ACADEMIC REGULATIONS COURSE STRUCTURE

AND

DETAILED SYLLABUS

DEPARTMENT

OF

ELECTRICAL AND ELECTRONICS ENGINEERING

(Applicable for batches admitted from 2023-2024)

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY
(Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUK,

NAAC Accredited with 'A' Grade, ISO 9001:2015 Certified

Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

About Institute

Vasireddy Venkatadri Institute of Technology (VVIT) was established in the year 2007, with an intake of 240 students in four B. Tech programs under Social Educational Trust in Nambur village, Guntur, AP, by Er. Vasireddy Vidya Sagar. It is located strategically between Guntur and Vijayawada in the capital region of Amravati, AP. In a short span of ten years, with an annual intake capacity of 2280 students into B.Tech (CE, EEE, ME, ECE, CSE, IT, CSM, CSO, CIC, CAI and AID) and 81 students into M. Tech (CSE, VLSI&ES, PEED, MD, SE) programs respectively, today almost 7500 students, 415 teaching staff and 225 non-teaching staff strive to fulfill the vision of VVIT.

VVIT has emerged as one of the top ten Engineering Colleges from the 200 engineering colleges affiliated to JNTU Kakinada. The Institute signed MoUs with Industry and Training & Placement Companies like Infosys, Tech Mahindra, Social Agro, Efftronics, AMCAT and Cocubes. Centre of Excellence (CoE) by Siemens India was established in the year 2016 by APSSDC to promote Industry Institute interface and strengthen employability skills in students, Google Inc. USA for establishing Google Code labs, University Innovative Fellowship (UIF) program by Stanford University USA and VDC established by Northeastern University

On achieving permanent affiliation to JNTUK, Kakinada, NAAC 'A" grade certification (CGPA 3.09) and B. Tech programs (CE, EEE, ME, ECE, CSE, IT) accredited by NBA, VVIT has set its sight on centrally funded research projects with 10 completed and 6 running DST projects and consultancy service from other departments. VVIT as part of its commitment to research, has published 23 patents, 26 books and nearly 790 journal papers and also has a 'Research Centre affiliated to JNTUK'.

Institute Vision

To impart quality education through exploration and experimentation and generate socially conscious engineers, embedding ethics and values, for the advancement in science and technology.

Institute Mission

➢ To educate students with a practical approach to dovetail them to industry-needs.

➢   To govern the institution with a proactive and professional management with passionate teaching faculty.

➢   To provide holistic and integrated education and achieve over all development of students by imparting scientific and technical, social and cognitive, managerial and organizational skills.

➢   To compete with the best and be the most preferred institution of the studious and the scholarly.

➢   To forge strong relationships and linkage with the industry.

About EEE Department

The department of Electrical and Electronics Engineering (EEE) was established during the inception of the institute in 2007 with an annual intake of 60 students. In the academic year 2012-2013 the intake capacity rose to 120 and in the year 2018-2019 it raise to 180.The department has a faculty student ratio of 1:15 as per AICTE norms. The average teaching experience is more than 5 years. The department also offers one post graduate programs in Power Electronics and Electrical Drives (PE & ED) with an intake of 18. The department is re-accredited by National Board of Accreditation for three years from 2020. The major goal of the EEE department is to produce highly knowledgeable, competent and resourceful young engineers who can perform well in awide variety of job profiles. To achieve this goal the department is putting dedicated efforts in nurturing a strong foundation both in analytical and technological aspects laid down in the curriculum. It also provides ample opportunities to students to work on mini projects, develop communication skills, explore internship opportunities in industry and take part in national and international design contests.

The laboratory practical classes are conducted in a systematic manner, where complete plan is given at the time of commencement of the semester. The laboratories are well equipped with modern training facilities that cater to the requirements of the university syllabus. This department plays a vital role in training students of other branches of engineering too. The department also encourages students to take up Graduate Aptitude Test for Engineers (GATE), Graduate Record Examination (GRE) during their final year so they can pursue their higher education either in India or countries like USA, UK, Canada, Australia etc. The department has an IE(I) student chapter where students learn to do projects and organize technical events like symposiums, paper presentations to inculcate abroader

perceptive on the profession. These efforts have culminated in the form of placements in various leading industries and organizations.

Department Vision

To nurture young and fresh minds into disciplined and globally competent technocrats with ethical values to excel in the arena of Electrical and Electronics Engineering leading to sustainable development of society.

Department Mission

➢ To produce qualified engineers with technical knowledge and innovative skills to cater the dynamic requirements in the field of Electrical and Electronics Engineering.
➢ To provide state-of-the-art resources that contributes to achieve excellence in teaching-learning, research and development activities.
➢ To produce graduates with leadership and Entrepreneurship qualities.
➢ To make our students life-long learners capable of building their careers upon a solid foundation of knowledge.
➢ Ensure that our students are well trained in interpersonal skills, team work, professional ethics, environmental awareness and participate in professional society activities.

Program Educational Objectives

➢ **PEO-1**: To prepare the students for academic and professional life of Electrical and Electronics Engineering.
➢ **PEO-2:** To train the students to adapt to the technological developments, innovations and updates in order to prepare them for their profession.
➢ **PEO-3:** To impart knowledge and skills that enables the students to work effectively with professional ethical values, as individuals and as team members in multidisciplinary environments.
➢ **PEO-4:** To encourage the graduates to pursue higher studies, research assignments and as entrepreneurs.

PROGRAM OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

Electrical and Electronics Engineering Graduates will be able to:

PSO1: Able to provide socially acceptable technical solutions to complex electrical engineering problems with the application of modern and appropriate techniques for sustainable development.

PSO2: Apply the appropriate techniques and modern engineering hardware and software tools in electrical engineering to engage in life-long learning and to successfully adapt in multi-disciplinary environments.

ACADEMIC REGULATIONS (R23) FOR B. TECH (REGULAR/HONORS/MINOR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2023-24 onwards

1. Award of the Degree

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

(i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).

(ii) Registers for 160 credits and secures all 160 credits.

(b) Award of B.Tech. degree with Honors

A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:

(i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 160 credits.

(ii) Registering for Honors is optional.

(iii) Honors is to be completed simultaneously with B.Tech. Programme.

2. Students who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 (a)(i).

3. Admissions

Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government / University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government / University or any other order of merit approved by the A.P. Government / University, subject to reservations as prescribed by the Government/University from time to time.

4. Program related terms

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

Credit definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

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

b) **Choice Based Credit System (CBCS):** The CBCS provides a choice for students to select from the prescribed courses.

5. Semester/Credits:

i) A semester comprises 90 working days and an academic year is divided into two semesters.

ii) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.

iii) Regular courses may also be offered during the summer on a fast-track mode to enable students to do additional courses or complete backlogs in coursework.

iv) The Universities/HEIs can decide on the courses to be offered in the summer term depending on the availability of faculty and the number of students.

6. Structure of the Undergraduate Programme

All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities and Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%

5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

7. Course Classification

All subjects/ courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programmes) are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Foundation Core Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences, and management courses
2.	Core Courses	Professional Core Courses (PC)	Includes subjects related to the discipline / department / branch of Engineering
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline / department / branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline / department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	Interdisciplinary/job-oriented/domain courses which are relevant to the industry
4.	Project	Project	B.Tech. Project or Major Project

	&Internships	Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit courses	Covering subjects of developing desired attitude among the learners

8. Programme Pattern

   i.   The total duration of the B. Tech (Regular) Programme is four academic years.

   ii.   Each academic year of study is divided into two semesters.

   iii.   The minimum number of instruction days in each semester is 90 days.

   iv.   There shall be a mandatory student induction program for freshers, with a three-week duration before the commencement of the 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., are included as per the guidelines issued by AICTE.

   v.   Health/wellness/yoga/sports and NSS /NSS /Scouts & Guides / **Community service activities** are made **mandatory as credit courses** for all the undergraduate students.

   vi.   Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.

   vii.   Design Thinking for Innovation & Tinkering Labs is made mandatory as credit courses for all the undergraduate students.

   viii.   Increased flexibility for students through an increase in the elective component of the curriculum, with **05 Professional Elective** courses and **04 Open Elective** courses.

   ix.   Professional Elective Courses include the elective courses relevant to the chosen specialization/branch. Proper choice of **professional elective courses** can lead to students specializing in **emerging areas** within the chosen field of study.

   x.   A total of **04 Open Electives** are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a **Minor within the 160 credits** by opting for the courses offered through various

verticals/tracks under Open Electives.

xi.   While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.

xii.   A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. 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 / interdisciplinary courses and the other shall be a soft skills course.

xiii. Students shall undergo mandatory **summer internships**, for a minimum of **eight weeks duration** at the end of the **second and third year** of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

xiv.   There shall also be mandatory **full internship** in the **final semester** of the programme along with the **project work**.

xv.   An undergraduate degree with **Honors** is introduced for the students having good academic record.

xvi.   Each department shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

xvii. Each department shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth / placements / opportunities for higher studies /GATE/other competitive exams etc.

xviii. Preferably **25% of course work** for the **theory courses** in **every semester** shall be conducted in the **blended mode** of learning.

9. Evaluation Process

The performance of a student in each semester shall be evaluated **subject-wise** with a maximum of **100 marks** for **theory** and **100 marks** for **practical subject**. **Summer Internships** shall be evaluated for **50 marks**, **Full Internship & Project work** in **final semester** shall be evaluated for **200 marks**, mandatory courses with no credits shall be evaluated for **30 mid semester marks**.

A student **must secure** not less than **35% of marks** in the **end examination** and a **minimum of 40% of marks** in the **sum of the mid semester and end examination marks** taken together for the theory, practical, design, drawing subject or project etc. In the case of a mandatory course, he/she should secure 40% of mid semester marks.

THEORY COUSES

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

i) For the theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.

ii) For practical subjects, the distribution shall be 30 marks for the Internal Evaluation and 70 marks for the End Examination.

iii) If any subject has both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given the same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

a) **Continuous Internal Evaluation**

i) For theory subjects, during a semester, there shall be two mid-term examinations. The first midterm examination shall be conducted for the first two and half units of syllabus and the second midterm examination shall be conducted for the rest of the syllabus. Each **mid-term examination consists** of (i) one **online objective** examination (ii) one **descriptive** examination (iii) one **assignment** and (iv) one **Subject Seminar**.

The **online examination** (objective) shall be **10 marks** with duration of **20 minutes**, **descriptive examination** shall be for **10 marks** with a duration of **1 hour 30 minutes**, **assignment** test shall be **5 marks** with duration of **50 minutes** (Open book system with questions of L4 standard on Bloom's scale) and **Subject Seminar 5 marks**.

ii) The first **online** examination (objective) is set with **20 multiple choice questions for 10 marks** (20 questions x 1/2 marks) from first two and half units (50% of the syllabus).

iii) The first **descriptive examination** is set with **30 marks** (two questions for 12 marks and one question for 6 marks) with either or

choice from first two and half units (50% of the syllabus), the student must answer all questions. The marks obtained in the subjective paper are condensed to 10 marks.

iv) The first **assignment Test** from first two and half units conducted for **20 Marks** and will be **scaled down to 5 Marks**. The test is an **open book** system, and the duration of the exam is **50 minutes**. Students can bring a maximum of three printed text books related to that subject. (Soft copies of the text books will not be allowed.) The assignments must provide broadened exposure to the course. The questions shall include problem solving approach, problem analysis & design, implementation, case studies etc.

v) For the first subject **seminar 5 marks**, each student shall be evaluated based on the presentation on any topic of his/her choice in the subject duly approved by the faculty member concerned.

In the **similar lines**, the **second mid** examinations shall be conducted on the rest of the syllabus. Any fraction in the total of mid marks shall be rounded off to the next higher mark.

vi) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid	: 25
Marks obtained in second mid	: 20
Final mid semester Marks	: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other.

For Example:

Marks obtained in first mid	: Absent
Marks obtained in second mid	: 25
Final mid semester Marks	: (0x0.2) + (25x0.8) = 20

b) **End Examination Evaluation:**

End examination of theory subjects shall have the following pattern:

i)   There shall be **6 questions** and **all questions** are **compulsory**.

ii)   **Question 1** shall contain **10 compulsory short answer**

questions (2 short questions from each unit) for a total of **20 marks** such that **each question** carries **2 marks**.

iii) In each of the questions from **2 to 6**, there shall be **either/or type** questions of **10 marks each**. Students shall answer any one of them.

iv) The questions from **2 to 6** shall be set by covering one unit of the syllabus for each question.

Note: End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical &Electronics Engineering shall have the following pattern: **Question 1** shall contain **10 compulsory short answer questions** (Fist five Questions from first two and half units and last five questions from remaining syllabus). The questions numbers **2, 3, 4(a)** shall be set by covering from first two and half units and questions numbers **4(b), 5, 6** in the remaining syllabus.

PRACTICAL COURSES

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

a) For practical courses, there shall be a continuous evaluation during the semester for **30 internal marks** and the end examination shall be for **70 marks**.

b) **Day-to-day** work in the laboratory shall be evaluated for **15 marks** by the concerned laboratory teacher based on the regularity/record/viva and 15 marks for the internal test.

c) The end examination shall be evaluated for **70 marks**, conducted by the **concerned laboratory teacher** and a **senior expert** in the subject from the **same department**.

  ➢ Procedure: **20 marks**

  ➢ Experimental work & Results: **30 marks**

  ➢ Viva voce: **20 marks**.

d) For the subject having **design and/or drawing/graphics**, such as Engineering Drawing, the distribution of marks shall be **30 for mid semester** evaluation and **70 for end examination**.

e)

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

Day-to-day work shall be evaluated for **15 marks** by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be **two midterm examinations** in a semester for duration of **2 hours** each for **15 marks** with weightage of **80% to better mid marks** and **20% for the other**. The first mid exam is set with **30 marks** (two questions for 12 marks and one question for 6 marks) with either or choice from first two and half units (50% of the syllabus), the student must answer all questions. The marks obtained in the subjective paper are condensed to 15 marks.   The **second mid** examinations shall be conducted on the rest of the syllabus. Any fraction in the total of mid marks shall be rounded off to the next higher mark. Finalized mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

There shall be no objective paper in the mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final internal marks for the subject.

Note: In a practical subject consisting of two parts (Eg: Basic Electrical & Electronics Engineering Lab), the **end examination** shall be conducted for **70 marks** as a **single laboratory** in **3 hours**. **Internal examination** shall be evaluated **30 marks** in **each part**. F**inal Internal marks** shall be arrived by considering the **average of marks obtained in two parts**.

The **end examination pattern for design and/or drawing/graphics** shall consist of **5 questions, either/or type**, of **14 marks each**. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing, multiple branches, etc. is mentioned along with the syllabus.

f) There shall be **no external examination** for **mandatory courses** with **zero credits**. However, **attendance shall be considered** while

calculating **aggregate attendance** and student shall be **declared to have passed** the mandatory course only when he/she secures a minimum of **40%** in the **internal examinations**. In case the student fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

g) The **laboratory records** and **mid semester test papers** shall be **preserved** for a **minimum of 3 years** in the **respective departments** as per the norms and shall be produced to the various committees as and when the same are asked for.

10. Skill oriented Courses

i) There shall be five skill-oriented courses offered during III to VII semesters.

ii) Out of the **five skill courses two** shall be skill-oriented courses from the **same domain**. Of the **remaining three** skill courses, **one shall** be a **soft skill course** and the **remaining two** shall be **skill-advanced courses** from the **same domain/Interdisciplinary/Job oriented**.

h) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 internal marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

iii) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.

iv) The student shall be given an option to choose either the skill courses being offered by the department or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the

student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the department to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

v) 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 Head of the department.

11. Massive Open Online Courses (MOOCs)

A Student must pursue and complete **one course compulsorily** through MOOCs approved by the concerned department. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through **MOOCs for awarding the degree**. A student is **not permitted to register and pursue core courses** through MOOCs.

