unit – V

Poster Presentation

Unit – VI

Interpretation of Data in Graphs and Tables

Text Books

1. *Communication Skills*. Sanjay Kumar and Pushpa Lata. OUP. 2011.
2. *Practical English Usage*. Michael Swan. OUP. 1995.
3. *Speak Well*. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
4. *Strengthen Your Communication Skills*. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
5. *Strengthen Your Steps*. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
6. *Technical Communication*. Meenakshi and Sangeetha. OUP. New Delhi. 2013.

Chemistry Lab
(Common to all Branches)

Subject Code : 20BSL102

L	T	P	C
0	0	3	1.5

Course Objectives

The students will become familiar and understand about:

- Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc
- Measure molecular/system properties such as surface tension and viscosity.
- Measure molecular/system properties such as pH, conductance of solutions, redox potentials, etc
- Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, etc.
- Synthesize a small polymer molecule and analyze a salt sample.
- Estimate iron (by colorimeter), partition coefficient, and adsorption of acetic acid by Charcoal etc.

Course Outcomes:

The students will learn to:

1. Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc.
2. Measure molecular/system properties such as surface tension and viscosity.
3. Measure molecular/system properties such as pH, conductance of solutions, redox potentials, etc
4. Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, etc.
5. Synthesize a small polymer molecule and analyze a salt sample.
6. Estimate iron (by colorimeter), partition coefficient, and adsorption of acetic acid by charcoal, etc.

List of Experiments

(Choice of 10-12 experiments from the following)

1. Determination of surface tension and viscosity
2. Determination of Hardness of water sample by EDTA Method.
3. Conductometric estimation of Acid by Base.
4. Conductometric estimation of mixture of acids by base.
5. Potentiometric Titrations.
6. Synthesis of a polymer/drug.
7. Determination of acid value of an oil
8. Chemical analysis of a salt
9. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method
10. Colorimetric estimation of iron
11. pH metric titrations
12. Determination of the partition coefficient of a substance between two immiscible liquids
13. Adsorption of acetic acid by charcoal Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

14. Potentiometric Titration of a Chloride-Iodide Mixture.
15. Determination of Chloride content present in given water sample.
16. Determination of kinematic viscosity of given lubricating oil.

Text Books

1. “Practical Engineering Chemistry” by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011).
2. “Lab Manual on Engineering Chemistry” by Sudharani, Dhanpat Rai Publications, Co., New Delhi., (2009).

Reference Books

1. “Engineering Chemistry Lab Manual” by Shuchi Tiwari (2010), SCITECH Publications.
2. “Vogel’s Text Book of Quantitative Chemical Analysis”, 6th Edition by G. J. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Longman Scientific & Technical Publications, New York.
3. “A Text Book of Engineering Chemistry” by R. N. Goyal and H. Goel, Ane Books (P) Ltd.(2009).
4. “A Text Book on experiments and calculations Engineering” by S.S. Dara, S.Chand & Company Ltd. (2003).
5. “Instrumental methods of Chemical Analysis”, Gurudeep R, Chatwal Sham, K. Anand, Latest Edition (2015), Himalaya Publications.

Constitution of India
(Common to all Branches)

Subject Code: 20MCT103

L	T	P	C
2	0	0	0

Course Objectives

1. To help Students regulate their behavior in a social environment as Engineering Professionals.
2. To make students aware of the impact of taking social, legal and Administrative decisions about their profession.
3. To understand the political and constitutional parameters in work environment.
4. To understand the need and strengths of our nation and adopt their knowledge for future career.

Course Outcomes

By the end of this course the student will be able to

1. Realize the rigidity of our Indian Politics and Administrative aspects.
2. A Student can understand our nation federalism.
3. Can assess different types of risks involved in misadministration.
4. Can create competitive advantage.
5. Summarizes the legal and administrative establishments
6. A student can infer financial aspects for betterment of the National building.

