ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABUS

(I & II Years)

ELECTRICAL AND ELECTRONICS ENGINEERING

FOR

B.TECH FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2022-23)

G. Narayanamma Institute of Technology and Science

(for women)

(AUTONOMOUS)

Shaikpet, Hyderabad –500104.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT VISION

To impart quality education in Electrical and Electronics Engineering for women empowerment

DEPARTMENT MISSION

The vision can be accomplished by

1. Imparting fundamental knowledge in Electrical and Electronics Engineering through well-qualified faculty
2. Providing exposure to current technologies
3. Providing hands-on experience to meet the expectations of the Industry
4. Facilitating individual and team activities to enhance personality and soft skills

G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE (for WOMEN)
(Autonomous)
Shaikpet, Hyderabad – 500 104

ACADEMIC REGULATIONS (R22)
For CBCS Based B.Tech. Degree Programmes

(Applicable for the students admitted into I year from the
Academic Year **2022-23** and onwards)

1.0 Under-Graduate Degree Programme (UGDP) in Engineering & Technology (E&T)

G. Narayanamma Institute of Technology & Science (GNITS) - for Women, Hyderabad, an Autonomous College approved by AICTE, New Delhi, and affiliated to Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme under Choice Based Credit System (CBCS) with effect from the Academic Year 2022 – 23 onwards in the following Branches of Engineering & Technology (Table 1.0) :

S.No.	*Programme*
I.	Computer Science & Engineering **(CSE)**
II.	Electrical & Electronics Engineering **(EEE)**
III.	Electronics & Communication Engineering **(ECE)**
IV.	Electronics & Telematics Engineering **(ETE)**
V.	Information Technology **(IT)**
VI.	Computer Science & Engineering (Artificial Intelligence & Machine Learning) **(CSM)**
VII.	Computer Science & Engineering (Data Science) **(CSD)**
VIII.	Computer Science & Technology **(CST)**

Table 1.0

2.0 Eligibility for Admission

2.1 The Admission to the UGDP shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (TSEAMCET), OR the University, OR on the basis of any other order of merit approved by the University, subject to the reservations as prescribed by the Government from time to time.

2.2 The medium of instruction for the entire UG Degree Programme in E&T shall be ENGLISH only.

3.0 B.Tech. Degree Programme Structure

3.1 The B.Tech. Degree Programmes at GNITS are of Semester Pattern, with 8 Semesters constituting 4 Academic Years and each Academic Year is of TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 Weeks duration (inclusive of Examinations), with a minimum of 90 Instructional Days per Semester.

3.2 UGC/AICTE specified Definitions/Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are listed under Clauses

3.2.1 to 3.2.4. The Course Structure is organized based on the AICTE Model Curriculum for Under-Graduate Degree Courses in Engineering & Technology (Jan. 2018).

3.2.1 Semester Scheme:

Each UGDP is of 4 Academic Years (8 Semesters), with each academic year divided into two semesters of 22 weeks (≥90 working days) each. Each semester has 2 components of evaluation - 'Continuous Internal Evaluation (CIE)' and 'End Semester Examination or Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Course Structure/Curriculum as suggested by AICTE are followed. The terms 'SUBJECT' or 'COURSE' imply the same meaning here, and refer to 'Theory Subject', or 'Lab/Practical Course', or 'Design/ Drawing Subject', or 'Elective', or 'Open Elective", or 'Seminar', or 'Project', or 'Mini-Project', or 'Online Course', as the case may be.

3.2.2 Credit Courses

All the Subjects/ Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject/ Course in a **L : T : P : C** (**L**ecture Periods : **T**utorial Periods : **P**ractical Periods : **C**redits) Structure based on the following general pattern:

- One Credit - for One hour/ Week/ Semester for Theory/ Lecture (L) Courses, and Tutorials (T); and,
- One Credit - for Two hours/ Week/ Semester for Laboratory/ Practical (P) Courses.
- Mandatory Courses (MC) will not carry Credits.

3.2.3 Subject/ Course Classification

All the Subjects/ Courses offered for the UGDP are broadly classified as : (a) Foundation Courses (FnC), (b) Core Courses (CoC), and (c) Elective Courses (E*l*C).

- Foundation Courses (FnC) are further categorized as :
  - (i) HS (Humanities and Social Sciences including Management Courses),
  - (ii) BS (Basic Sciences Courses), and
  - (iii) ES (Engineering Sciences Courses);
- Core Courses (CoC) and Elective Courses (E*l*C) are categorized as PS (Professional Subjects), which are further subdivided as:
  - (i) PC (Professional/ Departmental Core) Courses
  - (ii) PE (Professional / Departmental Electives) Courses
  - (iii) OE (Open Electives) Courses; and
  - (iv) Project Works (PW);
- Additional Courses :
  - ONLINE Courses (OL - offered on MOOCS platform by NPTEL/IITs) approved by JNTUH ;
  - MC - No Credits allocated.