A student shall register for the course (**Minimum of either 8 weeks or 12 weeks**) offered through MOOCs with the **approval of Head of the Department**. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to **earn a certificate** by **passing the exam**. The student shall be **awarded the credits assigned** in the **curriculum** only by **submission of the certificate**. The **examination fee**, if any, **will be borne by the student**. Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for **credit transfer as specified** and **are exempted from appearing internal as well as external examination** (for the specified equivalent credit course only) **conducted by the college**.

Necessary amendments to the **rules and regulations** regarding adoption of **MOOC courses** would be proposed from time to time.

12. Credit Transfer Policy

Adoption of **MOOCs is mandatory**, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of **20% of the total courses** being offered in a particular

programme i.e., maximum of **32 credits** through **MOOCs platform**.

i) The **college shall** offer credit mobility for MOOCs and give the **equivalent credit weightage to the students for the credits** earned through online learning courses.

ii) Student registration for the **MOOCs shall be** only through the **respective departments** and it is **mandatory** for the student to share **necessary information** with the **department**.

iii) The **credit transfer** policy will be **applicable** to the **Professional & Open Elective** courses only.

iv) The **concerned department** shall **identify** the courses permitted for **credit transfer**.

v) The **department shall notify** at the **beginning of semester** the **list** of the online learning courses **eligible for credit transfer**.

vi) The department shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.

vii) The department shall ensure **no overlap of MOOC exams** with that of the **college examination schedule**. In case of **delay in results**, the college will **re-issue** the **marks sheet** for **such students**.

viii) Students **pursuing courses under MOOCs** shall acquire the required credits only after **successful completion** of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

ix) The **institution** shall **submit** the following to the **examination section of the university**:

➢ List of students **who have passed MOOC** courses in the **current semester** along with the **certificate of completion**.

➢ **Undertaking form** filled in by the students **for credit transfer**.

x) The universities shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.

13. Academic Bank of Credits (ABC)

The institution has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i) provide option of mobility for learners across the universities of their choice

ii) provide option to gain the credits through MOOCs from approved digital platforms.

iii) facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC

iv) Execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

14. Mandatory Internships Summer Internships

Two summer internships either **onsite or virtual**, each with a **minimum** of **08 weeks** duration, done at the **end of second and third years**, respectively are mandatory. It shall be completed in collaboration with **local industries, Govt. Organizations, construction agencies, Power projects, software MNCs** or any industries in the areas of concerned specialization of the Undergraduate program. **One of the two summer internships** at the **end of second year** (**Community Service Project**) shall be **society oriented** and shall be completed in collaboration with government organizations/NGOs & others. The **other internship** at the **end of third year** is **Industry Internship** and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The **guidelines issued by the APSCHE / University** shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

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 comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The **report and the oral presentation** shall **carry 50% weightage each**. It shall be evaluated for **50 external marks**. There shall be **no internal marks** for Summer Internship. A student shall secure a **minimum of 40%** of

marks for successful completion. In case a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the institution.

Full Semester Internship and Project work:

In the **final semester**, the student should **mandatorily register** and undergo internship (**onsite/virtual**) 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 a project report on the work carried out during the internship.

The **project report** shall be **evaluated** by an **external examiner**. The total marks for project work are **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 an **internal examiner and external examiner** appointed by the University and is evaluated for **140 marks**.

The department 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.

15. Guidelines for offering a Minor
To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain a degree in Minor in another stream.
  i) The **Minor program** requires the completion of **12 credits** in Minor stream chosen.
 ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses

(or equivalents) before registering for the electives.

iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

Note: A total of **04 Open Electives** are offered in the curriculum. A student can complete the requirement for Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

16. Guidelines for offering Honors

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

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.

ii) A student shall earn an additional **15 credits** for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This **is in addition to the credits** essential for obtaining the Undergraduate degree in Major Discipline (i.e., **160** credits).

iii) A student is permitted to **register for Honors** in **IV semester after the results of III Semester** are declared and students may be allowed to take maximum two subjects per semester pertaining to the **Honors from V Semester onwards**.

iv) The Principal of the department shall arrange separate class work and timetable of the courses offered under Honors program.

v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.

vi) Students can complete the courses offered under **Honors either in the college** or in **online platforms** like SWAYAM with a **minimum duration** of **12 weeks for a 3-credit course and 8 weeks duration for a 2-credit** course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.

vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.

viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.

ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. **No class/division** (i.e., second class, first class and distinction, etc.) **shall be awarded for Honors degree programme**.

x) If a **student drops** or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a **separate grade sheet mentioning** the additional courses completed by them.

xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

Enrolment into Honors

i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline

ii) The **enrolment** of students into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken **up to III semester** in case of regular entry students and **only III semester** in case of **lateral entry** students. Students having **7 CGPA without any backlog subjects** will be permitted to register for Honors.

iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.

iv) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.

v) Honors is to be completed simultaneously with a Major degree program.

Registration for Honors

i) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students

shall be permitted to register for the courses under Honors.

ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of students pursuing the Honors.

iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from the parent department shall be assigned to a group of students to monitor the progress.

iv) There is no fee for registration of subjects for Honors program offered offline at the respective institutions.

17. Attendance Requirements:

i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. b) Condonation of 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.

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

iii) 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.

iv) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.

v) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

vi) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

vii) For induction programme attendance shall be maintained as per AICTE norms.

18. Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 17.

i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.

ii) A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any *decimal* fraction should be *rounded off* to *lower* digit) up to in the subjects that have been studied up to III semester.

iii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any *decimal* fraction should be *rounded off* to *lower* digit) in the subjects that have been studied up to V semester.

And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

iv) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such a case, he/she shall be in the academic regulations into which he/she is readmitted.

19. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

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

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

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

SGPA = Σ (C$_i$ × G$_i$)/Σ C$_i$

where, C$_i$ is the number of credits of the ith subject and G$_i$ is the grade point scored by the student in the ith course.

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

CGPA = Σ (C$_i$ × S$_i$)/ Σ C$_i$

where "S$_i$" is the SGPA of the ith semester and C$_i$ is the total number of credits up to that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D and F.

Award of Class:

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

Class Awarded	CGPA to be secured
First Class with distinction*	≥ 7.75 (Without any supplementary appearance)
First Class	≥ 7.75 (With any supplementary appearance) (or) ≥ 6.75 and < 7.75
Second Class	≥5.75 and <6.75
Pass Class	≥5 and <5.75
Fail	<5

***Note:** Students who have written supplementary examinations to fulfil the credit requirement will not be awarded First Class with Distinction. For such students the highest degree that is awarded will be First Class Only.

CGPA to Percentage conversion Formula – (CGPA – 0.5) x 10

20. With–holding of Results

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

21. Multiple Entry / Exit Option

(a) Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii) **Bachelor of Science (in Field of study/discipline)** i.e., **B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

(b) Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

Note: The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

22. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The HoD of the respective department shall forward such proposals submitted by the students to the Principal. An evaluation committee constituted by the Principal shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not.

23. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of

commencement of class work, subject to Section **2** and they will follow the academic regulations into which they are readmitted.

24. Minimum Instruction Days for a Semester:

The minimum instruction days including exams for each semester shall be 90 days.

25. Medium of Instruction:

The medium of instruction of the entire B. Tech undergraduate programme in Engineering &Technology (including examinations and project reports) will be in English only.

26. Student Transfers:

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

27. General Instructions:

a. The academic regulations should be read as a whole for purpose of any interpretation.

b. Malpractices <u>rules-nature</u> and punishments are appended.

c. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.

d. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

e. The Universities may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.

f. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

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ACADEMIC REGULATIONS (R23)
FOR B.TECH. (LATERAL ENTRY SCHEME)

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*(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year **2024-2025** onwards)*

1. Award of the Degree

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils th following:

   (i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).

   (ii) Registers for 120 credits and secures all 120 credits.

(b) **Award of B.Tech. degree with Honors**

   A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:

   (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.

   (ii) Registering for Honors is optional.

   (iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students who fail to fulfil the requirement for the award of the degree within <u>six</u> consecutive academic years from the year of admission, shall forfeit their seat.

3. Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.2

   (i) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.

   (ii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

And in case if student is already detained for want of credits for academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

4. Course Pattern

(i) The entire course of study is three academic years on semester pattern.

(ii) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

(iii) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

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

* * * *

MALPRACTICE RULES
DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No.	Nature of Malpractices/Improper conduct	Punishment
1. (a)	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 candidate 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.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell 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.	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 and 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 and sent to the University.
3.	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 practical 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.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination 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 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 University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	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.	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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other

	around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	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.	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 University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess 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 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 clause 6 to 8.	Student of the college 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. 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.	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 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 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 reported to the University for further action to award suitable punishment.	

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

⇨   Ragging within or outside any educational institution is prohibited.

⇨   Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

Offence	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Months	+	Rs. 50,000/-

In case any emergency call Toll Free No. 1800 425 1288

LET US MAKE VVIT A RAGGING FREE CAMPUS

Ragging ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

In case any emergency call Toll Free No. 1800 425 1288

LET US MAKE VVIT A RAGGING FREE CAMPUS

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B.TECH. - COURSE STRUCTURE – R23
(Applicable from the academic year 2023-24 onwards)

INDUCTION PROGRAMME

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	MC	2-0-2-0
3	Orientation to all branches career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch corresponding labs, tools, and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

I B.TECH - I SEMESTER

S.N	Course Code	Subjects	L/D	T	P	Credits
1	BS&H	Linear Algebra & Calculus	3	0	0	3
2	BS&H	Chemistry	3	0	0	3
3	ES	Basic Electrical and Electronics Engineering	3	0	0	3
4	ES	Engineering Graphics	1	0	4	3
5	ES	Introduction to Programming	3	0	0	3
6	ES	IT Workshop	0	0	2	1
7	BS&H	Chemistry Lab	0	0	2	1
8	ES	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	ES	Computer Programming Lab	0	0	3	1.5
10	BS&H	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
11	LS	Life Skills-I	2	0	0	0
		Total Credits				**20.5**

I B.TECH - II SEMESTER

S.N	Course Code	Subjects	L/D	T	P	Credits
1	BS&H	Communicative English	2	0	0	2
2	BS&H	Engineering Physics	3	0	0	3
3	BS&H	Differential Equations & Vector Calculus	3	0	0	3
4	ES	Basic Civil & Mechanical Engineering	3	0	0	3
5	PC	Electrical Circuit Analysis-I	3	0	0	3
6	BS&H	Communicative English Lab	0	0	2	1
7	BS&H	Engineering Physics Lab	0	0	2	1
8	ES	Engineering Workshop	0	0	3	1.5
9	PC	Electrical Circuits Lab	0	0	3	1.5
10	BS&H	Health and wellness, Yoga and sports	0	0	1	0.5
11	LS	Life Skills-II	2	0	0	0
		Total Credits				**19.5**

II B.TECH - I SEMESTER

S.No.	Category	Course Name	L	T	P	Credits
1	BS&H	Complex Variables & Numerical Methods	3	0	0	3
2	BS&H	Universal Human Values – Understanding Harmony and Ethical Human Conduct	2	1	0	3
3	E S	Electromagnetic Field Theory	3	0	0	3
4	PC	Electrical Circuit Analysis-II	3	0	0	3
5	PC	DC Machines and Transformers	3	0	0	3
6	PC	Fundamentals of IoT lab	0	0	3	1.5
7	PC	DC Machines and Transformers Lab	0	0	3	1.5
8	SEC	Data Structures	0	1	2	2
9	Audit Course	Environmental Science	2	0	0	0
10	LS	Life Skills-III	2	0	0	0
Total			**18**	**2**	**8**	**20**

II B.TECH - II SEMESTER

S.No.	Category	Course Name	L	T	P	Credits
1	Management Course - I	Managerial Economics and Financial Analysis	2	0	0	2
2	E S	Analog Circuits	3	0	0	3
3	PC	Electrical Power Generation	3	0	0	3
4	PC	Induction and Synchronous Machines	3	0	0	3
5	PC	Control Systems	3	0	0	3
6	PC	Control Systems Lab	0	0	3	1.5
7	PC	Induction and Synchronous Machines Lab	0	0	3	1.5
8	SEC	Python Programming	0	1	2	2
9	ES	Design Thinking & Innovation	1	0	2	2
10	LS	Life Skills-III	2	0	0	0
Total			**17**	**1**	**10**	**21**

I B.TECH	**LINEAR ALGEBRA AND**	**L**	**T**	**P**	**C**
I SEMESTER	**CALCULUS**	**3**	**0**	**0**	**3**

Course Objectives:

➢ To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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

CO1: Develop and use of matrix algebra techniques that are needed by engineers for practical applications. (L6)

CO2: Determine the eigenvalues and eigenvectors of a matrix or a linear transformation and using them to diagonalize a matrix. (L5)

CO3: Utilize mean value theorems to real life problems. (L3)

CO4: Familiarize with functions of several variables which is useful in optimization. (L3)

CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates. (L3)

UNIT-I: MATRICES

Rank of a matrix by Echelon form and normal form - Cauchy- Binet formulae (without proof) - Inverse of non-singular matrices by Gauss-Jordan method - System of linear equations: Solving system of homogeneous and non-homogeneous equations - Gauss elimination method, Jacobi and Gauss-Seidel iteration methods.

UNIT-II: EIGENVALUES, EIGENVECTORS AND ORTHOGONAL TRANSFORMATION

Eigenvalues, Eigenvectors, and their properties - Diagonalization of a matrix - Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem - Quadratic form and nature of a quadratic form - Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-III: CALCULUS

Mean Value Theorems (without proofs): Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation - Cauchy's mean value theorem - Taylor's and Maclaurin's theorems with remainders - Problems and applications on the above theorems.

UNIT-IV: PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS)

Functions of several variables: Continuity and Differentiability - Partial derivatives - Total derivatives - Chain rule - Taylor's and Maclaurin's series expansion of functions of two variables - Jacobians - Functional dependence - Maxima and minima of functions of two variables - Method of Lagrange's multipliers.

UNIT-V: MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS)

Double integrals - Triple integrals - Change of order of integration - Change of variables to polar, cylindrical and spherical coordinates - Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9th edition. Higher Engineering Mathematics, H. K. Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).

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I B.TECH	CHEMISTRY	L	T	P	C
I SEMESTER		3	0	0	3

Course Objectives:

- ➢ To familiarize engineering chemistry and its applications.
- ➢ To understand the significance of Schrodinger wave equation and molecular orbital theory
- ➢ To apply advanced materials for engineering applications.
- ➢ To train the students on the principles and applications of electrochemistry - batteries and fuel cells.
- ➢ To know the significance of polymers and composites (FRP's) in household appliances, aerospace, and automotive industries.
- ➢ To summarize the instrumental methods and their applications.

Course Outcomes: At the end of the course, the students will be able to:

CO1: Apply the principles of quantum mechanics to solve the problems like particle in a one-dimensional box.
CO2: Demonstrate and distinguish the principle of Band diagrams in the application of semiconductors, conductors & superconductors.
CO3: Analyze the materials usage in construction of batteries, fuel cells and electrochemical sensors.
CO4: Synthesize some important polymers, analyze the properties and applications of thermosetting, thermoplastics, elastomers& conducting polymers.
CO5: Compare and apply the principles of spectroscopy, to elucidate the molecular structure and functional group analysis.

UNIT I: STRUCTURE AND BONDING MODELS

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II: MODERN ENGINEERING MATERIALS

Semiconductors – Introduction, Classification, intrinsic and extrinsic Si-semiconductors, applications

Super conductors-Introduction, Types of superconductors, Meissner effect applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.
Nano materials: Introduction, classification of nanomaterials, properties and applications of Fullerenes, carbon nano tubes and Graphene nanoparticles.

UNIT III   ELECTROCHEMISTRY AND APPLICATIONS

Electrochemical cell, Nernst equation, Electrochemical series - significance, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, working of hydrogen-oxygen fuel cell–. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT IV   POLYMER CHEMISTRY

Introduction to polymers, functionality of monomers, chain growth, step growth polymerization, and coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics – Thermoplastics and Thermosettings, Preparation, properties, and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres (CFRP& GFRP).Elastomers–Buna-S,   Buna-N–preparation,   properties,   and applications.Conducting   polymers   –   polyacetylene,   polyaniline,   – mechanism of conduction and applications.

Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polys Lactic Acid (PLA).

UNIT V   INSTRUMENTAL METHODS AND APPLICATIONS

Types of electromagnetic spectrum, Absorption of radiation: Beer-Lambert's law, UV-Visible Spectroscopy, types of electronic transitions, Applications of UV-Visible Spectroscopy IR spectroscopy: fundamental modes molecular vibrations and selection rules, functional group region, fingerprint region, Applications of IR- Spectroscopy, NMR spectroscopy-Basic Principle, Chemical shift, Instrumentation and Applications.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008'
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition.

I B.TECH	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
I SEMESTER		3	0	0	3

Course Objectives

➢ To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes

Upon successful completion of the course, the student will be able to
CO1: Remembering the basic electrical elements and different fundamental laws. **(Remember)**
CO2: Understand the construction and operation of AC and DC machines, measuring instruments. **(Remember, Understand)**
CO3: Understand the different power generation mechanisms, Electricity billing concept, important safety measures related to electrical operations & understand the basic operation of Semiconductor Devices **(Remember, Understand)**
CO4: Understand the operation of different electronics circuits. **(Remember, Understand)**

CO5: Understand the Boolean Algebra theorems, simplify and design logic circuits and elements of sequential logic circuits. **(Remember, Understand)**

UNIT 1: DC & AC CIRCUITS
DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT 2: MACHINES AND MEASURING INSTRUMENTS

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge. (Elementary Treatment only).

UNIT 3A: ENERGY RESOURCES, ELECTRICITY BILL, SAFETY MEASURES

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. (Simple numerical problem)

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

UNIT 3B: SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier. (Elementary Treatment only)

UNIT 4: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system. (Elementary Treatment only).

UNIT 5: DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and

Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Content Beyond the syllabus: Digital Multi-meters (Block diagram).

Text books
1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition.
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013 .
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.
4. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
5. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Reference books
1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.
5. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
6. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
7. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

e- Resources & other digital material
1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

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I B.TECH	ENGINEERING GRAPHICS	L	T	P	C
I SEMESTER	(First angle projection only)	1	0	4	3

Course objectives:

➢ To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
➢ To impart knowledge on the projection of points and lines
➢ To improve the visualization skills for better understanding of plane surfaces and projection of solids
➢ To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
➢ To make the students understand the viewing perception of a solid object in Isometric and Orthographic projection.

Course Outcomes

1. Upon successful completion of the course, the student will be able to
2. **CO1:** Constructions of various engineering curves {**Apply level, KL3**}
3. **CO2:** Apply the principle of orthographic projection to points and lines {**Apply level, KL3**}
4. **CO3:** Understand and draw the projection of planes and solids inclined to both planes in first quadrant {**Understand level, KL2**}
5. **CO4:** Use the knowledge of sectional views and Development of Solid Surfaces in Real time Applications {**Apply level, KL3**}
6. **CO5:** Develop isometric drawings of simple objects reading the orthographic projections of those objects {**Analyze level, KL4**}

UNIT-I

INTRODUCTION: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

CURVES: construction of ellipse, parabola and hyperbola by general method **(Eccentricity method),** Cycloids, Involutes, Normal and tangent to Curves.

UNIT-II

ORTHOGRAPHIC PROJECTIONS: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants. **PROJECTIONS OF STRAIGHT LINES:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane.

Projections of Straight Lines Inclined to both the reference planes, Midpoint problems.

UNIT-III

PROJECTIONS OF PLANES: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

PROJECTIONS OF SOLIDS: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT-IV

SECTIONS OF SOLIDS: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in **simple position only.**

DEVELOPMENT OF SURFACES: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone in **simple position only.**

UNIT-V

CONVERSION OF VIEWS: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

COMPUTER GRAPHICS: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD **(Not for end examination).**

Learning Resources
Text books

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference books
1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.
4. AutoCAD 2018 Training Guide (English, Paperback, Sagar Linkan)

Websites
1 .https://www.autodesk.com.au/campaigns/autocad-tutorials
2. https://nptel.ac.in/courses/112104172

I B.TECH	INTRODUCTION TO PROGRAMMING COMMON TO ALL BRANCHES	L	T	P	C
I SEMESTER		3	0	0	3

Course Objectives:
- ➢ To introduce students to the fundamentals of computer programming.
- ➢ To provide hands-on experience with coding and debugging.
- ➢ To foster logical thinking and problem-solving skills using programming.
- ➢ To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- ➢ To encourage collaborative learning and teamwork in coding projects.

Course Outcomes: A student after completion of the course will be able to

CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.
CO2: Analyze a problem and develop an algorithm to solve it.
CO3: Implement various algorithms using the C programming language.
CO4: Understand more advanced features of C language.
CO5: Develop problem-solving skills and the ability to debug and optimize the code.

UNIT I INTRODUCTION TO PROGRAMMING AND PROBLEM SOLVING

Introduction: History of Computers, Basic organization of a computer: ALU, input-output units, memory.
Problem solving techniques: Algorithmic approach, characteristics of algorithm, Algorithms, flowcharts (Using Dia Tool).
Introduction to Programming: Languages & types, Basics of a Computer Program- basic structure of a C program, C Tokens – Literals, Primitive Data Types, Keywords, operators, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

UNIT II CONTROL STRUCTURES

Decision making: Simple sequential programs Conditional Statements (if, if-else, switch),
Iterative Statements: Loop - for, while, do-while, unconditional branching - break and continue.

UNIT III ARRAYS AND STRINGS

Arrays: indexing, memory model, programs with array of integers, two dimensional arrays
Strings: Introduction to Strings.

UNIT IV POINTERS & USER DEFINED DATA TYPES

Pointers: dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, Dynamic memory management.
User-defined data types: Structures and Unions.

UNIT V Functions & File Handling

Functions: Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables,

File Handling: Basics of File Handling

Textbooks:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.

2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition

3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

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I B.TECH	IT WORKSHOP	L	T	P	C
I SEMESTER		0	0	2	1

Course Objectives:
- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes:
CO1: Perform Hardware troubleshooting.
CO2: Understand Hardware components and inter dependencies.
CO3: Safeguard computer systems from viruses/worms.
CO4: Document/ Presentation preparation.
CO5: Perform calculations using spreadsheets.

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: 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. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a 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 both La TeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: 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, Paragraphs and Mail Merge in word.

EXCEL \Excel Orientation: The mentor needs to tell the importance of MS office or 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 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it

into another language. Compare the output to see how accurate and fluent the translations are.

Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003

2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition

3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition

4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)

5. LaTeX Companion, Leslie Lamport, PHI/Pearson.

6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition

7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

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I B.TECH	ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP	L	T	P	C
I SEMESTER		0	0	2	1

Preamble: Electrical and Electronics Engineering Workshop Lab provides the essential facilities to the students to augment their concepts about the fundamentals of Electrical and Electronics Engineering.
➢ To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.
➢ To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

Course Objectives: The student should be able to
➢ To understand the Electrical circuit design concept, operation of Electrical Machines and Transformer, control the speed of three phase induction motors, measurement of resistance, power, and power factor.
➢ To apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments.
➢ To analyzethe various characteristics of electrical circuits, electrical machines and measuring instruments.
➢ To understand the usage of electronic measuring instruments.
➢ To Plot and discuss the characteristics of various electron devices.

Course Outcomes: Upon successful completion of the course, the student will be able to
CO1, Analyse the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer. (L2)
CO2, Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments, calculations for the measurement of resistance, power and power factor. (L3)
CO3, Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.(L4)
CO4, Understand the usage of electronic measuring instruments.(L2)
CO5, Plot and discuss the characteristics of various electron devices.(L3)

LIST OF EXPERIMENTS
Any Ten of the following experiments are to be conducted:
1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Calculation of Electrical Energy for Domestic Premises
7. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
8. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
9. Implementation of half wave and full wave rectifiers
10. Plot Input & Output characteristics of BJT in CE and CB configurations
11. Frequency response of CE amplifier.
12. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.

List of Additional Experiments: Any of the two experiments are to be conducted.
1. Measurement of Earth Resistance using Megger.
2. Simulation of RC coupled amplifier with the design supplied
3. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs
4. Measurement of parameters of choke coil.

Learning Resources
Text books
1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.

Reference books:
1. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013.
2. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.
3. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata McGraw Hill, 2009
4. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

e- Resources & other digital material
1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

I B.TECH	CHEMISTRY LAB	L	T	P	C
I SEMESTER		0	0	2	1

Course Objectives:

➢ To verify the fundamental concepts with experiments

Course Outcomes: At the end of the course, the students will be able to

➢ CO1: Determine the cell constant and conductance of solutions.

➢ CO2: Prepare advanced polymer Bakelite materials.

➢ CO3: Measure the strength of an acid present in any given ample/specimen.

➢ CO4: Estimate the amount of Vitamin-C present in soft drinks.

➢ CO5: Verify Beer-Lambert's law.

List of Experiments:

1. Determination of Strength of an acid in Pb-Acid battery.
2. Determination of Hardness of a groundwater sample.
3. Conductometric titration of strong acid vs. strong base.
4. Conductometric titration of weak acid vs. strong base.
5. Determination of cell constant and conductance of solutions.
6. Potentiometry - determination of redox potentials and emfs.
7. pH metry/ pH metric titration of strong acid Vs strong base.
8. Preparation of a Bakelite.
9. Determine the strength of given KMnO4 by colorimetry (Verification of Lambert-Beer's law).
10. Estimation of Ferrous Iron by Dichrometry .
11. Estimation of Iron by Permanganometry.
12. Measurement of 10Dq by spectrophotometric method.
13. Wavelength measurement of sample through UV- Visible Spectroscopy.
14. Identification of simple organic compounds by IR.
15. Preparation of nanomaterials by precipitation method.
16. Estimation of Vitamin-C present in soft drink.

Note: A student can choose any 10 experiments from the above list.

 Reference:

"Vogel's Quantitative Chemical Analysis 6th Edition "Pearson Publications by J. Mendham, R. C. Denney, J. D. Barnesand B. Sivasankar.

I B.TECH	COMPUTER PROGRAMMING LAB	**L**	**T**	**P**	**C**
I SEMESTER		**0**	**0**	**3**	**1.5**

Course Objectives:

➢ The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

Course Outcomes:

CO1: Read, understand, and trace the execution of programs written in C language.

CO2: Select the right control structure for solving the problem.

CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.

CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

UNIT I

WEEK 1

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

i)   Basic Linux environment and its editors like Vi, Vim & Emacs etc.

ii) Exposure to Turbo C, gcc

iii) Writing simple programs using printf(), scanf()

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

i)   Sum and average of 3 numbers

ii) Conversion of Fahrenheit to Celsius and vice versa

iii) Simple interest calculation

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

  i)   Finding the square root of a given number

  ii) Finding compound interest

  iii) Area of a triangle using heron's formulae

  iv) Distance travelled by an object

WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

  i) Evaluate the following expressions.

      a. A+B*C+(D*E) + F*G
      b. A/B*C-B+A*D/3
      c. A+++B---A
      d. J= (i++) + (++i)

  ii) Find the maximum of three numbers using conditional operator

  iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

   i) Write a C program to find the max and min of four numbers using if-else.

   ii) Write a C program to generate electricity bill.

   iii) Find the roots of the quadratic equation.

   iv) Write a C program to simulate a calculator using switch case.

   v) Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and

for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

   i) Find the factorial of given number using any loop.

   ii) Find the given number is a prime or not.

   iii) Compute sine and cos series

   iv) Checking a number palindrome

   v) Construct a pyramid of numbers

WEEK 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7: 1D Array manipulation, linear search

   i) Find the min and max of a 1-D integer array.

   ii) Perform linear search on1D array.

   iii) The reverse of a 1D integer array

   iv) Find 2's complement of the given binary number.

   v) Eliminate duplicate elements in an array.

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

   i)   Addition of two matrices
   ii) Multiplication two matrices
   iii) Sort array elements using bubble sort
   iv) Concatenate two strings without built-in functions

   v)   Reverse a string using built-in and without built-in string functions

WEEK 9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.
   i)   Write a C program to find the sum of a 1D array using malloc()

   ii) Write a C program to find the total, average of n students using structures

   iii) Enter n students data using calloc() and display failed students list

   iv) Read student name and marks from the command line and display the student details along with the total.

   v)   Write a C program to implement realloc()

WEEK 10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10 : Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

   i)   Create and display a singly linked list using self-referential structure.

   ii) Demonstrate the differences between structures and unions using a C program.

   iii) Write a C program to shift/rotate using bitfields.

   iv) Write a C program to copy one structure variable to another structure of the same type

WEEK 11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

   i)   Write a C function to calculate NCR value.

   ii) Write a C function to find the length of a string.

   iii) Write a C function to transpose of a matrix.

   iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

   i)   Write a recursive function to generate Fibonacci series.
   ii) Write a recursive function to find the lcm of two numbers.
   iii) Write a recursive function to find the factorial of a number.
   iv) Write a C Program to implement Ackermann function using recursion.
   v) Write a recursive function to find the sum of series.

WEEK 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

   i) Write a C program to swap two numbers using call by reference.

   ii) Demonstrate Dangling pointer problem using a C program.

   iii) Write a C program to copy one string into another using pointer.

   iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers

WEEK14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

   i) Write a C program to write and read text into a file.

   ii) Write a C program to write and read text into a binary file using fread() and fwrite()

   iii) Copy the contents of one file to another file.

   iv) Write a C program to merge two files into the third file using command-line arguments.

   v) Find no. of lines, words and characters in a file

   vi) Write a C program to print last n characters of a given file.

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.

2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India

2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

I B.TECH	NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE	L	T	P	C
I SEMESTER		0	0	1	0.5

Course Objectives:

➢ The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcomes: After completion of the course the students will be able to

CO1: Understand the importance of discipline, character and service motto.
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO3: Explore human relationships by analyzing social problems.
CO4: Determine to extend their help for the fellow beings and downtrodden people.
CO5: Develop leadership skills and civic responsibilities.

UNIT I: ORIENTATION

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:
i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II: NATURE & CARE ACTIVITIES
i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III: Community Service Activities

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc

ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS

iii) Conducting consumer Awareness. Explaining various legal provisions etc.

iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme*
   Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

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I B.TECH	**LIFE SKILLS-I**	**L**	**T**	**P**	**C**
I SEMESTER		**2**	**0**	**0**	**0**

Course Outcomes: After completion of the course the student will be able to

CO 1: To convert difficult data into equations and find solution by various methods and means using Algebra.

CO 2: Application of Number system usage in daily life.

CO 3: Enhance the logical abilities on various series and analogies (number, letter and verbal).

CO 4: Implementing logical classification, coding and decoding (number, letter and verbal).

CO 5: Understand importance of effective communication ski, usage of contextual vocabulary

CO 6: Understand the importance of grammar for effective communication.

The Life Skills course is divided into three components – Part-A. Quantitative Ability, Part-B. Reasoning Ability and Part-C. Verbal Ability.

Part-A: Quantitative Ability: Almost all competitive examinations test the candidate for quantitative aptitude, especially recruitment test, public service examinations management courses, where they evaluate the student's thinking prowess and analytical skills. Critical analysis of problems asked in examination reveal that they are designed to correlate multiple topics and the test taker is expected to identify those link points and come out with an out-of-box unique solution. The purpose of the test is to assess arithmetic abilities, logic, analysis, problem solving and decision-making skills.

Part-B: Reasoning Ability: Reasoning ability is the ability to draw connections between factors, and the ability to synthesize a message from a body of information. Reasoning ability of the aspirants for jobs or courses is tested by means of a verbal reasoning test non-verbal reasoning. Thus, reasoning is a highly specialized thinking which helps an individual to explore mentally the cause & effect relationship of an event or solution of a problem by adopting some well-organized systematic steps based on previous experience combined with present observation. Most of the recruitment tests consist of questions to assess the reasoning ability of the students.