Unit – I**Introduction**

Historical perspective of the constitution of India - Salient features of The Indian Constitution - Amendment Procedure of The Indian Constitution. 42nd amendment (Mini Constitution) - 44th amendment (1978 – Janatha Govt.)

Unit – II**Important Features Of Constitution**

Fundamental Rights (Article 12 to 35), Duties (51 A – 1976 emergency) and Directive principles (Article 36 to 51) of State Policy - Articles 14 to 18 - Articles 19 - Article 21

Unit – III**Parliamentary form of Govt. In India**

President of India - Emergency provisions - National Emergency – Article 352 - President Rules – Article 356 - Financial Emergency – Article 360

Prime Minister and Cabinet - Supreme Court of India (Indian Judiciary)

Unit – IV**Indian Federalism**

Union – State relations; - Legislative, Administrative and Financial relations.

Local self Govt. – Constitutional Schemes in India (73 & 74 Constitutional amendments)

Unit – V**Parliamentary Committees:**

Public Accounts Committee - Estimates Committee - Committee on Public Undertakings. -

Election commission of India (Article -324) - Comptroller and Auditor General (CAG) of India (Article – 148 to 150)

Unit-VI

Finance Commission (Article – 280) - Neethi Aayog (Planning Commission) and - Political Parties.

Text Books:

- 1) Introduction to Indian Constitution by D.D Basu, Lexis Nexis Butterworth wadhwa Nagapur, 2008.
- 2) Poicits in India by Rajini Kothari, Orient LongMan, 2005.
- 3) The Indian Constitution by Madhav Khosla by Oxford University Press India, 2012.

Differential Equations
(Common to all Branches)

Subject Code : 20BST102

L	T	P	C
2	1	0	3

Course Objectives:

- To solve the first order Ordinary Differential equations and apply to Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
- To solve second and higher order ordinary differential equations.
- Derive the Fourier series expansion of one variable functions.
- Understand Taylor's, Maclaurin's series expansion and rules of calculating extreme value of two or more variable functions.
- Learn the methods of solving first order quasi-linear (Lagrange) partial differential equations and first order non-linear partial differential equations.
- Understand the method of solving a linear Partial differential equation with constant coefficients by method of Separation of Variables, solve a one dimensional Wave and a one dimensional Heat equation.

Course Outcomes

The student will be able to:

1. Apply the mathematical tool for the solution of Ordinary Differential equations, Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
2. Evaluate higher order homogenous and non-homogenous linear differential equations with constant coefficients.
3. Estimate the Fourier series expansion of one variable functions.
4. Estimate the Taylor's, Maclaurin's series expansion of two variable functions and extreme values of two or more variable functions.
5. Evaluate a first order quasi-linear (Lagrange) partial differential equations and first order non-linear partial differential equations.
6. Evaluate a one dimensional Wave and Heat equation.

Unit – I

Ordinary differential equations of first order: *Linear type - Bernoulli type-Exact type - Equations reducible to exact type- Orthogonal Trajectories-Newton's law of cooling - Law of Growth and Decay.* (8 hrs)

Unit – II

Ordinary differential equations of higher order: *Higher order homogenous and non-homogenous linear differential equations with constant coefficients- Complimentary Functions-Particular integrals for the functions of type $\sin(ax+b)/\cos(ax+b)$, x^m , e^{ax} , $e^{ax}V(x)$ - Method of variation of parameters, Applications-LCR circuits.* (8 hrs)

Unit – III

Fourier series: Fourier Series -Even and odd functions– Fourier series of functions defined in the interval $(0, 2\pi)$, $(-\pi, \pi)$, $(0, 2c)$, $(-c,c)$ - Half range Fourier sine and cosine series(**8 hrs**)

Unit – IV

Partial Differentiation: *Functions of two or more variables-Partial differentiation-Total Derivative- Taylor's and Maclaurin's Series (without proof) - Maxima, minima of functions without constraints and functions with constraints (Lagrange method of undetermined multipliers).* (8 hrs)