3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course Structure Grouping for each UG Degree Programme (or B.Tech. Degree Course) is as listed below (along with AICTE specified % Range of Credits) in Table 3.2.4:

S. No.	*Broad Course Classification*	*Course Group/ Category*	*Course Description*	*Range of Credits (AICTE Model)*	*R22 Regulations at GNITS*
1)	**Foundation Courses (FnC)**	**BS – Basic Sciences**	Include - Mathematics, Physics, Chemistry, Biology Subjects	**15% - 20%**	**22.5 C (14.06 %)**
2)		**ES - Engineering Sciences**	Include fundamental engineering subjects	**15% - 20%**	**25 C (15.63 %)**
3)		**HS – Humanities & Social Sciences**	Include subjects related to Humanities, Social Sciences and Management	**5% - 10%**	**12 C (7.5 %)**
4)	**Core Courses (CoC)**	**PC – Professional Core**	Include core subjects related to the Parent Department/ Branch of Engg.	**30% - 40%**	**54.5 C (34.06 %)**
5)	**Elective Courses (EℓC)**	**PE – Professional Electives**	Include Elective subjects related to the Parent Department/ Branch of Engg.	**10% - 15%**	**18 C (11.25 %)**
6)		**OE – Open Electives**	Elective subjects include subjects from other Technical and/ or Emerging Subject Areas	**5% - 10%**	**9 C (5.62 %)**
7)	**Projects Related Courses (PW)**	**Project Work**	B.Tech. Project or UG Project or UG Major Project	**10% - 15%**	**19 C (11.88 %)**
8)		**Mini-Project**	Mini-Project/Industrial Training / Internship/ UG Mini-Project		
9)		**Seminar**	Seminar based on core contents related to Parent Department/ Branch of Engg.		
10)	**Mandatory Courses**	**MC**	Mandatory Courses	**No Credits**	-
11)	**Additional Courses**	**ONLINE Courses (OL)**	Offered on MOOCS platform by NPTEL/ IITs	ADDI-TIONALs	24 C
Total Credits for UG (B. Tech.) Degree Programme				**160 (100%)**	**160 (100%)**

Table 3.2.4.

4.0 Course Work

4.1 A student after securing admission, shall pursue the B.Tech. UG Degree Programme in a minimum period of 4 Academic Years, and a maximum period of 8 Academic Years (with effect from the Date of Commencement of I Year).

4.2 As suggested by AICTE, a 3-week 'Mandatory Induction Programme' shall be offered for all the Branches of Engineering at the start of the I Year UGDP, to enable the newly admitted students get acquainted with the new professional environment, to develop awareness and understanding of the engineering education requirements, and to get them prepared for the academic schedules ahead. The features, activities and pattern of the Induction Programme shall be as per the guidelines suggested in the Model Curriculum. Conventional class work shall commence only after the completion of the Induction Programme.

4.3 Each student shall Register for and secure the specified number of Credits (160 Credits) required for the completion of the UGDP and Award of the B.Tech. Degree in the respective Branch of Engineering.

4.4 Each Semester is structured to provide 20 Credits (20 C), totaling to 160 Credits (160 C) for the entire B.Tech. Programme.

5.0 Course Registration

5.1 A 'Faculty Advisor or Counselor' shall be assigned to each B.Tech. student and the Faculty Advisor assigned shall advise/counsel the student about the UGDP, its Course Structure and Curriculum, Choice/Option for Subjects/Courses, based on the competence, progress, pre-requisites and interest of the student.

5.2 The Academic/Examination Section of the College invites 'Registration Forms' from the students apriori (before the beginning of the Semester) through 'ONLINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ONLINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

5.3 Every individual student is advised to register for all the number of credits (20 Credits) indicated in that semester workload of the respective UGDP Course Structure - this is termed as the 'Normal Work Load' (NWL).

5.4 A student can apply for ONLINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from her assigned Faculty Advisor, which should be submitted to the College Academic/Examination Section through the Head of the Department (a copy of the same is to be retained by the Head of the Department, Faculty Advisor and the student).

5.5 A student may be permitted to register for the Subjects/ Courses of her choice with the typical work load (20 Credits) suggested in the respective semester credit load allocation of that UGDP Course Structure as the Normal Work Load (NWL), and the Maximum Work Load per semester (MWL) – with permissible additional courses within the Course Structure (subject to a maximum of 2 Theory Courses and 1 Lab Course) of her choice, is limited to a total work load of 28 Credits, based on her PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses in the Department Course Structure and Syllabus contents.

5.6 The choice for the 'additional/extra' Subjects/Courses to reach the Maximum Work Load (MWL) of 28 Credits (above the NWL specified) in each semester must be clearly indicated on a

request letter, which needs the specific approvals and signatures of the Faculty Advisor/ Counselor and the HoD on the hardcopy.

5.7 If the student submits ambiguous choices or multiple options or erroneous entries during ONLINE Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first correctly mentioned Subject/ Course in that category shall be taken into consideration, as applicable.

5.8 The Subject/Course Options exercised through ONLINE Registration are final and CANNOT be changed, and CANNOT be inter-changed; further, alternate choices shall also be not considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of the Department) in a semester could not be offered on account of any unforeseen or unavoidable reasons, then the student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements shall be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of class-work for that semester.

5.9 Dropping of the Subjects/ Courses may be permitted ONLY AFTER obtaining the prior approval from the Faculty Advisor assigned (subject to the retaining of the NWL), 'within 15 Days of Time' from the beginning of the current semester.

5.10 For the Mandatory Courses, a 'Satisfactory Participation Certificate' from the concerned authorities of the relevant semester is essential. No Marks or Grades or Credits shall be awarded for the Mandatory Courses.

6.0 Subjects/ Courses to be offered

6.1 A typical Section strength (or Class strength) for each semester shall be 60.

6.2 A Subject/ Course may be offered to the students, ONLY IF a Minimum of 30 Students opt for the same. The Maximum Class Strength of a Section is limited to 80.