Part-C: Verbal Ability: The dramatic changes in global economies have been matched with the transformation in technology and these have an

impact on education as well the workplace. Life skills provide students with important skills such as independent thinking, social skills, situational awareness, and communication skills needed in the campus and future workplaces. They equip the student with the requisite tools for all round development, and the requisite non-academic skills to enrich their lives.

Part-A: Quantitative Ability

Unit-1: Module 1: Linear equation or simple equation and Algebraic equation
Module 2: Number System – Prime Factorization, divisibility of a factorial number, number of zeroes, unit digit and remainders, Examples, and practice problems.

Unit-2: Module 3: LCM AND HCF – Definitions of LCM and HCF, Methods of finding LCM and HCF using Prime Factorization method and Division Method, Examples, and practice problems.
Module 4: Ratio, proportion, and variation – Definition of Ratios and Proportions, Meaning of Ratios and Proportions, Properties of Ratios, Formulas, differences between Ratios and Proportions, Examples, and practice problems.
Part-B: Reasoning Ability

Unit-3: - Module 5: Series
Module 6: Analogy

Unit-4: - Module 7: Classification
Module 8: Coding and Decoding
Part-C: Verbal Ability

Unit-5: - Module 5: Functional English; Ad-lib/ impromptu speaking sessions; JAM sessions
Module 6: Writing paragraphs (describing a process, reporting an incident, explaining an experience); Summarizing TED talks; and Letter Writing

Unit-6: Module 7: Time management; Stress Management; and Emotional intelligence
Module 8: Interpersonal skills; Team dynamics; and Leadership development

Reference Books
1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
3. Teach Yourself Quantitative Aptitude, by Arun Sharma
4. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar
5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta
6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
7. How to Prepare for Data Interpretation by Arun Sharma
8. Logical Reasoning Data Interpretation by Nishit K. Sinha
9. Analytical Reasoning (2018-2019) Session by MK Panday
10. How to Crack Test of Reasoning by Jaikishan and Premkishan [Arihant]
11. Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
12. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
13. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGraw Hill]
14. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
15. Visual Intelligence for Beginners by Matthew Alcot
16. McCarthy, Michael& Felicity O'Dell. English Vocabulary in Use beginner, Cambridge University Press, 2017.
17. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Upper-Intermediate, Cambridge University Press, 2017.
18. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Advanced, Cambridge University Press, 2017.
19. Sonmez, John. Soft Skills: The Software Developer's Life, Manning Publications, 2014.
20. Tulgan, Bruce. Bridging the Soft Skills Gap: How to Teach the Missing Basics to Today's Young Talent, Pan Macmillan India, 2016.

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I B.TECH	COMMUNICATIVE ENGLISH	L	T	P	C
II SEMESTER		2	0	0	2

Course Objectives:

➢ To facilitate effective listening, speaking, reading, and writing skills among the students.
➢ To enhance the LSRW skills in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary.
➢ To help the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes

At the end of the course, the learners will be able to

CO1: Understand the context, topic, and pieces of specific information from social or transactional dialogues.
CO2: Apply grammatical structures to formulate sentences and correct word forms.
CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions.
CO4: Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.
CO5: Create a coherent paragraph, essay, and resume.

UNIT I
Lesson: HUMAN VALUES: Gift of Magi (Short Story)
Lesson: "How to Fashion Your Own Brand of Success" by Howard Whitman

Listening: Identifying the topic, the context, and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies, and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II
Lesson: **NATURE: The Brook by Alfred Tennyson (Poem)**
Lesson: **"How to Conquer the Ten Most Common Causes of Failure" by Louis Binstock**
Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT III
Lesson: **BIOGRAPHY: Elon Musk**
Lesson: **"How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz**
Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
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, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT IV
Lesson: **INSPIRATION: The Toys of Peace by Saki**

Lesson: **"How to Raise Your Self-Esteem and Develop Self-confidence" by James W Newman**

Listening: Making predictions while listening to conversations/transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes, or display complicated data.

Writing: Letter Writing: Official Letters, Resumes

Grammar: Reporting Verbs, Direct & Indirect Speech, Active & Passive Voice

Vocabulary: Words often Confused, Jargons

UNIT V
Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

Lesson: "How to Eliminate Your Bad Habits" by Benjamin Franklin

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.

Grammar: Editing short texts identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Vocabulary: Technical Jargons

Text Books
1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan 2023 (Units 1, 2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)
3. University of Success: OG Mandino Jaico Impression 2019 (5 Selected Lessons)

Reference Books:
1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020.
2. Bailey, Stephen. Academic Writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY
1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

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I B.TECH	ENGINEERING PHYSICS	L	T	P	C
II SEMESTER		3	0	0	3

Course Objectives:

➢ To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes:

CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.

CO2: Familiarize with the basics of crystals and their structures.

CO3: Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.

CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials.

CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids.

CO6: Identify the type of semiconductor using Hall effect.

UNIT-I: WAVE OPTICS

Interference: Introduction – principle of superposition – interference of light – interference in thin films (Reflection geometry) & applications – colours in thin films – Newton's Rings, determination of wavelength and refractive index.

Diffraction: Introduction – Fresnel and Fraunhofer diffractions – Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction grating - Dispersive power and resolving power of grating (Qualitative)

Polarization: Introduction -Types of polarization -Polarization by reflection, refraction, and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT-II: CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

Crystallography: Space lattice, Basis, Unit Cell, and lattice parameters Bravais Lattices crystal systems (3D) coordination number packing fraction of SC, BCC & FCC Miller indices separation between successive (hkl)

planes.

X-ray diffraction: Bragg's law-X-ray Diffractometer–crystal structure determination by Laue's and powder methods

UNIT-III: DIELECTRIC AND MAGNETIC MATERIALS

Dielectric Materials: Introduction – dielectric polarization, dielectric polarizability, susceptibility, dielectric constant, and displacement vector – relation between the electric vectors – types of polarizations: electronic (Quantitative), ionic (Quantitative) and orientation polarizations (Qualitative) – Lorentz internal field – Clausius-Mossotti's equation – complex dielectric constant – frequency dependence of polarization– dielectric loss.

Magnetic Materials: Introduction – magnetic dipole moment – magnetization – magnetic susceptibility and permeability – atomic origin of magnetism – classification of magnetic materials: Dia, para, ferro, anti-ferro & ferrimagnetic materials – domain concept for ferromagnetism & domain walls (Qualitative) – hysteresis – soft and hard magnetic materials.

UNIT – IV: QUANTUM MECHANICS AND FREE ELECTRON THEORY

Quantum Mechanics: Dual nature of matter – Heisenberg's uncertainty principle – significance and properties of wave function – Schrodinger's time independent and dependent wave equations – particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory-Fermi-Dirac distribution –Density of states -Fermi energy.

UNIT – V: SEMICONDUCTORS

Semiconductors: Formation of energy bands – classification of crystalline solids – Intrinsic semiconductors: Density of charge carriers – electrical conductivity – Fermi level – Extrinsic semiconductors: Density of charge carriers – dependence of Fermi energy on carrier concentration and temperature – drift and diffusion currents – Einstein's equation – Hall effect and its applications.

TEXT BOOKS

1. "Applied Physics" by T. Vijaya Krishna, T. Madhu Mohan, B. K. Pandey, Manoj K. Harbola, S. Chaturvedi - Cengage, 2020.

2. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.

3. Engineering Physics -D. K. Bhattacharya and Poonam Tandon, Oxford press(2015)

REFERENCE BOOKS

1. Engineering Physics –Shatendra Sharma, Jyotsna Sharma, Pears on Education, 2018.
2. Engineering Physics"-Sanjay D.Jain, D.Sahasrabudhe and Girish, University Press.2010
3. Engineering Physics -M. R. Srinivasan, New Age international publishers (2009).
4. Fundamentals of Physics- Halliday, Resnick and Walker, Wiley (2006).
5. Physics for Scientists & Engineers, Serway and Jewett, Cengage (2019).

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

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I B.TECH	DIFFERENTIAL EQUATIONS AND	L	T	P	C
II SEMESTER	VECTOR CALCULUS	3	0	0	3

Course Objectives:

➢ To enlighten the learners in the concept of differential equations and multivariable calculus.

➢ To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

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

CO1: Solve the differential equations related to various engineering fields. (L3)

CO2: Solve the second and higher order differential equations and its applications. (L3)

CO3: Identify solution methods for partial differential equations that model physical processes. (L3)

CO4: Interpret the physical meaning of different operators such as gradient, curl and divergence. (L5)

CO5: Estimate the work done against a field, circulation and flux using vector calculus. (L5)

UNIT-I: DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST

Linear differential equations - Bernoulli's equations - Exact equations and equations reducible to exact form - Applications: Newton's law of cooling - Law of natural growth and decay - Electrical circuits.

UNIT-II: LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral - Wronskian, Method of variation of parameters - Simultaneous linear equations - Applications to L-C-R circuit problems and Simple harmonic motion.

UNIT-III: Partial differential equations

Introduction and formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solutions of first order linear equations using Lagrange's method - Homogeneous linear partial differential equations with constant coefficients.

UNIT-IV: Vector differentiation

Scalar and vector point functions - Vector operator del - Del applied to scalar point functions - Gradient, Directional derivative - Del applied to vector point functions - Divergence and Curl - Vector identities.

UNIT-V: Vector integration

Line integral - Circulation - Work done - Surface integral, flux - Green's theorem in the plane (without proof) - Stoke's theorem (without proof) - Volume integral - Gauss divergence theorem (without proof) and related problems.

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition.

2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, Mc Graw Hill Education, 2017.

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I B.TECH	**BASIC CIVIL AND MECHANICAL ENGINEERING**	**L**	**T**	**P**	**C**
II SEMESTER		**3**	**1**	**0**	**3**

BASIC CIVIL ENGINEERING

Course Objectives:

➢ Get familiarized with the scope and importance of Civil Engineering sub-divisions and introduction to basic civil engineering materials and construction techniques.
➢ Introduce the preliminary concepts of surveying.
➢ Acquire preliminary knowledge on Transportation and its importance in nation's economy.
➢ Get familiarized with the importance of quality, conveyance, and storage of water.

Course Outcomes:

On completion of the course, the student should be able to:

CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society and understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

CO2: Know the concepts of surveying and to understand the measurement of distances, angles, and levels through surveying.

CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation and importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.

UNIT I
BASICS OF CIVIL ENGINEERING: Role of Civil Engineers in Society-Various Disciplines of Civil Engineering- Structural Engineering- Geo-Technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

UNIT – II
SURVEYING: Objectives of Surveying- Horizontal Measurements- Angular Measurements-Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings - Contour mapping.

UNIT - IIIA
TRANSPORTATION ENGINEERING: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible

Pavements and Rigid Pavements - Simple Differences. Basics of Harbor, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Text Books

1. M. S. Palanichamy, Basic Civil Engineering, McGraw Hill Education, 4th edition, 2017
2. S. S. Bhavikatti, Basic Civil Engineering, New Age International, 2010
3. Srikrishna A. Dhale and Kiran M. Tajne, Basics of Civil Engineering, 2014.

Reference Books:

1. G. Shanmugam and M. S. Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education, 2018.
2. S. Gopi, Basic Civil Engineering, Pearson, 2018
3. Introduction to Civil Engineering, Course Material, IIT Madras.

BASIC MECHANICAL ENGINEERING

Course objectives:

➢ Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
➢ Explain different engineering materials and different manufacturing processes.
➢ Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes: Upon successful completion of the course, the student will be able to

CO4: Understand the different manufacturing processes {**Understand level, KL2**}

CO5: Demonstrate the working of different mechanical power transmission systems and Basics of robotics. {**Understand level, KL2**}

CO6: Understand the working principles of Various power plants {**Understand level, KL2**}

UNIT-IIIB

INTRODUCTION TO MECHANICAL ENGINEERING: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors

such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

ENGINEERING MATERIALS: Classification of Engineering materials &Their applications: Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials. Definition of Strength, Hardness, Ductility and Toughness

UNIT-IV

MANUFACTURING PROCESSES: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

MECHANICAL POWER TRANSMISSION: Belt Drives, Chain, Rope drives, Gear Drives and their applications.

INTRODUCTION TO ROBOTICS: Joints & links, configurations, and applications of robotics

UNIT-V

POWER PLANTS: working principle of Steam, Diesel, Hydro, Nuclear power plants.

THERMAL ENGINEERING: working principle of Boilers (Cochran boiler, Babcock and Wilcox boiler, La Mont boiler), Refrigeration cycle (Ideal Vapour Compression refrigeration cycle) and air-conditioning system (Summer air-conditioning system), IC engines, Otto cycle, Diesel cycle, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Textbooks

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.

2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.

3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications

3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.

4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

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I B.TECH	ELECTRICAL CIRCUIT ANALYSIS –	L	T	P	C
II SEMESTER	I	3	0	0	3

Course objectives: The student should be able to
➢ Remembering the basic electrical elements and different fundamental laws.
➢ Understand the network reduction techniques, transformations, concept of self- inductance and mutual inductance, phasor diagrams, resonance, and network theorems.
➢ Apply the concepts to obtain various mathematical and graphical representations.
➢ Analyse nodal and mesh networks, series and parallel circuits, steady state response, different circuit topologies (with R, L and C components).
➢ Evaluation of Network theorems, electrical, magnetic, and single-phase circuits

Course Outcomes: Upon successful completion of the course, the student will be able to
CO1: Remembering the basic electrical elements and different fundamental laws.
CO2: Understand the network reduction techniques, transformations, concept of self- inductance and mutual inductance, phasor diagrams, resonance, and network theorems.
CO3: Apply the concepts to obtain various mathematical and graphical representations.
CO4: Analyze nodal and mesh networks, series and parallel circuits, steady state response, different circuit topologies (with R, L and C components).
CO5: Evaluation of Network theorems, electrical, magnetic, and single-phase circuits.

UNIT I: INTRODUCTION TO ELECTRICAL CIRCUITS
Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis, and mesh analysis to DC networks with dependent and independent voltage and current sources, node, and mesh analysis.

UNIT II: MAGNETIC CIRCUITS

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT III: SINGLE PHASE CIRCUITS

Characteristics of periodic functions, Average value, R.M.S. value, form factor, representation of a sine function, concept of phasor, phasor diagrams, node and mesh analysis. Steady state analysis of R, L and C circuits to sinusoidal excitations-response of pure resistance, inductance, capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallel RC circuit

UNIT IV: RESONANCE AND LOCUS DIAGRAMS

Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity, and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables

UNIT V: NETWORK THEOREMS (DC & AC EXCITATIONS)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem

Content Beyond the syllabus: Telligen's theorem, Electrical circuits pplications

Learning Resources

Text books:

1. 1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition

Reference books:

1. Fundamentals of Electrical Circuits, Charles K. Alexander and Mathew N.O. Sadiku, Mc Graw Hill Education (India), 2013, Fifth Edition
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and K. Rao, Mc Graw Hill Education, 2017, Fifth Edition.
3. Electric Circuits, David A. Bell, Oxford University Press, 2009, Seventh Edition.

4. Introductory Circuit Analysis, Robert L Boylestad, Pearson Publications, 2023, Fourteenth Edition.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018, Seventh Revised Edition.

e- Resources & other digital material

1. https://onlinecourses.nptel.ac.in/noc23_ee81/preview
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/108106172

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I B.TECH	**COMMUNICATIVE ENGLISH LAB**	L	T	P	C
II SEMESTER		0	0	2	1

Course Objectives:
➢ To expose the students to a variety of self-instructional, learner friendly modes of language learning.
➢ To train the students in basic communication skills and also make them ready to face job interviews.

Course Outcomes:
CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
CO2: Apply communication skills through various language learning activities.
CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.
CO5: Create effective career objectives.