Unit- V

Partial Differential Equations of first order: Partial differential Equations - Formation of partial differential equations– solutions of first order quasi-linear (Lagrange) partial differential equations and first order non-linear (standard type) partial differential equations. (8 hrs)

Unit – VI

Applications of Partial Differential Equations *Solution of linear Partial differential equations with constant coefficients – Method of Separation of Variables- One dimensional Wave and Heat equations.* (8 hrs)

Text Books

1. B.V.Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi, 2014.
 2. Dr.B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2015.
- Reference Books
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
 4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

Applied Physics
(Common to all Branches)

Subject Code : 20BST105

L	T	P	C
3	0	0	3

Course Description

This course encompasses Fundamental Concepts of Physics that include

- Wave Optics
- Lasers
- Fiber Optics
- Modern Physics
- Electro Magnetic Theory
- Semiconductor Physics

that are inevitable for any Engineering student so that these prerequisites aid the student to readily understand Day to Day Engineering Problems with Pragmatic Approach.

Course Objectives

- To realize the principles of optics in designing optical devices
- To comprehend the Principles of Lasers
- To Infer the Principles of Fiber Optics
- To Recognize the shortcoming of classical physics and describe the need for modifications to classical theory
- To Identify the interaction of electromagnetic fields
- To Summarize the characteristics of semiconductor materials.

Course Outcome

Students will be able to

1. Apply the principles of optics in designing optical devices
2. Illustrate the Principles of Lasers
3. Outline the Principles of Fiber Optics
4. Resolve the discrepancies in classical estimates through quantum principles
5. Analyze the interaction of electromagnetic fields.
6. Interpret the characteristics of semiconductor materials.

Unit – I**Wave Optics**

Interference - Introduction, Principle of Superposition of Waves, Interference in Plane Parallel Film due to Reflected Light, Newton's Rings under Reflected Light - Determination of Wavelength of Monochromatic Source of Light.

Diffraction - Introduction, Differences between Interference and Diffraction, Fraunhofer Diffraction due to Single Slit – Intensity Distribution.

Unit – II

Lasers - Introduction, Characteristics of Lasers- Coherence, Directionality, Monochromaticity and High Intensity, Principle of Laser – Absorption, Spontaneous and Stimulated Emission, Einstein Coefficients (Qualitative), Population Inversion, Optical Resonator and Lasing Action, Ruby Laser

[Three Level System], Helium-Neon Laser [Four Level System], Applications of Lasers in Industry, Scientific and Medical Fields.

Unit – III

Fiber Optics - Introduction, Optical Fiber Construction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle, Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Applications of Optical Fibers in Communication

Unit – IV (Modern Physics)

Quantum Mechanics - Wave Particle Duality, de-Broglie's Hypothesis of Matter Waves, Heisenberg's Uncertainty Principle, Physical Significance of Wave Function. Time independent wave equation and Particle in One Dimensional Potential Box.

Unit – V

Electromagnetic Theory Concept of Electric Field, Point Charge in Electric Field, Gauss Law and its Applications, Magnetic Field - Magnetic Force on Current Carrying Coil. Ampere's Law, Biot-Savart Law, Faraday's Law of Induction, Lenz's Law, Maxwell's Equations and Applications

Unit – VI

Semiconductors Physics: Introduction- Intrinsic and Extrinsic Semiconductors, Dependence of Fermi Level on Carrier Concentration and Temperature, Diffusion and Drift Currents. Hall Effect – Mobility, Sign of Charge Carriers, Conductivity, Resistivity.