6.3 More than ONE TEACHER may offer the SAME SUBJECT (Theory/ Tutorials/Lab./Practicals) in any semester. However, selection choice for students will be based on - 'FIRST COME FIRST SERVE Basis and CGPA Criterion' (ie., the first focus shall be on the earliest stamping of ONLINE ENTRY from the student for Registration in that semester, and the second focus, if needed, shall be on the existing CGPA of the student).

6.4 If more entries for the Registration of a Subject come into picture, then the Head of the Department concerned shall take necessary action, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT .

6.5 In case of the options coming from the students of the other Departments/ Branches/ Disciplines also (not considering OPEN ELECTIVES), PRIORITY shall be given to the student of the 'Parent Department/Branch' first.

7.0 Attendance Requirements

7.1 A student shall be eligible to appear for the End Semester Examinations if she acquires a minimum of 75% of attendance in aggregate of all the Subjects/Courses (including Mandatory or Non-Credit Courses) for that semester. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject.

7.2 Condoning 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 (CAC) on genuine and valid grounds based on the student's representation with supporting evidence.

7.3 A stipulated fee shall be payable towards condoning of shortage of attendance.

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

7.5 A student, whose shortage of attendance is not condoned in a semester is not eligible to take her End Examinations of that semester; she gets detained and her registration for that semester shall stand cancelled. She will not be promoted to the next semester. She may seek re-registration for all those Subjects registered in that semester in which she got detained, by seeking re-admission for that semester as and when offered; in case if there are any Professional Electives and/ or Open Electives, the same may also be re-registered if offered, however, if those Electives are not offered in later semesters, then alternate Electives may be chosen from the same set of Elective Subjects available under that Elective category.

8.0 Academic Requirements

The following Academic Requirements have to be satisfied in addition to the Attendance Requirements mentioned under Clause 7.0.

8.1 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course (except for Seminar and Mini-Projects), if she secures not less than 35% (14 marks out of 40 marks) in CIE (Continuous Internal Evaluation), not less than 35% (21 marks out of 60 marks) in SEE (Semester End Examination), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing **'C'** grade or above in that subject/ course.

8.2 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to the Seminar (IV Year II Semester) and the Mini-Projects (II Year II Semester, and III Year II Semester), if she secures not less than 40% of the total marks (that is, 40 out of 100 marks allotted) for each of them. The student would be treated as failed, if she - (i) does not submit a report on her Mini-Projects, or does not make a presentation of the same before the Evaluation Committee as per specified schedule, or (ii) does not present the Seminar as required in the IV year II Semester, or (iii) secures less than 40% of marks (that is, 40 marks) in the Mini-Projects/ Seminar evaluations. She may reappear once for each of the Mini-Projects/ Seminar evaluations, as and when they are scheduled again; if she fails in such 'one reappearance' evaluation also, she has to reappear for the same in the next subsequent semester, as and when they are scheduled, as supplementary candidate.

8.3 A student will not be promoted from the I Year to the II Year, unless she fulfills the Attendance and Academic Requirements and secures a total of 20 Credits out of 40 Credits specified for the I Year, from all the relevant regular and supplementary examinations, whether she takes those examinations or not.

8.4 A student will not be promoted from the II Year to the III Year, unless she fulfills the Attendance and Academic Requirements and secures a total of 48 Credits out of 80 Credits specified up to and inclusive of the II Year II Semester, from all the relevant regular and supplementary examinations, whether she takes those examinations or not.

8.5 A student will not be promoted from the III Year to the IV Year, unless she fulfils the Attendance and Academic Requirements and secures a total of 72 Credits out of 120 Credits specified up to and inclusive of the III Year II Semester, from all the relevant regular and supplementary examinations, whether she takes those examinations or not.

8.6 A student - (i) shall register for all the Subjects covering 160 Credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, (ii) puts up all the Attendance and Academic requirements for 160 Credits securing a minimum of C Grade (Pass Grade) or above in each Subject, (iii) earns ALL 160 Credits securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, and (iv) satisfactorily completes all Mandatory Courses; to successfully complete the UG Degree Programme. **THERE IS NO EXEMPTION OF CREDITS IN ANY CASE**

8.7 B.Tech. Degree Programme with HONORS/ MINOR DEGREE in EMERGING AREAS as per AICTE Norms and JNTUH Specifications (with effect from 2022-23 Academic Year) :

a) GNITS offers B.Tech. Degree Programme with HONORS in CSE Branch of CSE Department, with the JNTUH stipulated Regulations and Eligibility Conditions. Accordingly, students need to acquire 20 additional Credits in specified subjects offered from identified Emerging Areas during III Year and IV Year, for HONORS specialization in the same Major Discipline/ Branch of Engineering.

The Academic Regulations, Eligibility Conditions, Registration and other details are listed in Annexure-H (enclosed).

b) GNITS offers B.Tech. Degree Programmes with MINOR DEGREE in the following Emerging Areas – (i) Artificial Intelligence & Machine Learning (AI & ML), (ii) Cyber Security (CS), (iii) Data Science (DS), (iv) Internet of Things (IoT), v) Advanced Web Development (AWD – under AICTE-LITE Programme - Online), with the JNTUH specified Regulations and Eligibility Conditions. Accordingly, students need to acquire 18 additional Credits in specified subjects offered from identified Emerging Areas, during III Year and IV Year, for MINOR DEGREE specialization from other Departments/Branches of Engineering.