List of Topics:
1. Vowels & Consonants

2. Neutralization/Accent Rules

3. Communication Skills & JAM

4. Role Play or Conversational Practice

5. E-mail Writing

6. Resume Writing, Cover Letter, SOP

7. Group Discussions-Methods & Practice

8. Debates - Methods & Practice

9. PPT Presentations/ Poster Presentation

10. Interview Skills

Suggested Software

➢ Walden Infotech
➢ Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication.* Oxford Press. 2018.
2. Taylor Grant: *English Conversation Practice,* Tata McGraw-Hill Education India, 2016.
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English,* (2nd Ed),Kindle, 2013

Web Resources:
Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

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I B.TECH	ENGINEERING PHYSICS LAB	L	T	P	C
II SEMESTER		0	0	2	1

Course Objectives:

➢ To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes: The students will be able to

CO1:Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate the wavelengths of different colours using diffraction grating.
CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO4: Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
CO5: Calculate the band gap of a given semiconductor.
CO6: Identify the type of semiconductor using Hall effect.

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photo electric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.

13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

References

➢ A Textbook of Practical Physics-S. Balasubramanian, M. N. Srinivasan, S. Chand Publishers, 2017.

Web Resources:

➢ www.vlab.co.in

➢ https://phet.colorado.edu/en/simulations/filter?subjects=physics&type =html,prototype

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I B.TECH	ENGINEERING WORKSHOP	L	T	P	C
II SEMESTER		0	0	3	1.5

Course objectives:

➢ To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes: Upon successful completion of the course, the student will be able to

CO1: Identify workshop tools and their operational capabilities (KL1)

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding (KL2)

CO3: Apply fitting operations in various applications (KL3)

CO4: Apply basic electrical engineering knowledge for House Wiring Practice (KL3)

List of Experiments:(Student has to complete Two experiments in each Trade)

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in woodworking and make following joints.
   a) Half – Lap joint
   b) Mortise and Tenon joint
   c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray
   b) Conical funnel
   c) Elbow pipe
   d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit
   b) Dovetail fit.
   c) Semi-circular fit
   d) Bicycle tire puncture and change of two-wheeler tyre

5. **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series
   b) Two-way switch
   c) Godown lighting
   d) Tube light
   e) Three phase motor
   f) Soldering of wires

6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.

7. **Welding Shop:** Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.

8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.

2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition

2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.

3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22

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I B.TECH	**ELECTRICAL CIRCUITS LAB**	**L**	**T**	**P**	**C**
II SEMESTER		**0**	**0**	**3**	**1.5**

Preamble: Electrical Circuits Lab provides the essential facilities to the students to augment their concepts basic electrical concepts. The lab is equipped withcircuit elements,RPS, bread board, CRO. The lab covers the determination of circuit parameters like resistance and inductance, performance characteristics, verification of network theorems,

Course Objectives: The student should be able to
- Understand the concepts of network theorems, node and mesh networks, series and parallel resonance and Locus diagrams.
- Apply various theorems to compare practical results obtained with theoretical calculations.
- Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil.
- Analyze different circuit characteristics with the help of fundamental laws and various configurations.
- Create locus diagrams of RL, RC series circuits and examine series and parallel resonance.

Course Outcomes: Upon successful completion of the course, the student will be able to

CO1: Analyze the concepts of network theorems, node and mesh networks, series and parallel resonance and Locus diagrams. (**Understand, Analyze**)

CO2: Apply various theorems to compare practical results obtained with theoretical calculations. (**Remember and Understand**)

CO3: Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil (**Evaluate**)

CO4: Analyze different circuit characteristics with the help of fundamental laws and various configurations. (**Apply and Analyze**)

CO5: Create locus diagrams of RL, RC series circuits and examine series and parallel resonance. (**Understand, Apply and Analyze**).

LIST OF EXPERIMENTS
Any Ten of the following experiments are to be conducted:
1. Verification of series and parallel DC networks response
2. Verification of node and mesh analysis.
3. Verification of network reduction techniques.

4. Determination of cold and hot resistance of an electric lamp
5. Determination of Parameters of a choke coil.
6. Determination of self, mutual inductances, and coefficient of coupling
7. Verification of Series and parallel resonance.
8. Locus diagrams of R-L (L Variable) and R-C (C Variable) series circuits
9. Verification of Thevenin's and Norton's Theorems
10. Verification of Maximum power transfer theorem
11. Verification of Compensation theorem
12. Verification of Reciprocity and Millman's Theorems
13. Verification of Thevenin's and Norton's Theorems for AC circuits.

List of Additional Experiments:
1. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
2. Simulation and experimental verification of electrical circuit problems using Current division and voltage division.
3. Verification of Kirchhoff's circuit laws.
4. Verification of Maximum power transfer theoremfor AC circuits

Learning Resources

Text books:
1. Fundamentals of Electric Circuits by CHARLES K.ALEXANDER, Matthew N.O.SADIKU
2. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.

Reference books:
1. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition
2. Circuits& Networks Analysis & Synthesis by A. Sudhakar and Shyammohan S Palli,Tata McGraw- Hill.
3. Network Analysis by N.C.Jagan, C.Lakshmi Narayana BS publications 2nd edition

e- Resources & other digital material
1. https://onlinecourses.nptel.ac.in/noc22_ee93/preview
2. https://archive.nptel.ac.in/courses/117/106/117106108/

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I B.TECH	HEALTH AND WELLNESS, YOGA AND SPORTS	L	T	P	C
II SEMESTER		0	0	1	0.5

Course Objectives

➢ The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes: After completion of the course the student will be able to

CO1: Understand the importance of yoga and sports for Physical fitness and sound health.

CO2: Demonstrate an understanding of health-related fitness components.

CO3: Compare and contrast various activities that help enhance their health.

CO4: Assess current personal fitness levels.

CO5: Develop Positive Personality

UNIT I
Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI) of all age groups.

   Activities:
   i)   Organizing health awareness programmes in community
   ii) Preparation of health profile
   iii) Preparation of chart for balance diet for all age groups

UNIT II
Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas-Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

   Activities:
   Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III
Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:
  i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
    Practicing general and specific warm up, aerobics
  ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:
1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T. K. V. Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J. Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc. 2014

General Guidelines:
1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

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I B.TECH	LIFE SKILLS-II	L	T	P	C
II SEMESTER		2	0	0	0

Course Outcomes: After completion of the course the student will be able to:

CO 1: Enhance application skills in Business Mathematics.
CO 2: Implementation of Mathematical skills in Business.
CO 3: To improve logical visualization and counting in series, analogies and classification (non-verbal reasoning).
CO 4: Implementation of arrangement in circular and row form in daily life.
CO 5: Appreciate the importance of job requisites and attaining them.
CO 6: Recognize the importance of goal setting and building of a ethical, and personal value system.

Part-A: Quantitative Ability
Unit-1: Module 1: PERCENTAGE - Formula of percentages, Finding percentages, percentage differences, changes in percentages, computing table of percentages, fraction to percentage and vice versa, Examples and practice problems.
Module 2: PROFIT and LOSS

Unit-2: - Module 3: DISCOUNT
Module 4: PARTNERSHIP

Part-B: Reasoning Ability

Unit-3: Module 5: Counting Figures
        Module 6: Non-Verbal Reasoning

Unit-4: - Module 7: Finding Missing Terms
Module 8: Arrangements
Part-C: Verbal Ability

Unit-5: - Module 9: Understanding professional communication; Contextual Usage of selected vocabulary; Contextual understanding of vocabulary in a paragraph.
Module 10: Parts of speech; Subject-verb agreement; Tenses

Unit-6: - Module 11: Introduction to employability /life skills; Career guidance; Personal grooming and projecting a positive self-image.
Module 12: Goal setting & Planning; Ethics, values & Attitude

Reference Books

1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
3. Teach Yourself Quantitative Aptitude, by Arun Sharma
4. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar
5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta
6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
7. Reasoning Ability for Competitive Examination by Dr R S Agarwal
8. A Modern Approach to Logical Reasoning (2019-20 Session) by R.S. Aggarwal [S. Chand]
9. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGraw Hill]
10. Multidimensional Reasoning by Mishra and Kumar Dr. Lal [Upkar's]
11. A Modern Approach to Verbal & Non-Verbal Reasoning (2019-20 Session) by R.S. Aggarwal [S. Chand]
12. A New Approach to Reasoning Verbal & Non-Verbal by B.S. Sijwali and Indu Sijwali [Arihant]
13. Analytical Reasoning (2018-2019) Session by MK Panday
14. How to Crack Test of Reasoning by Jaikishan and Premkishan [Arihant]
15. Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
16. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
17. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
18. Visual Intelligence for Beginners by Matthew Alcot
19. Logical Reasoning & Data Interpretation by Nishit K. Sinha
20. McCarthy, Michael& Felicity O'Dell. English Vocabulary in Use beginner, Cambridge University Press, 2017.
21. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Upper-Intermediate, Cambridge University Press, 2017.
22. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Advanced, Cambridge University Press, 2017.
23. Sonmez, John. Soft Skills: The Software Developer's Life, Manning Publications, 2014.
24. Tulgan, Bruce. Bridging the Soft Skills Gap: How to Teach the Missing Basics to Today's Young Talent, Pan Macmillan India, 2016

II B.TECH	Name of the Course	L	T	P	C
I SEMESTER	**COMPLEX VARIABLES AND NUMERICAL METHODS**	3	0	0	3

Course Objectives:
To elucidate the different numerical methods to solve non linear algebraic equations.
To disseminate the use of different numerical techniques for carrying out numerical integration.
To familiarize the complex variables.
To equip the students to solve application problems in their disciplines.

Course Outcomes: At the end of the course students will be able to
1. Evaluate the approximate roots of polynomial and Transcendental equations by different algorithms. Apply Newton's forward and backward and Lagrange's formulae for equal and unequal intervals (L3).
2. Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3).
3. Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic(L3).
4. Evaluate the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues. Make use of Cauchy Residue theorem to evaluate certain integrals (L3).
5. Explain properties of various types of conformal mappings (L5).

UNIT – I
Iterative Methods

Introduction, Solutions of algebraic and transcendental equations: Bisection method, Secant method, Method of false position, General Iteration method, Newton-Raphson method (Simultaneous Equations).
Interpolation: Newton's forward and backward formulae for interpolation, interpolation with unequal intervals, Lagrange's interpolation formula.

UNIT – II
Numerical integration, Solution of ordinary differential equations:
Trapezoidal rule, Simpson's 1/3rd and 3/8th rules, Solution of initial value problems by Taylor's series, Picard's method of successive approximations, Euler's method, Runge-Kutta method (second and fourth order), Milne's predictor and corrector method.

UNIT – III
Functions of a complex variable and Complex integration:
Introduction: Continuity, Differentiability, Analyticity, Cauchy-Riemann equations in Cartesian and polar coordinates, Harmonic and conjugate harmonic functions, Milne –Thompson method.
Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula Generalized integral formula (all without proofs) and problems on above theorems.

UNIT – IV
Series expansions and Residue Theorem:
Radius of convergence, Expansion of function in Taylor's series, Maclaurin's series and Laurent series.
Types of Singularities: Isolated, Essential, Pole of order m, Residues, Residue theorem (without proof), Evaluation of real integral of the types

$$\int_{-\infty}^{\infty} f(x)dx \text{ and } \int_{C}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta.$$

UNIT – V
Conformal mapping:
Introduction, Transformation by e^z, lnz, z^2, z^n (n positive integer), $\sin z, \cos z, z + \frac{a}{z}$

Translation, rotation, inversion and bilinear transformation, fixed point, cross ratio, properties, invariance of circles and cross ratio determination of bilinear transformation mapping 3 given points.

Text Books:
1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. Micheael Greenberg, Advanced Engineering Mathematics, 2nd edition, Pearson publishers.

Reference Books:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, Wiley India.
2. B. V. Ramana,Higher Engineering Mathematics, 45th Edition, Tata Mc. Graw Hill Education.
3. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
4. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
5. J. W. Brown and R. V. Churchill Complex Variables and Applications, 9th edition, Mc-Graw Hill, 2013.

II B.TECH	Name of the Course	L	T	P	C
I SEMESTER	**Universal Human Values –Understanding Harmony and Ethical Human Conduct**	**2**	**1**	**0**	**3**

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Course Outcomes:

CO1: Students are expected to become more aware of themselves, and their surroundings (family, society, nature)

CO2:They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3: They would have better critical ability.

CO4: They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO5: It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

UNIT - I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Purpose and motivation for the course, recapitulation from Universal Human Values-I.

Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.

Continuous Happiness and Prosperity- A look at basic Human Aspirations.

Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.

Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT - II

Understanding Harmony in the Human Being - Harmony in Myself!
Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body'-happiness and physical facility Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I'.

Understanding the harmony of 'I' with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT - III

Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.

Understanding the meaning of Trust; Difference between intention and competence.

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.

Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.

Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT - IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexisten

Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self- regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence.
Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT - V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values Definitiveness of Ethical Human Conduct.
Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.
Competence in professional ethics: (a) Ability to utilize the professional competence for augmenting universal human order (b) Ability to identify the scope and characteristics of people friendly and eco- friendly production systems, (c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b. At the level of society: as mutually enriching institutions and organizations Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Textbooks:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004. The Story of Stuff (Book).
3. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
4. E. FSchumacher. "Small is Beautiful" Slow is Beautiful –Cecile Andrews
5. J C Kumarappa "Economy of Permanence" Pandit Sunderlal "Bharat Mein Angreji Raj" Dharampal, "Rediscovering India"
6. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule" India Wins Freedom - Maulana Abdul Kalam Azad Vivekananda - Romain Rolland(English)
7. Gandhi - Romain Rolland (English).

II B.TECH	Name of the Course	L	T	P	C
I SEMESTER	**ELECTROMAGNETIC FIELD THEORY**	**3**	**0**	**0**	**3**

Pre-requisite: Concepts of Differential Equations, Vector Calculus and Electrical Circuit Analysis.

Course Objectives:
- To study the production of electric field and potentials due to different configurations of static charges.
- To study the properties of conductors and dielectrics, calculate the capacitance of different configurations. Understand the concept of conduction and convection current densities.
- To study the magnetic fields produced by currents in different configurations, application of Ampere's law and the Maxwell's second and third equations.
- To study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
- To develop the concept of self and mutual inductances and the energy stored.
- To study time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced EMF.

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

CO1: Compute electric fields and potentials using Gauss law/ solve Laplace's Poisson's equations for various electric charge distributions.

CO2: Analyse the behaviour of conductors in electric fields, electric diploe and the capacitance and energy stored in dielectrics.

CO3: Calculate the magnetic field intensity due to current carrying conductor and understanding the application of Ampere's law, Maxwell's second and third law.

CO4: Estimate self and mutual inductances and the energy stored in the magnetic field.

CO5:Understand the concepts of Faraday's laws, Displacement current, Poynting theorem and Poynting vector.

UNIT-I
Vector Analysis:
Vector Algebra: Scalars and Vectors, Unit vector, Vector addition and

subtraction, Position and distance vectors, Vector multiplication, Components of a vector.

Coordinate Systems: Rectangular, Cylindrical and Spherical coordinate systems.
Vector Calculus: Differential length, Area and Volume. Del operator, Gradient of a scalar, Divergence of a vector and Divergence theorem (definition only). Curl of a vector and Stoke's theorem (definition only), Laplacian of a scalar

Electrostatics:
Coulomb's law and Electric field intensity (EFI) – EFI due to Continuous charge distributions (line and surface charge), Electric flux density, Gauss's law (Maxwell's first equation, $\nabla . \vec{D} = \rho_v$), Applications of Gauss's law, Electric Potential, Work done in moving a point charge in an electrostatic field (second Maxwell's equation for static electric fields, $\nabla \times \vec{E} = 0$),   Potential gradient, Laplace's and Poison's equations.

UNIT-II:

 Conductors – Dielectrics and Capacitance:
Behaviour of conductor in Electric field, Electric dipole and dipole moment – Potential and EFI due to an electric dipole, Torque on an Electric dipole placed in an electric field, Current density-conduction and convection current densities, Ohm's law in point form, Behaviour of conductors in an electric field, Polarization, dielectric constant and strength, Continuity equation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space, Capacitance of parallel plate, coaxial and spherical capacitors, Energy stored and density in a static electric field.

UNIT-III
Magneto statics, Ampere's Law and Force in magnetic fields:
Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Magnetic flux density and Maxwell's second Equation ($\nabla . \vec{B} = 0$), Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation ($\nabla \times \vec{H} = \vec{J}$).
Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors, Magnetic dipole, Magnetic torque, and moment.