Text Books

1. A Textbook of Engineering Physics, [M N Avadhanulu](#) & [P G Kshirsagar](#), S.Chand Publishers
2. Fundamentals of Physics by Resnick, Halliday and Walker
3. Modern Physics by Arthur Beiser

Reference books

1. University Physics by Young and Freedman
2. Solid State Physics by S. O. Pillai, New Age International Publishers
3. Engineering Physics, Volume-I&II, P.K.PalaniSwamy, Scitech Publications Hyderabad
4. Engineering Physics Volume I&II Dr.K.Vijaykumar, S.Chand Publishing Company, New Delhi
5. Engineering Physics Dr. S. Mani Naidu, Pearson Publications Chennai

Data Structures and Algorithms

Subject Code: 20CST101

L	T	P	C
3	0	0	3

Course Outcomes:

On completion of this course, the student will be able to:

1. Compute the time and space complexities and calibrate the performance of a given algorithm.
2. Compare the performances of various Searching and Sorting techniques.
3. Demonstrate the advantages of dynamic memory allocation via linked lists.
4. Illustrate the applications of Stacks and Queues.
5. Implement the basic operations and Traversals on binary Trees.
6. Understand traversals and shortest path algorithms on a Graph.

Unit – I

Introduction: Basic Concepts of Data Structures; Notations of Time & Space Complexity; Performance Analysis of algorithms: Iterative & Recursive Algorithms; Asymptotic Notations (O , Ω , θ , o , ω)

Unit – II

Searching: Linear Search, Binary Search: Algorithm & Analysis; **Hashing:** Hash functions, Collision Resolution techniques; **Sorting:** Methodology & Performance Analysis of Sorting Algorithms: Selection, Bubble, Insertion, Quick, Merge, Heap Sort.

Unit – III

Linked Lists: Comparison with Arrays; Operations on Singly linked list: Creation, Insertion, Deletion, Traversing, Searching; Operations on Doubly linked list; Operations on Circular Linked Lists;

Unit – IV

Stacks: Definition & Efficient operations: Push & Pop; Applications of Stacks: Conversion & Evaluation of expressions;

Queues: Types of Queues: Simple Queue; Circular Queue: Efficient Operations on Queues; Implementation of Stack and Queue using Linked Lists.

Unit – V

Trees: Basic Terminology of Trees; Binary Tree: Traversals; Binary Search Tree Operations: Insert, Delete; Introduction to Balanced Trees: AVL, B-Tree

Unit – VI

Graph: Basic Terminologies and Representations of Graphs; Graph traversal algorithms: Breadth-FS & Depth-FS; Single-Source Shortest Path Algorithm: Dijkstra's Algorithm.

Text Books:

1. Mark Allen Weiss , “**Data Structures and Algorithm Analysis**”, Fourth Edition , Pearson.
2. Ellis Horowitz, Sartaj Sahni, “**Fundamentals of Data Structures**”, Illustrated Edition, Computer- Science Press.

Reference Books

1. Michel T. Goodrich, Roberto Tamassia, David Mount, “**Data Structures and Algorithm Analysis**”, 2nd Edition, John Wiley & Sons, Inc.
2. Adam. Drozdek , “**Data Structure And Algorithms In C++**”, 4th edition, Cengage.

Basic Electrical Engineering
(Common to all Branches)

Subject Code: 20EST101

L	T	P	C
3	0	0	3

Course objectives

- To introduce the basic knowledge of electric circuits
- To illustrate knowledge with network reduction techniques.
- To analyze AC circuits.
- To provide knowledge on Magnetic circuits.
- To become familiar with DC Generator.
- To understand the concept of DC Motor.

Course outcomes:

1. Able to summarize different electrical circuits.
2. Able to construct network reduction techniques
3. Able to outline the basics of AC circuits.
4. Able to state magnetic circuits.
5. Able to examine DC Generator.
6. Able to explain DC Motor.

Unit – I

Introduction to Electric Circuits: Basic definitions, Electrical circuit elements (R, L and C), Voltage and current sources Independent and dependent sources, Ohm's Law, Series & Parallel circuits, Source transformation, Kirchhoff's Laws, , simple problems.