The Academic Regulations, Eligibility Conditions, Registration and other details are listed in Annexure-M (enclosed).

c) Students who opt for the above HONORS/ MINOR DEGREE Programmes should not have any backlogs, as per JNTUH stipulations (details listed in Annexures - H and M).

d) If the student fails to get the JNTUH stipulated number of Credits (18 for Minor Degree and 20 for Honors) within 4 years from the date of commencement of their UGDP, then they shall get only the B.Tech. Degree with the Major Engineering Branch Specialization in which they were admitted in I Year, subject to completion of the required 160 C (as per NWL). All the other Credits they have acquired (beyond this 160 C) shall only be listed as 'Additional Subjects/ Courses chosen' in the Marks Memo along with the Grade obtained. The performances in these 'Additional Subjects' shall not be taken into account while calculating the SGPA and CGPA of the B.Tech. Degree Programme.

e) If a student takes prior permission and registers for any 'Additional Subjects' (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totalling to 160 Credits as specified in the Course Structure of her Department, without HONORS/

MINOR DEGREE considerations (as listed above), the performances in those 'Additional Subjects' (although evaluated and graded) shall not be taken into account while calculating the SGPA and CGPA of the B.Tech. Degree Programme. For such 'Additional Subjects' registered, the % of marks and/or the Letter Grade alone may be indicated in the Marks Memo as a performance measure, subject to the completion of the Attendance and Academic Requirements as stated under Clauses 7.0 and 8.1 – 8.6.

8.8 Students who fail to earn 160 Credits as per the Course Structure, and as indicated above, within 8 Academic Years from the Date of the Commencement of their I Year, shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

8.9 When a student is detained due to the shortage of attendance in any semester, she may be re-admitted into that semester as and when offered, along with the Academic Regulations of the Batch into which she gets readmitted. However, no Grade Allotments or SGPA/CGPA calculations shall be done for that entire semester in which she got detained.

8.10 When a student is detained due to lack of Credits in any year, she may be readmitted in the next year(s), after the fulfilment of the Academic Requirements, along with the Academic Regulations of the Batch into which she gets readmitted.

8.11 A student who is eligible to appear for the End Semester Examination in any Subject/ Course, but is absent for a particular Subject/Course or has failed (failing to secure C Grade or above), may reappear for that Subject/ Course at the supplementary examination (SEE) as and when conducted. In such cases, her Internal Marks (CIE) assessed earlier for that Subject/Course shall be retained and carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating her performance in that Subject.

9.0 Evaluation - Distribution and Weightage of Marks

9.1 The performance of a student in each semester shall be evaluated Subject-wise (irrespective of the Credits assigned) with a maximum of 100 marks for Theory, or Labs/ Practicals, or Engineering Graphics/ Engineering Drawing, or Elective Course, or Mini-Projects, or Seminar, or Project – I (Phase – I), or Project – II (Phase – II) etc. These evaluations shall be based on 40% CIE (Continuous Internal Evaluation) and 60% SEE (Semester End Examination) basis, and a Letter Grade corresponding to the % of marks obtained shall be given.

9.2 For all the Subjects/ Courses as mentioned under **9.1**, the distribution shall be: 40 Marks for the CIE and 60 Marks for the SEE for the entire UG Degree Programme.

9.3 a) For the Theory Subjects during the semester, the CIE assessment for 40 marks includes two Mid-Term Examinations. Each Mid-Term Examination is conducted for 30 marks, for a duration of 120 minutes, and it shall have two parts : i) Part-A (Objective/Quiz Paper) for 10 marks, and ii) Part-B (Descriptive Paper) for 20 marks. Average of these two Mid-Term Examinations is assessed for 30 marks.

The Objective/Quiz Paper is set with ten multiple choice/ fill-in the blanks/ match the following … type of questions for a total of 10 marks. The Descriptive Paper (for 20 marks) shall contain 6 full questions, out of which, the student has to answer 4 questions, each carrying 5 marks.

The remaining 10 marks of CIE are distributed as - i) 5 marks for Assignment (average of 2 Assignments submitted, each for 5 marks), and ii) 5 marks for - Subject Viva-voce/ PPT/ Poster Presentation/ Case Study on a topic in the concerned subject.

b) The first mid-term examination shall be conducted in the middle of the semester for the first 50% of the syllabus, and the second mid-term examination shall be conducted at the end of the semester for the remaining 50% of the syllabus.

c) There shall be 2 Assignments per semester, and 5 marks are allocated for each Assignment. The First Assignment should be submitted before the conduct of the first mid-term examination, and the Second Assignment should be submitted before the conduct of the second mid-term examination. The Assignments shall be as specified by the concerned subject teacher, and the Average of these two Assignments shall be taken into account for 5 marks.

d) Assessment (for 5 marks) for the Subject Viva-voce/ Poster Presentation/ Case Study on a topic in the subject concerned shall be carried out before the commencement of II Mid-Term Examinations.

e) Sum of these three components of marks - (i) Average of the two Mid-Term Examinations marks (for 30 marks), (ii) Average of the two Assignments marks (for 5 marks), and (iii) the Assessment for the Subject Viva-voce/ Poster Presentation/ Case Study on a topic in the subject concerned (for 5 marks) – shall be the final marks secured towards the CIE (40 marks) in that Subject/ Course. The student has to earn a minimum of 35 % (14 marks) out of these 40 marks allocated.