UNIT-IV
Self and mutual inductance:
Self and mutual inductance – determination of self-inductance of a solenoid, toroid, coaxial cable and mutual inductance between a straight long wire and a square loop wire in the same plane – Energy stored and energy density in a magnetic field.

UNIT-V
Time Varying Fields:
Faraday's laws of electromagnetic induction, Maxwell's fourth equation $\left(\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}\right)$, integral and point forms of Maxwell's equations, statically and dynamically induced EMF, Displacement current, Modification of Maxwell's equations for time varying fields, Poynting theorem and Poynting vector.

Textbooks:
1. "Elements of Electromagnetics" by Matthew N O Sadiku, Oxford Publications, 7th edition, 2018.
2. "Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill, 7th Editon.2006.

Reference Books:
1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt. Ltd, 2nd edition.
2. "Electromagnetic Field Theory" by Yaduvir Singh, Pearson India, 1st edition, 2011.
3. "Fundamentals of Engineering Electromagnetics" by Sunil Bhooshan, Oxford University
   Press, 2012.
4. Schaum's Outline of Electromagneticsby Joseph A. Edminister, MahamoodNavi,4th Edition,2014.

Online Learning Resources:
1. https://archive.nptel.ac.in/courses/108/106/108106073/
2. https://nptel.ac.in/courses/117103065

II B.TECH	Name of the Course	L	T	P	C
I SEMESTER	**ELECTRICAL CIRCUIT ANALYSIS-II**	**3**	**0**	**0**	**3**

Pre-requisite: Analysis of DC and Single phase AC Circuits, Concepts of differentiation and integration.

Course objectives: The main objectives are

- To understand three phase circuits
- To analyse transients in electrical systems
- To evaluate network parameters of given electrical network
- To apply Fourier analysis to electrical systems
- To understand the concepts of network synthesis.

Course Outcomes

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

CO1 Analyse the balanced and unbalanced 3 phase circuits for power calculations. {**Apply level, KL2**}

CO2 Analyse the transient behaviour of electrical networks in different domains {**Evaluate level, KL3**}

CO3 Estimate various Network parameters. {**Analyze level, KL3**}

CO4 Apply the concept of Fourier series to electrical systems. {**Understand level, KL3**}

CO5 Synthesis procedure for drawing equivalent electrical network for a given transfer functions. {**Analyze level, KL3**}

UNIT-I

Analysis of three phase balanced circuits:

Phase sequence, star and delta connection of sources and loads, relation between line and phase quantities, analysis of balanced three phase circuits, measurement of active and reactive power.

Analysis of three phase unbalanced circuits

Star-Delta connection of sources and loads, Loop method, two-wattmeter method for measurement of three phase power.

UNIT-II

Transient Analysis

Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and onlysinusoidal excitations– Initial conditions -

Solution using differential equation approach and Laplace transform approach.

UNIT-III

Network Parameters

Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Cascaded configurations-problems.

UNIT-IV

Analysis of Electric Circuits with Periodic Excitation

Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems – Effective value and average value of non-sinusoidal periodic waveforms, power factor, effect of harmonics

UNIT-V

Network synthesis

Positive real function - basic synthesis procedure - LC immittance functions - RC impedance functions and RL admittance function - RL impedance function and RC admittance function - Foster and Cauer methods.

Text books:
1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, 8th Edition McGraw-Hill, 2013
2. Fundamentals of Electric Circuits, Charles K. Alexander, Mathew N. O. Sadiku, 3rd Edition, Tata McGraw-Hill, 2019

Reference books:
1. Network Analysis, M. E. Van Valkenburg, 3rd Edition, PHI, 2019.
2. Network Theory, N. C. Jagan and C. Lakshminarayana, 1st Edition, B. S. Publications, 2012.
3. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyam Mohan S. Palli, 5th Edition, Tata McGraw-Hill, 2017.
4. Engineering Network Analysis and Filter Design (Including Synthesis of One Port Networks)- Durgesh C. KulshreshthaGopal G. Bhise, Prem R. Chadha ,Umesh Publications 2012.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, DhanpatRai& Co., 2018, 7th Revised Edition.

e- Resources & other digital material
1. https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-ee01/
2. https://www.coursera.org/learn/power-electronics
3. https://www.classcentral.com/course/powerelectronics-716

II B.TECH	Name of the Course	L	T	P	C
I SEMESTER	**DC MACHINES & TRANSFORMERS**	3	0	0	3

Pre-requisite: Principles of Electromechanical Energy Conversion, Electromagnetic fields and Electrical Circuit Analysis.

Course Objectives:

Students will get exposure to
- Understand the characteristics and applications of DC Machines.
- Develop problem solving skills about the starting, speed control and testing of DC Machines.
- Understand the concepts of efficiency and regulation of a transformer by obtaining equivalent circuit.
- Analyze the performance of single-phase transformers and to understand the connection diagrams of three-phase transformers.

Course Outcomes

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

CO1 Understand the characteristics and applications of DC Machines.(**Understand**)

CO2 Develop problem solving skills about the starting, speed control and testing of DC Machines.(**Apply**)

CO3 Understand the concepts of efficiency and regulation of a transformer by obtaining equivalent circuit.(**Understand**)

CO4 Analyze the performance of single-phase transformers.(**Analyze**)

CO5 Understand the connection diagrams of three-phase transformers.(**Understand**)

UNIT – I

DC Generators   (12Hours)

Construction and principle of operation of DC machines – EMF equation for generator –Excitation techniques – characteristics of DC generators – applications of DC Generators, Back-emf and torque equations of DC motor – Armature reaction and commutation.

UNIT – II

Starting, Speed Control and Testing of DC Machines(14Hours)

Characteristics of DC motors – losses and efficiency – applications of DC motors. Necessity of a starter – starting by 3-point and 4-point starters – speed control by armature voltage and field current control – testing of DC machines – brake test, Swinburne's test –Hopkinson's test–Field Test.

UNIT – III

Single-phase Transformers(12Hours)

Introduction to single-phase Transformers (Construction and principle of operation)–emf equation – operation on no-load and on load –lagging, leading and unity power factors loads –phasor diagrams– equivalent circuit – regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency.

UNIT –IV

Testing of Transformers (12Hours)

Open Circuit and Short Circuit tests – Sumpner's test – separation of losses— Parallel operation with equal and unequal voltage ratios– auto transformer – equivalent circuit – comparison with two winding transformers.

UNIT – V

Three-Phase Transformers: (12Hours)

Polyphase connections- Y/Y, Y/Δ, Δ/Y, Δ/Δ, open Δ and Vector groups – third harmonics in phase voltages– Parallel operation–three winding transformers-transients in switching –off load and on load tap changers–Scott connection.

Text books:

1.Electrical Machinery by Dr. P S Bimbhra, 7th edition, Khanna Publishers, New Delhi,1995.

2.Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference books

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill, 2019, Fourth Edition

2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020

3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017

4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

5. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.

6. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.

7. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

   e- Resources & other digital material
      1. nptel.ac.in/courses/108/105/108105112
      2. nptel.ac.in/courses/108/105/108105155

II B.TECH	Name of the Course	L	T	P	C
I SEMESTER	**Fundamentals of Internet of Things Lab**	0	0	3	1.5

PRE-REQUISITES: 1) Basic programming knowledge

Preamble: The Internet of Things (IoT) is a course about the new paradigm of objects interacting with people, with information systems, and with other objects. The course will focus on creative thinking and on hands-on project development.

Course objectives: The main objectives are
1. Describe what IoT is and how it works today as well as recognise the factors that contributed to the emergence of IoT.
2. To give a fundamental knowledge on the basic phenomena on which operation of sensor transformation of energy is based.
3. Design an IoT platforms design methodology.
4. To train the students to build IoT systems using Raspberry pi for IoT platforms.
5. To train the students to build IoT systems using Arduino for IoT platforms.

Course Outcomes

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

CO1 Explain the emergence and challenges in IoT. {**Explain level, KL2**}

CO2 Understand the importance of sensors and actuators. {**understand level, KL3**}

CO3 Understand the design methodologies and application areas of IoT. { **Evaluate level, KL4**}

CO4 Design and develop programs in Raspberry Pi for sensor applications. {**Analyze level, KL4**}

CO5 Interface and deploy sensors with Arduino { **Evaluate level, KL5**}

UNIT-I

Introduction to IoT

Definition and characteristics of IoT, Physical Design and Logical Design of IoT, IoT Architecture and Protocols. IoT Enabling Technologies, IoT levels. (Basic concepts only). Difference between IoTand M2M.

UNIT-II

Sensors and actuators:

Definition of sensor, Classifications of sensors and actuators, Principle of

sensors, Selection of sensors, Generation of sensors.

UNIT-III

IoT Platforms Design Methodology

Introduction, Step by step procedure of IoT Design Methodology, Challenges in IoT Design, IoT System Management.

UNIT-IV

Interfacing with Arduino

Introduction, Types of Arduinos, Arduino IDE, Basic Commands for Arduino, Interfacing Arduino with LED, Interfacing Arduino with LCD. Controlling Arduino with python.

UNIT-V

Interfacing with Raspberry Pi

Basic building blocks of an IoT device, Introduction to Raspberry Pi, hardware & software requirements for Raspberry Pi, Raspberry interfaces, Programming Raspberry Pi with python-Controlling LED with Raspberry Pi - Interfacing an LED and switch with Raspberry Pi-Interfacing a Light Sensor (LDR) with Raspberry Pi- Interfacing of a DC motor with Raspberry Pi.

List of Experiments:

1. Raspberry Pi Motion Sensor Alarm using PIR Sensor
2. Raspberry Pi based Smart Phone Controlled Home Automation
3. Interfacing DHT11 (Temperature and Humidity) Sensor with Raspberry Pi
4. Interfacing ultrasonic Sensor with Raspberry Pi
5. Interfacing camera Sensor with Raspberry Pi
6. DC Motor Control with Raspberry Pi
7. Stepper Motor Control with Raspberry Pi
8. Interfacing DS18B20 (Temperature Sensor) with Raspberry Pi and Arduino.
9. Interfacing Flame Sensor with Raspberry Pi and Arduino.

Interfacing LED with Raspberry Pi and Arduino.

Text books:

1."Internet of Things A Hands-On- Approach", VijayMadisetti, Arshdeep Bahga1st edition, University press, 2014.

2."Internet of things with Raspberry Pi and arduino" Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, and Mahendra Swain, 1st edition, CRC Press, 2020.

Reference books:

1. "Internet of Things A to Z: Technologies and Applications" Qusay F. Hassan,1st edition, Wiley Publishers, 2018.

2. "Introduction to IoT" Sudip Misra, Anandarup Mukherjee, Arijit Roy,
 1st edition, Cambridge University Press, 2021.

e- Resources & other digital material

1.https://nptel.ac.in/courses/106/105/106105166/

2.https://nptel.ac.in/courses/108/108/108108098/

3.https://www.classcentral.com/course/iot-4338

4. https://www.coursera.org/learn/interface-with-arduino?specialization=iot

II B.TECH	Name of the Lab Course	L	T	P	C
I SEMESTER	**DC MACHINES & TRANSFORMERSLAB**	0	0	3	1.5

Course Objectives:

The objectives of this course is
- To conduct the experiment and plot the characteristics and applications of DC machines.
- To perform the starting, speed control and testing methods of DC Machines.
- To determine/Predetermine efficiency and regulation of the transformer through equivalent circuit.

Course Outcomes

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

CO1 Demonstrate starting and speed control methods of DC Machines (KL 4)

CO2 Apply theoretical concepts in analysing the performance characteristics of DC Machines.(KL 3)

CO3 Determine the performance characteristics of DC machines using different testing methods..(KL 3)

CO4 Determine the performance parameters of single-phase transformer..(KL 3)

List of Experiments

Any 10 of the following experiments are to be conducted:
1. Speed control of DC shunt motor by Field Current and Armature Voltage Control.
2. Brake test on DC shunt motor- Determination of performance curves.
3. Swinburne's test - Predetermination of efficiencies as DC Generator and Motor.
4. Hopkinson's teston DC shunt Machines.
5. Load test on DC compound generator-Determination of characteristics.
6. Load test on DC shunt generator-Determination of characteristics.
7. Fields test on DC series machines-Determination of efficiency.
8. Brake test on DC compound motor-Determination of performance curves.
9. OC & SC tests on single phase transformer.
10. Sumpner's test on single phase transformer.
11. Scott connection of transformers.

12.   Parallel operation of Single-phase Transformers.
13.   Separation of core losses of a single-phase transformer.

Text books:

1.Electrical Machinery by Dr. P S Bimbhra, 7th edition, Khanna Publishers, New Delhi,1995.

2.Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference books

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill, 2019, Fourth Edition

2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020

3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017

4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

5. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.

6. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.

7. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

e- Resources & other digital material

1.nptel.ac.in/courses/108/105/108105112
2.nptel.ac.in/courses/108/105/108105155

Online Learning Resources:

https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html.

II B.TECH	Name of the Course	L	T	P	C
I SEMESTER	Data Structures **(Skill Enhancement course)**	1	0	2	2

Prerequisites: Programming in C.

Course Objectives:
- To make students learn the basic concepts of Data Structures and Algorithms.
- To solve problems using data structures such as linear lists, stacks, queues.
- To explore advanced data structures such as balanced search trees.
- To be familiar with Graphs and their applications.
- To analyze various sorting techniques.

Course Outcomes

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

CO1   **Implement** various operations on linear lists. (L2)

CO2   **Apply** data structure strategies like stacks and queues for exploring complex data structures. (L3)

CO3   **Identify** performance and trade-offs of static and dynamic data structures. (L3)

CO4   **Incorporate** data structures into the applications such as binary trees, binary search trees. (L3)

CO5   **Identify** appropriate data structure algorithms for graphs. (L3)

UNIT-I Linear Lists (12 hrs)
Introduction to Data Structures, Definition, Need & Types of Data Structures.
Algorithms: Introduction, Time complexity and Space complexity.
Linear lists (Arrays) – Introduction, linear and Binary Search.
Sorting - Insertion Sort and Quick Sort.
UNIT-II Stack & Queue (10 hrs)
Stacks: Introduction, Operations, implementation, Applications.
Queues: Introduction, Operations, implementation, Circular Queue.
UNIT-III Linked Lists (10 hrs)
Single Linked List: Introduction, Representation, Operations, Applications.
Circular Lists: Introduction, Representation, Operations.

Double linked lists – Representation, operations.

UNIT-IV TREES (8 hrs)

Trees: Introduction, Terminology, Representation of Trees.

Binary Trees: Properties, Representations, Traversals, Types of Trees.

Binary Search Trees: Definition, Operations.

UNIT-V GRAPHS (12 hrs)

Graphs: Introduction, Definition, Representation, Graph Traversals – Depth First Search, Breadth First Search.

List of Experiments:
1. Write a C program to find **min & max element** in an array.
2. Write a C program to find an element in given list using **Binary search**.
3. Write a C program to implement **Insertion sort** techniques.
4. Write a C program to implement **Quick sort** techniques.
5. Write a C program to implement **Stack** using arrays.
6. Write a C program to Evaluation of **postfix expression**.
7. Write a C program to implement **Queue** using arrays.
8. Write a C program to implement **Circular Queue** using arrays.
9. Write a C program to implement **Singly Linked List**.
10. Write a C program to implement **Binary Search trees**.
11. Write a C program to implement **Binary tree traversal** techniques.
12. Write a C program to implement **graphs** (BFS and DFS).

Learning Resources

Text Books:

1. Data structures, Algorithms and Applications in C, S. Sahni, University Press (India) Pvt. Ltd, 2nd edition, Universities Press, Pvt. Ltd.