Unit – II

Network Reduction Techniques: Star-Delta transformation, Nodal Analysis, Super node, Mesh analysis, super mesh-Problems.

Unit – III

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series only), real power, reactive power, apparent power, power factor, simple problems.

Unit – IV

Magnetic circuits: Basic definitions of magnetic flux, flux density, Reluctance, Magneto motive force (m.m.f), magnetic field intensity, magnetic permeability and susceptibility. Comparison between magnetic and electrical circuits, inductively coupled circuits, coefficient of coupling, dot convention, simple problems on magnetic circuits.

Unit – V

DC Generator: Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator, Applications.

Unit – VI

DC Motor: Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 point starter, Applications.

Text Books

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.

Reference Books .

1. Basic Electrical Engineering Dr.K.B.MadhuSahu scitech publications (india) pvt.ltd.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill,2010.

IT Workshop
(Common to all Branches)

Subject Code : 20ESL104

L	T	P	C
1	0	4	3

Course Objectives:

- PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers.
- All the DOS commands would be covered for maintains of the Operating system.
- Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered.
- Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools.

Course Outcomes:

1. Students gain knowledge on computer system such as system Unit, input devices, and output devices connected to the computer.
2. Students gain knowledge to understand the booting process that includes switching on the system, and familiar with all the commands of an operating system.
3. Students gain knowledge to understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers and search engines etc.
4. Students get familiarize with parts of Word window, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.
5. Students get familiarize with parts of Excel window, to create and save a workbook with single and/or multiple worksheets, to apply operations on range of cells using built-in formulae, etc.
6. Students get familiarize with parts of PowerPoint win, to create and save a new presentation, apply design templates to a presentation, to insert, edit and delete a slide , etc.

PC Hardware

Task 1: Identification of the peripherals of a computer.

To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions.

Task 2: (Optional) : A practice on disassemble the components of a PC and assembling them to working condition.

Task 3 : Installation of WINDOW XP operating system in PC.

Task 4: Introduction to all internal and external DOS commands

Task 5 : Installation of LINUX operating system in PC.

Internet & World Wide Web

Task 6: Surfing the Web using Web Browsers and Search engine: How to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers. And Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google.

MS – Word

Word Orientation : Describe Importance of MS- Word

Task 7 :Using word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

Task 8: Creating project abstract for using MS-WORD: Abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Task 9 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

Task 10 : Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

MS-Excel

Excel Orientation : The mentor needs to tell the importance of MS/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel –Accessing, overview of toolbars, saving excel files, Using help and resources

Task 11 : Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 12 : Creating Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

Task 13: Calculating GPA - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

Task 14: Creating Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

MS-Power Point

Task 15 : Students will be working on basic power point utilities and tools which help them create basic power point presentation.

Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in Powerpoint.

Task 16 : Concentrating on the in and out of Microsoft power point, Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week

includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

Text Books:

1. Vikas Gupta ,“Comdex Information Technology course tool kit” , WILEY Dreamtech
2. Cheryl A Schmidt ,“The Complete Computer upgrade and repair book”, 3rd edition, WILEY Dreamtech
- 3.“Introduction to Information Technology”, ITL Education Solutions limited, Pearson Education.
4. Kate J. Chase ,“PC Hardware and A+ Handbook” –PHI (Microsoft)

Reference Books:

- 1 Scott. Mueller, 2008, Upgrading and Repairing PCs, 22/e, QUE,
- 2 Cheryl A Schmidt ,The Complete Computer upgrade and repair book,3/e , Dreamtech

Physics Lab
(Common to all Branches)

Subject Code: 20BSL101

L	T	P	C
0	0	3	1.5

Course Description

This Laboratory course is intended to apply the scientific method to expedite experiments that include

- Error analysis
- Waves Fundamentals
- Mechanics
- Physical Optics
- Lasers and Fiber Optics
- Semiconductor devices

So that student can verify theoretical ideas and concepts covered in lecture through host of analytical techniques, statistical analysis and graphical analysis.