- *The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Over all 40%of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.*
- *The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.*
- *In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE*

f) 60 marks are allocated for Semester End Examination (SEE), which is of 3 hours duration. The SEE Question Paper will have two parts : i) Part-A is for 10 marks and is compulsory - it consists of 10 questions of 1 mark each (2 questions from each unit); and ii) Part-B is for 50 marks – it consists of 5 questions of 10 marks each (one question from each unit, it may contain sub-questions); for each question there will be 'either/ or' choice, which means that there will be two questions from each unit and the student should answer one of these two.

9.4 For the Lab/Practical Subjects also, the Continuous Internal Evaluation (CIE) during the semester shall be for 40 Marks, and the End Semester Examination (SEE) shall be for 60 Marks. Out of the 40 Marks for internals (CIE), day-to-day assessment of the lab work shall be judged for 20 Marks; and one internal lab exam shall be conducted by the laboratory teacher concerned for 20 Marks, out of which 10 Marks are allocated for the viva-voce. The Semester End Examination (SEE) for Lab/Practicals shall be conducted at the end of the semester by Two Examiners nominated by the Head of the Department and approved by the Principal.

- *The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Over all 40%of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.*

- *The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.*
- *In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE*

9.5 For the Subjects with Design and/or Drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Production Drawing Practice, and Estimation etc.), the distribution shall be: 40 Marks for CIE (20 Marks for the day-to-day work and 20 Marks for the internal test) and 60 Marks for SEE. There shall be TWO internal tests in a semester and the AVERAGE of the two shall be taken into consideration for the award of Marks from the internal tests for CIE.

9.6 Open Electives (OE) : 3 Open Elective Courses shall be offered in the 8 Semester UG Degree Programme. Students are to choose each Open Elective, from the set of options given, in 3 different semesters (in III and IV Years). The students have to choose three Open Electives (OE1, OE2, OE3) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by her own (parent) department, if she has not registered that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

9.7 There shall be a Seminar Presentation in the IV Year II Semester. For the Seminar, the student shall collect the information on a technical topic, prepare a Technical Report and submit the Technical Report to the Department at the time of Seminar Presentation. The Seminar Presentation (along with the Technical Report submitted) shall be evaluated for 100 marks by Two Faculty Members assigned by the Head of the Department. There shall be no SEE or external examination for the Seminar.

9.8 a) There shall be two Mini-Projects – first one (Mini-Project 1 or MP1) will be during II Year II Semester (also termed Real Time Project, based on Laboratory Experiments and Teachers' advice); and the second one (Mini-Project 2 or MP2) is preferably in collaboration with an Industry with the relevant specialization (Industry Oriented Mini-Project), to be registered immediately after II Year II Semester examinations, and taken up during the summer vacation (between II and III Years) for about eight weeks duration. Students also have an option to choose Industry Internship (instead of Industry Oriented Mini-Project) for MP2, if they secure selection at any reputed Industry.

b) The Mini-Project Work shall be submitted in a Report form, and a presentation of the same shall be made before a Committee, which is evaluated for 100 marks by the Committee. The Committee shall consist of - 1) Head of the Department (for MP2) / a Professor of the Department (for MP1), 2) the Supervisor of Mini-Project, and 3) External Examiner (for MP2) / a Senior Faculty Member of the Department (for MP1). There shall be no internal marks for Mini-Projects. Performance evaluation of MP1 and MP2 shall be included in the II Year II Semester Grade Card and III Year II Semester Grade Card, respectively. The External Examiner for MP2 shall be nominated by the Principal from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the Head of Department. Performance Evaluations of MP1 and MP2 Mini-Projects will be included in the II Year – II Semester, and III Year – II Semester Grade Cards, respectively.

c) Industry Internship (for MP2, in place of collaborative Mini-Project) is exclusively meant for those students who have been considered eligible and selected accordingly by the Industry. Based on such selection letters from Industry, approvals will be given to students by the Principal of the Institution to carry out the Industry Internship for the specified period. The work performed during the Internship and the outcomes shall be reported in a Report form, which will also be evaluated in the same format (same as that of MP2 as stated in 9.8 b above).

9.9 Each student shall start the Project Work during the IV Year I Semester as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of the Department.

a) The Project Work shall be divided and carried out in 2 phases : Phase – I (Project - I) during IV Year I Semester, and Phase – II (Project - II) during IV Year II Semester, and the student has to prepare two independent Project Work Reports – *one each during each phase*. First Report shall include the Project Work carried out under Phase – I, and the Second Report (Final Report) shall include the Project Work carried out under Phase – I and Phase – II put together. Phase – I and Phase – II of the Project Work shall be evaluated for 100 marks each.

b) Out of the total 100 marks allotted for each Phase of the Project Work, 40 marks shall be for the CIE (Continuous Internal Evaluation/CIE), and 60 marks shall be for the End Semester Viva-voce Examination (SEE). The marks earned under CIE for both Phases of the Project shall be awarded by the Project Guide/Supervisor, based on the continuous evaluation of student's performance and her presentations at the Project Review Committee (PRC) Meetings in the Department, during the two Project Work Phases/periods. The PRC shall be constituted by the Head of the Department, and shall consist of the Head of the Department (HoD), Project Supervisor, and a Senior Faculty Member of the Department. The PRC shall monitor and review the progress of the Project Work, based on the PRC presentations and performance evaluations. The marks earned under SEE shall be awarded by the Project Viva-voce Committee/ Board (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

c) For the Project Phase - I, the Viva-voce shall be conducted at the end of the IV Year I Semester, before the commencement of the Semester End Examinations, at the Department Level by the Project (Phase – I) Evaluation Committee comprising of HoD or One Professor (nominated by the HoD), Supervisor (no External Examiner).