2. Data structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd, Second Edition.

3. Data Structures, Schaum's Outline, Seymour Lipschutz, Kindle Edition

Reference Books

1. Introduction to Algorithms, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, MIT Press.

2. Classical Data Structures, Second Edition, Debasis Samanta, PHI

e- Resources & other digital material

Data Structures Visualizations :

https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

Code Archery Youtube Channel:

https://www.youtube.com/playlist?list=PLrKBFf87Cy9CNZpzi3poq8BFWc0h4f0vL

II B.TECH	Name of the Course	L	T	P	C
I SEMESTER	**ENVIRONMENTAL SCIENCE** **(Common to All branches of Engineering)**	2	0	0	-

Course Objectives
- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

Course Outcomes

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

CO1	Grasp multi disciplinary nature of environmental studies and various renewable and non-renewable resources.
CO2	Understand flow and bio-geo-chemical cycles and ecological pyramids.
CO3	Understand various causes of pollution and solid waste management and related Preventive measures.
CO4	About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
CO5	Casus of population explosion, value education and welfare programmes.

UNIT-I Multidisciplinary Nature Of Environmental Studies
Definition, Scope and Importance - Need for Public Awareness.
Natural Resources: Renewable and non-renewable resources - Natural resources and associated problems - Forest resources - Use and over - exploitation, deforestation, case studies - Timber extraction - Mining, dams and other effects on forest and tribal people - Water resources - Use and over utilization of surface and ground water - Floods, drought, conflicts over water, dams - benefits and problems .Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources.

UNIT-II Ecosystems, Biodiversity, and its Conservation
Ecosystems:
Concept of an ecosystem - Structure and function of an ecosystem - Producers,

consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation: Introduction 0 Definition: genetic, species and ecosystem diversity - Bio-geographical classification of India - Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels - India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III

Environmental Pollution and Solid Waste Management

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT-IV

Social Issues and the Environment

Social Issues and the Environment: From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns. Case studies - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies - Wasteland reclamation - Consumerism and waste products - Environment Protection Act -

Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public awareness.

UNIT-V

Human Population and the Environment

Human Population And The Environment: Population growth, variation among nations. Population explosion - Family Welfare Programmes- Environment and human health - Human Rights - Value Education - HIV/AIDS - Women and Child Welfare - Role of information Technology in Environment and human health - Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain - Visit to a local polluted site- Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds - river, hill slopes, etc.

Text books:
1. Text book of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

Reference books
1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M. Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

e- Resources & other digital material
1. https://nptel.ac.in/courses/103107084

II B.TECH	Name of the Course	L	T	P	C
I SEMESTER	**Life skills-III (Employability Skills –II)**	**2**	**0**	**0**	**0**

Verbal:

Today's world of globalization and technological advancements emphasizes the importance of quality interpersonal communication. Cross-cultural and non-verbal communication skills are becoming perhaps more important than ever before in this time of an increasingly diverse workforce and extensive travel for business. The course imparts vital language competencies that transform students into better professionals. The course also deals with considerations of intercultural ethics, and strategies for resolving conflicts within professional contexts.

Prerequisite: Learnability Quotient (LQ)

Course Outcomes: After completion of the course the student will be able to:

CO 1 Understand practical dimensions of intercultural and non-verbal communication

CO 2 Employ functional English in professional context effectively

CO 3 Frame impactful sentences thereby enhancing potential language proficiency

CO 4 Develop competencies that are essential to address sustainable development challenges

Module 1.
 ✓ Body Language
 ✓ Cross-cultural Communication
 ✓ Networking Skills

Module 2.
 ✓ Reading Comprehension
 ✓ Listening Comprehension
 ✓ Drawing Inferences

Module 3.
 ✓ Spellings
 ✓ Synonyms and Antonyms

✓ One-word Substitutes

Module 4.

✓ Idioms
✓ Phrasal Verbs
✓ Analogies

Reference Books:

1. Pease, Allan. Body *Language: How to Read Others' Thoughts by Their Gestures.* UK: Sheldon Press, 1997.
2. Holliday, A., Hyde, M. & Kullman, J. *Intercultural Communication: An Advanced Resource Book.* London: Routledge, 2004.
3. Thorpe, Edgar & Showick. *Objective English for General Competitive Examinations.* Pearson Education, 2016.
4. Condon, J. & Yousef, F. *An Introduction to Intercultural Communication.* New York: Macmillan Publishing Company, 1975.
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success. Pearson Education; 2013.
6. Remesh S., Vishnu R.G., *Life Skills for Engineers,* Ridhima Publications, 2016.
7. Mishra, P K & J K Verma .*Managing Sustainable Development Concepts Issues and Challenges.* Associated Publishing Company, 2019.

Reasoning :

Reasoning ability is the ability to draw connections between factors, and the ability to synthesize a message from a body of information. Reasoning ability of the aspirants for jobs or courses is tested by means of a verbal reasoning test non-verbal reasoning. Thus, reasoning is a highly specialized thinking which helps an individual to explore mentally the cause & effect relationship of an event or solution of a problem by adopting some well-organized systematic steps based on previous experience combined with present observation. Most of the recruitment tests consists questions to assess the reasoning ability of the students.

Prerequisite: Learnability Quotient (LQ)

Course Outcomes: After completion of the course the student will be able to:

CO 1 Analysing data using Venn diagrams based on SET theory; Calculate

and determine the direction and distance among various objects.

CO 2 Analysis of measuring to time, be it huge or less, by means of Clocks and Calendars; Identifying the relationship among various individuals by various methods.

CO 3 Enhance the logical abilities to find out deductions of statements (logical) and connectives of statements through various methodologies.

CO 4 Improve the abilities to solve relationship of letters and numbers using arithmetical operations.

Syllabus (II year I Sem. B.Tech - Employability Skills – Reasoning Ability part)

Module 1
  ✓ Logical Venn Diagrams
Module 2
  ✓ Directions
Module 3
  ✓ Blood Relations
Module 4
  ✓ Clocks & Calendars

Syllabus (II year II Sem. B.Tech - Employability skills – Reasoning Ability part)

Module 5
  ✓ Syllogisms
Module 6
  ✓ Logical Connectives
Module 7
  ✓ Cubes and Dice
Module 8
  ✓ Crypto Arithmetic

Reference Books
1. Reasoning Ability for Competitive Examination by Dr R S Agarwal
2. A Modern Approach to Logical Reasoning (2019-20 Session) by R.S. Aggarwal [S.Chand]
3. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGrawHill]
4. Multidimensional Reasoning by Mishra and Kumar Dr. Lal [Upkar's]
5. A Modern Approach to Verbal & Non-Verbal Reasoning (2019-20 Session) by R.S. Aggarwal [S.Chand]
6. A New Approach to Reasoning Verbal & Non-Verbal by B.S. Sijwali and

   Indu Sijwali [Arihant]
7.   Analytical Reasoning (2018-2019) Session by MK Panday
8.   How to Crack Test Of Reasoning by Jaikishan and Premkishan [Arihant]
9.   Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
10. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
11. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGrawHill]
12. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
13. Visual Intelligence for Beginners by Matthew Alcot
14. Analytical Reasoning by M K Pandey
15. Logical Reasoning & Data Interpretation by Nishit K. Sinha

Quants:

Almost all competitive examinations tests the candidate for quantitative aptitude, especially recruitment test, public service examinations management courses, where they evaluate the student's thinking prowess and analytical skills. Critical analysis of problems asked in examination reveal that they are designed to correlate multiple topics and the test taker is expected to identify those link points and come out with an out-of-box unique solution. The purpose of the test is to assess the arithmetic abilities, logical, analysis, problem solving and decision making skills.

   Prerequisite: Learnability Quotient (LQ)

   Course Outcomes: After completion of the course the student will be able to:

CO 1	Application of utilization of man power and estimated work done along with the wages paid.
CO 2	Calculating volumes of pipes and cisterns, consumption of liquid and their application in daily life.
CO 3	Calculating, applying and estimating time, speed and distance in boats, streams, races and games.
CO 4	Implementing mean, median and mode in day-to-day application.

Syllabus (II year I Sem. B.Tech - Employability Skills – Quantitative Ability part)

Module 1.
   ✓ Time and Work

Module 2.

    ✓ Pipes and Cisterns

Module 3.

    ✓ Time, Distance and Speed

Module 4

    ✓ Boats and Streams

Syllabus (II year II Sem. B.Tech - Employability skills – Quantitative Ability part)

Module 5

    ✓ Races and Games

Module 6

    ✓ Geometry and Mensuration

Module 7

    ✓ Sequences

Module 8

    ✓ Statistics

Reference Books
1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
3. Teach Yourself Quantitative Aptitude, by Arun Sharma
4. The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar
5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta
6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
7. How to Prepare for Data Interpretation by Arun Sharma
8. Logical Reasoning Data Interpretation by Nishit K. Sinha

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II- Year	Name of the Course	L	T	P	C
II- Semester	**Managerial Economics and Financial Analysis**	2	0	0	2

PREREQUISITE: Basic Sciences and Humanities

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting.

- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost

- To Know the Various types of market structure and pricing methods and strategy

- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.

- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes:

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

CO1	Define the concepts related to Managerial Economics, financial accounting and management.
CO2	Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets and apply these concepts for effective business decision.
CO3	Understand the Nature of Competition, Characteristics of Pricing in the different market structure and know the different forms of Business organization.
CO4	Analyze how to invest their capital and maximize returns and evaluate the capital budgeting techniques.
CO5	Develop the accounting statements and evaluate the financial performance of business entity.

UNIT – I: Introduction to Managerial Economics

Definition of Managerial Economics and Scope – Managerial Economics with other subjects -Demand Concept, types, Law of Demand-Demand Elasticity-Types - Measurement. Demand Forecasting- Factors governing Forecasting, Methods.

UNIT – II: Production and Cost Analysis

Introduction - Production Function – Cobb-Douglas Production Function Least- cost combination - short run and long run Production Function-Isoquants and Isocosts, MRTS - - Laws of Returns - Internal and External Economies of scale.

Cost & Break-Even Analysis - Cost concepts- opportunity costs - Fixed costs, Variable Costs and Total costs - Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT – III: Introduction of Markets, Pricing Policies and Business Organizations

Introduction -meaning, Types of Markets -Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition - Oligopoly- Pricing Methods and Strategies.

 Forms of Business Organizations-Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises.

UNIT – IV: Capital Budgeting

Introduction - Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting - Features, Proposals, Methods and Evaluation. Projects - Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), Internal Rate Return (IRR) Method (sample problems).

UNIT – V: Financial Accounting and Analysis

Introduction - meaning, significance -Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis -

Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Aryasri: Business Economics and Financial Analysis, 1/e, MGH, 2020.
2. Aryasri: Managerial Economics and Financial Analysis, 4/e, MGH, 2019.
3. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2014.

Reference Books:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2019.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Online Learning Resources:

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016
3. https://www.slideshare.net/darkyla/business-organizations-19917607
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-accounting

II- Year	Name of the Course	L	T	P	C
II- Semester	**ANALOG CIRCUITS**	**3**	**0**	**0**	**3**

Pre-requisite: Knowledge of electronic components and semiconductor devices, number systems, binary arithmetic, Boolean or switching algebra, and logic gates

Course objectives: The main objectives are
- To acquire the basic knowledge on clippers, clampers & biasing circuits.
- To determine the h-parameters of a transistor circuit & understand the concepts of feedback amplifiers.
- To know the operation of oscillators and operational amplifier.
- To understand the applications of operational amplifier.
- To acquire the knowledge on IC 555 timer and their applications and know the operation of Analog to Digital Converters and Digital to Analog Converters.

Unit – I:

Diode clipping and clamping circuits: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, clamping circuit operation.

DC biasing of BJTs Load lines, Operating Point, Bias Stability, Collector-to-Base Bias, Self-Bias, Stabilization against Variations in V_{BE} and β for the Self-Bias Circuit, Bias Compensation, Thermal Runaway, Thermal Stability.

Unit – II:

Small Signals Modelling of BJT: Analysis of a Transistor Amplifier Circuit using h-parameters, Simplified CE Hybrid Model, *Analysis of CE, CC, CB Configuration using Approximate Model, *Frequency Response of CE and CC amplifiers.(*elementary treatment only)

Feedback Amplifiers: Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Effect of Negative Feedback upon Output and Input Resistances, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

Unit – III: Oscillator Circuits: Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator, Crystal Oscillator.

Operational Amplifiers: Introduction, Basic information of Op-Amp, Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp, *OP-Amps Characteristics: Introduction, DC and AC characteristics (*elementary treatment only), 741 op-amp & its features.

Unit – IV:

OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator.

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

Unit – V:

Timers and Phase Locked Loop: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL block schematic, principles and description of individual blocks, 565 PLL, Applications of VCO (566).

Digital to Analog And Analog to Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

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Content Beyond the syllabus:--- Basics of biasing **FET** and **MOSFET;**
Active filter: Butterworth, Sallen key**.**

CO1   **Analyze** diode clipping and clamping circuits. Understand different types of biasing circuits of a transistor **{Analyze level, KL4}**

CO2   **Apply** the small signal modelling for transistor circuit analysis and **illustrate** the operation of feedback amplifiers. **{Apply level, KL3}**

CO3   **Understand** the operation of oscillators, operational amplifier.
        {Understand level, KL2}

CO4   **Illustrate** the applications of op-amps, comparators and waveform generators
        {Apply level, KL3}

CO5   **Understand** the use of 555 timers in multi-vibrators, Schmitt Trigger, PLL applications and to know the operation of different ADC's and DAC's
        {Understand level, KL2}

Text books:
1. Electronic Devices and Circuit Theory – Robert L.Boylestad and Louis Nashelsky, Pearson Edition, 2021
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (P) Ltd, 2nd Edition, 2003.
3. Electronic Devices and Circuits—J.B. Gupta , S K Kataria and sons publishers, 6th edition, 2013

Reference books:
1. Integrated Electronics- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2013
2. Electronic Devices and Circuits–G.K. Mithal, Khanna Publisher, 23rd Edition, 2017
3. Electronic Devices and Circuits – David Bell, Oxford, 5thEdition, 2008.
4. Electronic Principles–Malvino, Albert Paul, and David J. Bates, McGraw-Hill/Higher Education, 2007.
5. Operational Amplifiers and Linear Integrated Circuits– Gayakwad R.A, Prentice Hall India, 2002.

e- Resources & other digital material
1. https://onlinecourses.nptel.ac.in/noc24_ee106/preview
2. https://archive.nptel.ac.in/courses/108/102/108102097/
3. https://www.youtube.com/watch?v=qRIhUkNeq04&list=PLs5_Rtf2P2r5MplA OADz3fTWIyBZTkGbB
4. https://archive.nptel.ac.in/courses/108/108/108108114/
5. https://archive.nptel.ac.in/courses/108/108/108108111/

II- Year	Name of the Course	L	T	P	C
II- Semester	**Electrical Power Generation**	**3**	**0**	**0**	**3**

Pre-requisite: Analysis of DC and AC Circuits.

Course objectives: The main objectives are

- To study principle of operation of different components of a hydro and thermal power stations.
- To study principle of operation of different components of a nuclear power stations.
- To study constructional and operation of different components of an Air and Gas Insulated substations.
- To study different types of cables and distribution systems.
- To study different types of load curves and tariffs applicable to consumers.

Unit I:

Hydroelectric Power Stations:

Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

Thermal Power Stations:

Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

Unit II:

Nuclear Power Stations:

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

Unit III:

Substations:

Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment. Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.

Unit IV:

Underground Cables:

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables. Grading of cables: capacitance grading and intersheath grading.

Distribution Systems:

Classification of Distribution systems, A.C Distribution, Overhead versus Underground system, Connection schemes of Distribution system, Requirements of Distribution system, Design considerations in Distribution system.

UNIT V:

Economic Aspects & Tariff:

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants.

Tariff Methods– Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

Content Beyond the syllabus:
Types of Conductors, Bundled Conductors.

Course Outcomes

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

CO1 Understand the different types of power plants and their Principle of operation.
{Understand level, KL2}

CO2 Understand various Nuclear power plants and their Principle of operation.
{ Understand level, KL2}

CO3 Describe the different components of air and gas insulated substations.
{Analyze level, KL3}

CO4 Discuss the construction of single core and three core cables and describe distribution system configurations.
{Understand level, KL2}

CO5 Analyse different economic factors of power generation and tariffs.
{Analyze level, KL3}

Text books:
1. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2010
2. J.B.Gupta, Transmission and Distribution of Electrical Power, S.K.Kataria and sons,10th Edition, 2012

Reference Books:

1. I.J. Nagarath & D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.

2. C.L.Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.

3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th Edition, 2005.

4. Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill, 1985.

5. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007.

e- Resources & other digital material

1.https://nptel.ac.in/courses/108102047

2.https://nptel.ac.in/courses/108104191

II- Year	Name of the Course	L	T	P	C
II- Semester	**INDUCTION AND SYNCHRONOUS MACHINES**	3	0	0	3

Pre-requisite: Principles of Electromechanical Energy Conversion, Electromagnetic fields and Electrical Circuit Analysis.

Course Objectives:

Students will get exposure to

- characteristics, starting and testing methods of Induction Motor
- Torque production and performance of Induction Motor.
- In determining the performance parameters of Induction Motor.
- working of synchronous machines

UNIT-I 3-phase induction motors (12 Hours)
Construction of Squirrel cage and Slip ring induction motors– production of rotating magnetic field – principle of operation – rotor emf and rotor frequency – rotor current and power factor at standstill and during running conditions– rotor power input, rotor copper loss and mechanical power developed and their inter-relationship –equivalent circuit – phasor diagram.

UNIT-II Performance of 3-Phase induction motors (15 Hours)
Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics–No load, Brake test and Blocked rotor tests – circle diagram for predetermination of performance- methods of starting –starting current and torque calculations -speed control of induction motor with V/f control method, rotor resistance control and rotor emf injection technique – crawling and cogging – induction generator operation.

UNIT-III Single Phase Motors (10 Hours)
Single phase induction motors – constructional features – double revolving field theory, Cross field theory – equivalent circuit- starting methods: capacitor start capacitor run, capacitor start induction run, split phase & shaded pole, AC series motor.

UNIT-IV Synchronous Generator (15 Hours)
Constructional features of non-salient and salient pole type alternators-armature windings – distributed and concentrated windings – distribution& pitch factors – E.M.F equation –armature reaction – voltage regulation by synchronous impedance method – MMF method and Potier triangle method – two reaction analysis of salient pole machines -methods of synchronization-Slip test – Parallel operation of alternators.

UNIT-V Synchronous Motor (10 Hours)

Synchronous motor principle and theory of operation – Effect of excitation on current and power factor– synchronous condenser –expression for power developed –hunting and its suppression – methods of starting.

Course Outcomes

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

CO1 Understand the construction and operation of three-phase induction motor.(**Understand**)

CO2 Analyse the performance of three-phase induction motor. (**Analyze**)

CO3 Describe the working of single-phase induction motors. (**Describe**)

CO4 Analyze the performance of Synchronous generators and motors.(**Analyze**)

Text books:

1.Electrical Machinery by Dr. P S Bimbhra, 7th edition, Khanna Publishers, New Delhi,1995.

2.Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference books

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.
5. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
6. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall,
India, 2002.
7. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

   e- Resources & other digital material

1.nptel.ac.in/courses/108/105/108105112
2.nptel.ac.in/courses/108/105/108105155

II- Year	Name of the Course	L	T	P	C
II- Semester	**CONTROL SYSTEMS**	3	0	0	3

PREREQUISITE: Laplace Transforms, Differential equations, Matrix Algebra,Basic Circuit Analysis

COURSE OBJECTIVE:

- To learn the mathematical modelling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
- To analyze the time response of first and second order systems and improvement of performance using P, PI, PD and PID controllers
- To investigate the stability of closed loop systems using Routh's stability criterion and root locus method
- To learn Frequency Response approaches for the analysis of LTI systems using Bode plots, polar plots and Nyquist stability criterion.
- To learn state space approach for analysis of LTI systems and understand the concepts of controllability and observability

UNIT-1: Mathematical Modelling of Control Systems

Introduction to control systems, Classifications - Open Loop and closed loop, transfer function, Mathematical Modelling of electrical networks, Translational and Rotational systems, analogous systems, Transfer Function of DC & AC Servo motor- Synchros, Block diagram algebra–Signal flow graph-Mason's gain formula

UNIT-II: Time Response Analysis:

Standard test signals-Time response of first and second order systems- Time domain specifications – Steady state errors and error constants – Effects of Feedback-Dominant Closed loop poles- P-PD-PI-PID controllers

UNIT-III: Stability and Root locus Technique:

The concept of stability - Routh's stability criterion, Procedure and problems– limitations of Routh's stability–Root locus concept-construction of root loci –Effect of Adding open loop poles and Zeros on Root Locus

UNIT-IV: Frequency Response Analysis:

Introduction - Frequency domain specifications- Bode diagrams- transfer function from the Bode Diagram-Polar Plots, Nyquist Stability criterion

relative stability analysis-Phase margin and Gain margin- Lag, Lead and Lag- Lead compensator

UNIT-V: State Space Analysis:

Concepts of state, state variables, state equation and state model, state space modelling of control systems, Solution of the state equation-State Transition Matrix and its Properties-Transfer function from state models, Tests for controllability and observability.

COURSE OUTCOMES:
Upon successful completion of the course, the student will be able to

CO1 To derive the transfer function using block diagram algebra and signal flow graph {**Apply level, KL2**}

CO2 To Determine time response specifications of second order systems and Error constants. {**Evaluate level, KL3**}

CO3 To analyze stability using Routh's stability criterion and the root locus method {**Analyze level, KL3**}

CO4 To analyze the stability using Bode plot and Nyquist criterion {**Understand level, KL3**}

CO5 To obtain the state models and understanding the concepts of controllability and observability {**Analyze level, KL3**}

TEXTBOOKS:

1. "Control Systems Engineering" by I.J.Nagarath and M.Gopal, 5thEdition , New age International Publications.

2. "Automatic control systems" by Benjamin C.Kuo, 2ndEdition, Prentice Hall of India.

REFERENCEBOOKS:

1. "Control Systems principles and design" by M.Gopal,4thEdition , Tata McGraw Hill education PvtLtd.

2. "Modern Control Engineering" by Kotsuhiko Ogata, Prentice Hall of India.

3. "Control Systems" by Manik Dhanesh N, Cengage publications.

4. "Control Systems Engineering" by S.Palani, Tata Mc Graw Hill Publications.

ONLINE REFERENCES:
1. https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ee84/
2. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ee25/

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II- Year	Name of the Course	L	T	P	C
II- Semester	**Control Systems Lab**	0	0	3	1.5

Course Objectives:
- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C servo motors and Synchros.
- To understand time and frequency responses of control system with and without controllers and compensators.

Any 10 of the following experiments are to be conducted:
1. Time response of Second order system
2. Characteristics of Synchros
3. Effect of P, PD, PI, PID Controller on a second order systems
4. Study of Lag and lead compensation – Magnitude and phase plot
5. Effect of feedback on DC servomotor
6. Bode Plot, Root locus, Nyquist Plots for the transfer functions of systems up to 5th order using MATLAB
7. Potentiometer as error detector
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of DC servo motor
11. State model using MATLAB

Course Outcomes:
After the completion of the course the student should be:
CO1: Able to analyze the time response of a second order system.
CO2: Able to analyze the effect of P, PI,PD, PID controllers and Lag, Lead compensators.
CO3: Able to analyze the performance and working of magnetic amplifier and synchros.
CO4: Able to judge the stability in time and frequency domain.
CO5: Able to analyze the performance and working of DC servomotor.

II- Year	Name of the Lab Course	L	T	P	C
II-Semester	**Induction And Synchronous Machines Lab**	0	0	3	1.5

Course Objectives:

The objectives of this course is

- To apply the concepts of speed control methods in 3-phase Induction Motor.
- To experimentally develop circle diagram and obtain equivalent circuit to analyse the performance of 3-phase induction motor
- To apply the concepts of power factor improvement on single phase Induction Motor
- To perform various testing methods on alternators for experimentally predetermine the regulation

<div align="center">

List of Experiments

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Any 10 of the following experiments are to be conducted:

1. Brake test on three phase Induction Motor.

2. Circle diagram of three phase induction motor.

3. Speed control of three phase induction motor by V/f method.

4. Equivalent circuit of single-phase induction motor.

5. Power factor improvement of single-phase induction motor by using capacitors.

6. Load test on single phase induction motor.

7. Regulation of a three -phase alternator by synchronous impedance method.

8. Regulation of a three -phase alternator by MMF method.

9. Regulation of three-phase alternator by Potier triangle method.

10. V and Inverted V curves of a three-phase synchronous motor.

11. Determination of X_d, X_q& Regulation of a salient pole synchronous generator.

12. Determination of efficiency of three phase alternator by loading with three phase induction motor.

13. Parallel operation of three-phase alternator under no-load and load conditions.

14. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.

Course Outcomes

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

CO1 Demonstrate the speed control methods on 3-phase Induction Motor. (KL 4)

CO2 Evaluate the performance of 3-phase Induction Motor by obtaining the locus   diagram and equivalent circuit of 3-phase Induction Motor.(KL 5)

CO3 Adapt the power factor improvement methods for single phase Induction Motor (KL 3)

CO4 Determine the regulation of 3-phase alternator.(KL 3)

CO5 Determine the synchronous machine reactance of 3-phase alternator (KL 3)

II- Year	Name of the Course	L	T	P	C
II- Semester	Python Programming Lab **(Skill Enhancement course)**	0	1	2	2

Prerequisites: Basic Mathematics.

Course Objectives:
- To introduce the foundational concepts of Python programming.
- To develop an understanding of Python functions, strings, and lists, and their applications.
- To familiarize students with the use of dictionaries, tuples, and sets in Python.
- To provide hands-on experience in handling file operations and understanding object-oriented programming concepts.
- To equip students with the skills to use Python for data science tasks.

UNIT-I

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

UNIT-II

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

UNIT-III

Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

UNIT-IV

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

UNIT-V

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Course Outcomes

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

CO1	**Understand** the foundational concepts of Python programming. (L2)
CO2	**Apply** Python programming concepts such as functions, strings, and lists, along with their methods to solve basic programming problems. (L3)
CO3	**Apply** the concepts of dictionaries, tuples, and sets in Python.(L3)
CO4	**Incorporate** file operations, work with various file types, and implement object-oriented programming concepts. (L3)
CO5	**Analyze** Data using Numpy and Pandas libraries in Python for data science tasks. (L4)

Text Books:
1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.

2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024

Reference Books

1. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e- Resources & other digital material

1.https://onlinecourses.nptel.ac.in/noc21_cs32/preview

2.https://www.youtube.com/watch?v=qiR6ePI5u0w&list=PLDVrhnY7hFVoA0N5NhRA9lPur5dxXBujy

3.https://www.coursera.org/learn/python?specialization=python#syllabus

II- Year II- Semester	Name of the Course	L	T	P	C
	DESIGN THINKING & INNOVATION	1	0	2	2

Pre-requisite: Electrical Circuits, Basics of IOT and basic idea about renewable energy sources.

Course Objectives: The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems. The main objectives are

- To define the concepts related to design thinking and explain the fundamentals of Design Thinking and innovation
- To apply the design thinking techniques for solving problems in various sectors.
- To analyse to work in a multidisciplinary environment
- To evaluate the value of creativity
- To formulate specific problem statements of real time issues

UNIT - I

Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II

Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development.

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT – III

Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV

Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT – V

Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for start-up.

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Course Outcomes
Upon successful completion of the course, the student will be able to

CO1 Define the concepts related to design thinking and explain the fundamentals of Design Thinking and innovation
{**Remember & Apply level, KL2**}

CO2 Apply the design thinking techniques for solving problems in various sectors. {**Apply level, KL3**

CO3 Analyse to work in a multidisciplinary environment {**Analyze level, KL3**}

CO4 Evaluate the value of creativity {**Evaluate level, KL3**}

CO5 Formulate specific problem statements of real time issues.
{**Apply level, KL3**}

Text books:
1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons.

Reference books:
1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough.H

e- Resources & other digital material
1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview

II- Year	**Name of the Course**	**L**	**T**	**P**	**C**
II- Semester	**Life Skills-III**	**2**	**0**	**0**	**0**

The Life Skills course is divided into three components – Part-A. Quantitative Ability, Part-B. Reasoning Ability and Part-C. Verbal Ability.

Part-A: Quantitative Ability: Almost all competitive examinations test the candidate for quantitative aptitude, especially recruitment test, public service examinations management courses, where they evaluate the student's thinking prowess and analytical skills. Critical analysis of problems asked in examination reveal that they are designed to correlate multiple topics and the test taker is expected to identify those link points and come out with an out-of-box unique solution. The purpose of the test is to assess the arithmetic abilities, logical, analysis, problem solving and decision-making skills.

Part-B: Reasoning Ability: Reasoning ability is the ability to draw connections between factors, and the ability to synthesize a message from a body of information. Reasoning ability of the aspirants for jobs or courses is tested by means of a verbal reasoning test non-verbal reasoning. Thus, reasoning is a highly specialized thinking which helps an individual to explore mentally the cause & effect relationship of an event or solution of a problem by adopting some well-organized systematic steps based on previous experience combined with present observation. Most of the recruitment tests consist of questions to assess the reasoning ability of the students.

Part-C: Verbal Ability:

Prerequisite: Learnability Quotient (LQ)

Course Outcomes: After completion of the course the student will be able to:

CO 1	Calculating, applying and estimating time, speed and distance in boats, streams, races and games.
CO 2	Implementing mean, median and mode in day-to-day application.
CO 3	Enhance the logical abilities to find out deductions of statements (logical) an connectives of statements through various methodologies.
CO 4	Improve the abilities problem solving skills and to solve relationship of letters and numbers using arithmetical operations
CO 5	Able to frame impactful sentences thereby enhancing potential language proficiency
CO 6	Develop competencies that are essential to address sustainable development challenges

Part-A: Quantitative Ability
Unit-1: -
Module 1: Races and Games
Module 2: Geometry and Mensuration

Unit-2: -
Module 3: Sequences
Module 4: Statistics

Part-B: Reasoning Ability
Unit-3: -
Module 5: Syllogisms
Module 6: Logical Connectives

Unit-4: -
Module 7: Cubes and Dice
Module 8: Crypto Arithmetic

Part-C: Verbal Ability
Unit-5: -
Module 9: Conflict Management
Social Responsibility/Sustainable Development
Creative Thinking
Module 10: Cloze test
              Correction of Errors
              Ordering of Words
Unit-6: -
Module 11: e-mail Writing
              Oral Presentations
              PowerPoint Presentations
Module 12: Ethical Approach to Technology
              Adaptability
              Empathy

Reference Books

1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
3. Teach Yourself Quantitative Aptitude, by Arun Sharma
4. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar
5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta
6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
7. Reasoning Ability for Competitive Examination by Dr R S Agarwal
8. A Modern Approach to Logical Reasoning (2019-20 Session) by   R.S. Aggarwal [S. Chand]
9. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGraw Hill]
10. Multidimensional Reasoning by Mishra and Kumar Dr. Lal [Upkar's]
11. A Modern Approach to Verbal & Non-Verbal Reasoning (2019-20 Session) by R.S. Aggarwal [S. Chand]
12. A New Approach to Reasoning Verbal & Non-Verbal by B.S. Sijwali and

Indu Sijwali [Arihant]

13. Analytical Reasoning (2018-2019) Session by MK Panday
14. How to Crack Test Of Reasoning by Jaikishan and Premkishan [Arihant]
15. Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
16. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
17. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
18. Visual Intelligence for Beginners by Matthew Alcot
19. Logical Reasoning & Data Interpretation by Nishit K. Sinha
20. McCarthy, Michael& Felicity O'Dell. English Vocabulary in Use beginner, Cambridge University Press, 2017.
21. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Upper-Intermediate, Cambridge University Press, 2017.
22. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Advanced, Cambridge University Press, 2017.
23. Sonmez, John. Soft Skills: The Software Developer's Life, Manning Publications, 2014.
24. Tulgan, Bruce. Bridging the Soft Skills Gap: How to Teach the Missing Basics to Today's Young Talent, Pan Macmillan India, 2016.