Course Objectives

- To Operate Sensitive Instruments for precision measurements
- To Identify Error for targeted accuracy
- To Interpret the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- To Determine relevant parameters associated with Interference and Diffraction phenomena using Travelling Microscope and Spectrometer.
- To Exhibit Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- To Characterize semiconducting material devices.

Course Outcomes: Will be able to

1. Demonstrate the ability for precision measurements to design instrumentation
2. Estimate the Error for targeted accuracy
3. Infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
4. Apply the knowledge of Optics to calculate geometrical parameters of thickness of thin object and radius of curvature of a lens
5. Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
6. Evaluate characteristics of semiconducting material devices

List of Experiments

1. Precision Measurements and Instruments
2. Error Analysis and Graph Drawing

3. Determination of Rigidity Modulus of the Material of Wire using Tensional Pendulum
4. Determination of Acceleration due to Gravity (g) using Compound Pendulum
5. Newton's Rings – Determination of the Radius of Curvature of a given Plano Convex Lens
6. Determination of Thickness of Thin Object using Wedge Method
7. Verify the characteristic curve of NTC Thermistor.
8. Determination of width of a single slit using LASER
9. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
10. Determination of Energy Band Gap using the given Semiconductor

Manual / Record Book

1. Manual cum Record for Engineering Physics Lab, by Prof. M. Rama Rao, Acme Learning.
2. Lab Manual of Engineering Physics by Dr.Y. Aparna and Dr. K. Venkateswara Rao
(VGS books links, Vijayawada)

Basic Electrical Engineering Lab
(Common to all Branches)

Subject Code: 20ESL101

L	T	P	C
0	0	3	1.5

Course Objective

To introduce the student to study different electrical components and to verify the basic laws related to electrical engineering, Speed control of D.C. motor, testing of transformer, electrical wiring system through study, practice, and experiments.

Course Outcomes

Students will be able to

1. Label various types of electrical components.
2. Demonstrate various basic electrical laws.
3. Demonstrate speed control DC motor & Characteristics of generator.
4. Experiment with lamps.
5. Examine electrical wiring system

List of Experiments:

1. Study of electrical components.
2. To verify Ohm's law.
3. To verify (a) Kirchhoff's current law (b) Kirchhoff's voltage law.
4. To verify the total resistance of the series and parallel connected circuits.
5. Find armature resistance, field resistance and filament Lamp Resistance using V-I method.
6. Magnetization characteristics of DC shunt generator.
7. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
8. Fluorescent tube connection.
9. (a) One way control of lamp
(b) Two way control of lamp
10. Fan wiring.

Additional Experiments:

11. Soldering and bread board precautions.
12. To find voltage current relationship for series RL circuit and determine power factor

Data Structures and Algorithms Lab

Subject Code : 20CSL101

L	T	P	C
0	0	3	1.5

Course Outcomes:

1. Develop Programs as recursive solutions for problems.
2. Demonstrate different strategies to solve the common searching and sorting algorithms.
3. Illustrate the use of dynamic memory allocation through linked list operations.
4. Design programs for linear data structures such as Stacks, and Queues.
5. Develop Programs for implementing various operations on Binary Trees and Binary Search Trees.
6. Apply the fundamental graph algorithms to solve problems using Depth-First and Breadth- First Search.