d) For the Project Phase – II Viva-voce (or Final Project Viva-voce) shall be conducted by a Project (Phase -II) Evaluation Committee comprising of an External Examiner, HoD and the Project Supervisor at the end of the IV Year II Semester, before the commencement of the Semester End Examinations. The External Examiner shall be nominated by the Principal from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

e) The student would be treated as failed, if she - (i) does not submit a Report on her Projects (Phase – I or Phase – II), or does not make a presentation of the same before the Evaluation Committee as per specified schedule, or (ii) secures less than 40% of marks (that is, 40 marks) in the sum total of the CIE and SEE taken together, in her Projects evaluations. She may reappear once for each of the Projects evaluations, as and when they are scheduled again; if she fails in such 'one reappearance' evaluation also, she has to reappear for the same in the next subsequent semester, as and when they are scheduled, as supplementary candidate.

9.10 For the Mandatory Non-Credit Course offered in a semester, a 'Satisfactory Participation Certificate' shall be issued to the student from the concerned authorities, only after securing ≥ 75% attendance in the Course. No Marks or Letter Grade shall be allotted for the Mandatory Courses.

9.11 ONLINE Courses (OL) – offered on MOOCs platform (by NPTEL/IITs) : Provision is made to offer some identified Courses, PEs and OEs (or their nearest equivalent courses, along with the number of credits and period of duration, as notified by the HoD) over 'ONLINE' mode, in addition to the conventional 'OFFLINE' mode (regular class-room teaching), from III Year onwards. Students may choose any mode out of these two, within one week from the commencement of the current semester; however, for ONLINE mode choice, prior intimation and approval from the Head of the Department and Principal is necessary. If any student wishes to discontinue the ONLINE mode, she can switch back to OFFLINE mode with prior intimation to the Head of Department, preferably within 2 weeks from the beginning of the current semester. Prior to Registration of these ONLINE Courses (on MOOCS platform – offered by NPTEL/IITs), formal approval of the Courses by JNTUH is essential. On successful completion of the ONLINE Course, the performance Grade – based on the certification from the 'MOOCS Course Conducting Authorities' (NPTEL/IITs), will be appropriately awarded to the student and the same will be recorded on her Grade Card.

9.12 a) If the internal marks secured by a student in CIE in any theory subject are less than 35% (14 marks out of 40), but fulfilled the attendance requirements, she may be permitted to reappear once for the mid-term examination in each of the subjects, as and when it is rescheduled (within the same semester). The syllabus coverage for this one-time reappearance examination shall be the entire syllabus of that subject in the same semester; and the marks secured in this examination shall be treated as - component (i) of 9.3 (e) Clause, the other two components remaining the same as before. Altogether, she should secure at least 35% marks in CIE (14 out of the 40 marks allotted), to which marks earned in SEE will be added for declaration of Grade in that subject (as per Clause 8.1).

b) A student shall be given one time chance to re-register for a maximum of two theory subjects … if the internal marks secured by her in CIE (Continuous Internal Evaluation) are less than 35% (14 marks out of 40) and failed in those subjects, but fulfilled the attendance requirements. A student must re-register for such failed subject(s) within two weeks of commencement of the class work in the next academic year, and write all related examinations (including SEE) as listed in Clause 9.3. In the event of the student taking this chance, her CIE marks for 40 and SEE marks for 60 obtained in the previous attempt stand cancelled. Also, the student has to earn a minimum of 35% marks (14 marks out of 40) in her CIE now, to which marks earned in the current SEE will be added for declaration of Grade in that subject (as per Clause 8.1).

10.0 Grading Procedure

10.1 Marks shall be awarded to indicate the performance of each student in each Theory Subject, or Lab/ Practicals, or Workshop/Drawing, or Elective Course, or Seminar, or Project, or Mini-Project, etc., and, based on the % of marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified under 9.0, a corresponding Letter Grade shall be given.

10.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following (Table 10.2) 'Letter Grades and corresponding percentage of marks' shall be followed:

% of Marks Secured(Class Intervals)	*Letter Grade(UGC Guidelines)*	*Grade Points*
90% and above (≥ 90% , ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥ 80% , < 90%)	A^+ (Excellent)	9
Below 80% but not less than 70% (≥ 70% , < 80%)	A (Very Good)	8
Below 70% but not less than 60% (≥ 60% , < 70%)	B^+ (Good)	7
Below 60% but not less than 50% (≥ 50% , < 60%)	B (above Average)	6
Below 50% but not less than 40% (≥ 40% , < 50%)	C (Pass)	5
Below 40% (< 40%)	F (FAIL)	0

Table 10.2

10.3 The Grade Designations include 7 categories, namely … O, A+, A, B+, B, C and F .

10.3.1 A student obtaining F Grade in any Subject shall be considered 'FAILED' and will be required to reappear as 'Supplementary Candidate' in the End Semester Examination (SEE), as and when conducted later. In such cases, her Internal Marks (CIE Marks) in those Subject(s) will remain the same as those obtained earlier.

10.3.2 If a student fails to appear for SEE of any Subject (s) for any reason whatsoever, she is deemed to have 'failed', and she will get F Grade in all such failed Subject (s). She will be required to reappear as 'Supplementary Candidate' in the End Semester Examination (SEE), as and when conducted later. In these cases also , her Internal Marks (CIE Marks) in those Subject(s) will remain the same as those obtained earlier.

10.4 A Letter Grade does not imply any specific % of marks.

10.5 In general, a student shall not be permitted to repeat any Subject/ Course (s) for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'. However, she has to repeat all the Subjects/Courses pertaining to that semester, when she is detained (as listed under Clauses 8.9- 8.10).

10.6 A student earns Grade Points (GP) in each Subject/ Course on the basis of the Letter Grade obtained by her in that Subject/Course (excluding Mandatory non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/Course.

Credit Points (CP) = Grade Points (GP) x Credits - for a Course

10.7 The student passes the Subject/ Course only when she gets GP ≥ 5 (C Grade or above).

10.8 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a semester by the Total Number of Credits registered during that semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$\textbf{SGPA} = \{\sum_{i=1}^{N} C_i G_i\} / \{\sum_{i=1}^{N} C_i\} \ldots \textbf{for each semester}$$

where 'i' is the Subject indicator index (takes into account all Subjects in a semester), 'N' is the no. of Subjects 'REGISTERED' for the semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the ith Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that ith Subject.

10.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all the semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL the registered Courses in ALL the semesters, and the Total Number of Credits registered in ALL the semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards at the end of each semester as per the formula

$$\textbf{CGPA} = \{\sum_{j=1}^{M} C_j G_j\} / \{\sum_{j=1}^{M} C_j\} \quad \textbf{... for all S semesters registered}$$

(ie., upto and inclusive of S semesters, $S \geq 2$),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the student has 'REGISTERED' from the 1st Semester onwards upto and inclusive of the semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S semesters), C_j is the no. of Credits allotted to the jth Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. After the registration and completion of I Year I Semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

10.10 For the Merit Ranking or Comparison Purposes or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs shall be used.

10.11 SGPA and CGPA of a semester will be mentioned in the Semester Grade Card or Grades Memorandum, if all the subjects of that semester are passed in first attempt. Otherwise, the SGPA and CGPA shall be mentioned on the Grade Card, only when the student passes all subjects of that semester.

10.12 Passing Standards

10.12.1 A student shall be declared successful or 'passed' in a semester, only when she gets a SGPA ≥ 5.00 (at the end of that particular semester); and a student shall be declared successful or 'passed' in the entire UG Degree Course, only when she gets a CGPA ≥ 5.00; subject to the condition that she secures a GP ≥ 5 (C Grade or above) in every registered Subject/ Course in each semester (during the entire UG Degree Course) for the Award of the Degree, as required.

10.12.2 A student shall be declared successful or 'passed' in any Non-Credit Subject/ Course, if she secures a 'Satisfactory Participation Certificate' for that Mandatory Course.

10.13 After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the Registered Students of that semester indicating the Letter Grades and

the Credits earned. The Grade Card or the Grade Sheet shall show the details of the Courses Registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA.

11.0 Declaration of Results

11.1 Computation of SGPA and CGPA are done using the procedure listed under Clauses 10.6 – 10.10.

11.2 CGPA is NOT indicative of the % of marks secured. However, in case if % of marks equivalent to the FINAL CGPA (computed at the end of UG Degree Programme) is required, then the following formula may be used as an estimate.

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of Degree

12.1 a) A student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire UG Degree Programme, and secures the required number of 160 Credits (with Final CGPA ≥ 5.0), within 8 Academic Years from the Date of Commencement of the First Academic Year, shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.

b) B.Tech. with Honors/ Minor Degree shall be awarded by JNTUH to those successful and acquired 20 Credits (for Honors) and 18 Credits (for Minors) in addition to the stipulated 160 Credits for B.Tech. Degree, as per norms listed Clause 8.7 and Annexures H-M.

12.2 A student who qualifies for the Award of the Degree as listed under Clause 12.1, shall be placed in the following Classes (Table 12.2) :

AWARD OF CLASS BASED ON FINAL CGPA (at the end of the UG Degree Programme)

First Class with Distinction	Final CGPA 8.00 or more ##
First Class	Final CGPA below 8.00 but not less than 7.00
Second Class	Final CGPA below 7.00 but not less than 6.00
Pass Class	Final CGPA below 6.00 but not less than 5.00

Table 12.2

Note :

a) A student with Final CGPA (at the end of the UG Degree Programme) ≥ 8.00, and fulfilling the following conditions -

(i) should have passed all the Subjects/ Courses within the first 4 Academic Years (or 8 Sequential Semesters) from the Date of Commencement of her First Academic Year,

(ii) should not have been detained or prevented from writing the End Semester Examinations in any semester due to shortage of attendance or any other reason, shall be placed in 'FIRST CLASS with DISTINCTION'.

A student fulfilling the conditions listed under (a) above, alone will be the eligible candidate for the 'University/College Rank' and/or 'Gold Medal' considerations.

b) A student with Final CGPA (at the end of UG Degree Programme) ≥ 8.00, but not fulfilling the above conditions, shall be placed in 'FIRST CLASS'.

c) A student with Final CGPA (at the end of the UG Degree Programme) < 5.00 will not be eligible for the Award of the Degree.