List of Experiments:

- 1] a) Write a C program to generate a Fibonacci series using recursive function.
b) Write a C program to find the GCD of given numbers using recursive function.
c) Write a C program to solve the Towers of Hanoi problem using recursive function.
- 2] a) Design, Develop and Implement a C program to perform linear search for a key value in a given list.
b) Design, Develop and Implement a C program to perform Binary search for a key value in a given list.
- 3] Given a File of **N** employee records with a set **K** of Keys(4-digit) which uniquely determine the records in file **F**. Assume that file **F** is maintained in memory by a Hash Table(HT) of **m** memory locations with **L** as the set of memory addresses (2-digit) of locations in HT. Let the keys in **K** and addresses in **L** are Integers. Design and develop a Program in C that uses Hash function **H: K→L** as $H(K)=K \bmod m$ (**remainder** method), and implement hashing technique to map a given key **K** to the address space **L**. Resolve the collision (if any) using **linear probing**.
- 4] a) Design, Develop and Implement a C program that implement Selection Sort to sort a given list of integers.
b) Design, Develop and Implement a C program that implement Bubble Sort to sort a given list of integers.
- 5] a) Design, Develop and Implement C program that implement Quick Sort to sort a given list of integers.
b) Design, Develop and Implement C program that implement Merge Sort to sort a given list of integers.
- 6] Design, Develop and Implement a menu driven Program in C for the following operations on **Singly Linked List (SLL)** of Student Data with the fields: **USN, Name, Branch, Sem, PhNo**
 - a. Create a SLL of N Students Data by using front insertion.
 - b. Display the status of SLL and count the number of nodes in it
 - c. Perform Insertion / Deletion at End of SLL
 - d. Perform Insertion / Deletion at Front of SLL (Demonstration of stack)
 - e. Exit
- 7] Design, Develop and Implement a menu driven Program in C for the following operations on **STACK** of Integers (Array Implementation of Stack with maximum size **MAX**)

- a. **Push** an Element on to Stack
 - b. **Pop** an Element from Stack
 - c. Demonstrate how Stack can be used to check **Palindrome**
 - d. Demonstrate **Overflow** and **Underflow** situations on Stack
 - e. Display the status of Stack
 - f. Exit
- Support the program with appropriate functions for each of the above operations
- 8] Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(**Remainder**), ^(Power) and **alphanumeric** operands.
- 9] Design, Develop and Implement a menu driven Program in C for the following operations on **QUEUE** of Characters (Array Implementation of Queue with maximum size **MAX**)
- a. Insert an Element into QUEUE
 - b. Delete an Element from QUEUE
 - c. Demonstrate **Overflow** and **Underflow** situations on QUEUE
 - d. Display the status of QUEUE
 - e. Exit
- Support the program with appropriate functions for each of the above operations
- 10]a) Design, Develop and Implement a C program to implement Binary tree traversals using iterative functions.
b)Design, Develop and Implement a C program to implement Binary tree traversals using recursive functions.
- 11]Design, Develop and Implement a menu driven Program in C for the following operations on **Binary Search Tree (BST)** of Integers
- a. Create a BST of **N** Integers: 6, 9, 15, 22, 8, 45, 24, 18, 71, 8, 5, 2
 - b. Traverse the BST in Inorder, Preorder and Post Order
 - c. Search the BST for a given element (**KEY**) and report the appropriate message
 - e. Exit
- 12]Design, Develop and Implement a Program in C for the following operations on **Graph(G)** of Cities
- a. Create a Graph of **N** cities using Adjacency Matrix.
 - b. Print all the nodes **reachable** from a given starting node in a digraph using DFS/BFS method.

Text Books:

1. Mark Allen Weiss , “**Data Structures and Algorithm Analysis**”, Fourth Edition , Pearson.
2. Ellis Horowitz, Sartaj Sahni, “**Fundamentals of Data Structures**”, Computer Science Press.

References Books

1. Michel T. Goodrich, Roberto Tamassia, David Mount, “Data Structures and Algorithm Analysis”, 2nd Edition, John Wiley & Sons, Inc.
2. Debasis Samanta, “Classic Data Structures”, Second Edition, PHI, 2012, New Delhi, India.
3. B.A. Forouzan and R.F. Gilberg, “Computer science, A structured programming approach using C”, Third edition, 2011, Thomson, New Delhi, India.

Reference Link

1. <https://www.geeksforgeeks.org/data-structures/>