12.3 Award of 2-Year Diploma Certificate

A student is awarded a 2-Year Diploma Certificate in the concerned engineering branch, on completion of all the academic requirements and earned all the 80 credits upto B.Tech. II Year, II Semester (within 4 years from the date of admission), if she wants to exit the 4 Year B.Tech. Degree Program. The student once opted and awarded the 2-Year UG Diploma Certificate, she will not be permitted - to join the B.Tech. III Year I Semester and continue for completion of remaining years of study for the 4 Year B.Tech. Degree.

13.0 Withholding of Results

13.1 If the student has not paid fees to the University/ College at any stage, or has pending dues against her name due to any reason whatsoever, or if any case of indiscipline is pending against her, the result of the student may be withheld, and she shall not be allowed to go into the next higher semester. The award or issue of the Degree may also be withheld in such cases.

14.0 Transitory Regulations

14.1 A student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed in her B.Tech. Degree Programme after the UGDP period of 4 years, may be considered eligible for readmission to the same Subjects/ Courses (or equivalent Subjects/ Courses, as the case may be), and/ or to the same Professional Electives/ Open Electives (from the same set/category of Electives available or equivalents suggested, as the case may be) as and when she is offered (within the time-frame of 8 years from the Date of Commencement of her I Year I Semester), along with the Academic Regulations of the Batch into which she gets readmitted.

15.0 Student Transfers

15.1 There shall be no Branch transfers after the completion of the Admission Process.

16.0 Scope

i) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".

ii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.

iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

iv) The College may change or amend the Academic Regulations, Course Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the College Authorities.

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ANNEXURE - H :

H1) JNTUH stipulated Regulations for B.Tech. Degree Course with Honors :

H1.1 Academic Regulations :

a) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. program.

b) For B. Tech with Honors program, a student needs to earn additional 20 credits (over and above the required 160 credits for B. Tech degree). The broad guidelines for the courses of Honors program, their respective credits weightage and semester-wise break-up of the course are enclosed below in Clause H1.4 . All these 20 credits need to be completed in III year and IV year only.

c) After registering for the Honors program, if a student is unable to pass all courses in first attempt and earn the required 20 credits, she shall not be awarded Honors degree. However, if the student earns all the required 160 credits of B. Tech., she will be awarded only B. Tech degree in the concerned branch.

d) There is no transfer of credits from courses of Honors program to regular B. Tech. degree course & vice versa.

e) These 20 credits are to be earned from the additional courses offered by the host department in the college or from a closely related departments in the college as well as from the MOOCS platform.

f) For the courses selected under MOOCS platform following guidelines may be followed:

  i) Prior to registration of MOOCS courses, formal approval of the courses, by the University is essential. University before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.

  ii) Minimum credits for a MOOCS course must be equal to or more than the credits specified in the Honors course structure provided by the University.

  iii) Only Pass-grade/marks or above shall be considered for inclusion of grades in the Honors grade memo.

  iv) Any expenses incurred for the MOOCS courses are to be met by the students only.

g) The choice to opt/take the Honors program is purely on the choice of the students.

h) The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Honors program at any time; and in that case the student will be awarded only B. Tech. degree in the concerned branch on earning the required credits of 160.

i) The students of every branch can choose Honors program in their respective branches if they are eligible for the Honors program. A student who chooses an Honors program is not eligible to choose a Minor program and vice-versa.

j) The B. Tech. with Honors program shall be offered at GNITS (W) from the AY 2022-23 onwards. The students who are pursuing their III year I semester in the current academic year can register for the Honors program if they fulfil the eligibility criteria.

k) A student can graduate with Honors if she fulfils the requirements for her regular B. Tech. program as well as fulfils the requirements for Honors program.

l) The institute shall maintain a record of students registered and pursuing their Honors programs branch-wise. The same report needs to be sent to the University once the -enrolment process is complete.

m) The department shall prepare the time-tables for each Honors program offered at their respective departments without any overlap/clash with other courses of study in the respective semesters.

H1.2 Eligibility conditions of the students for the Honors degree :

a) A student can opt for B.Tech. degree with Honors, if she passed all subjects in first attempt in all the semesters till the results announced and maintaining 7.5 or more CGPA.

b) If a student fails in any registered course of either B. Tech. or Honors in any semester of four years program, she will not be eligible for obtaining Honors Degree. She will be eligible for only B. Tech. degree.

c) Prior approval of mentor and Head of the Department for the enrolment into Honors program, before commencement of III year I Semester (V Semester), is mandatory.

d) If more than 30% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 30%. The criteria to be followed for choosing 30% candidates in a branch may be the CGPA secured by the students till II year I semester.

e) The department concerned should be preferably NBA accredited and shall offer at least one M. Tech. Program.

f) Successful completion of 20 credits earmarked for Honors program with atleast 7.5 CGPA along with successful completion of 160 credits earmarked for regular B. Tech. Program with at least 7.5 CGPA and passing all subjects in first attempt gives the eligibility for the award of B. Tech. (Honors) degree.

g) For CGPA calculation of B. Tech. course, the 20 credits of Honors program will not be considered.

H1.3 Registration for the course in Honors Program :

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

b) The students should choose a course from the list against each semester (from Honors course structure) other than the courses they have studied/registered for regular B.Tech. programme. No course should be identical to that of the regular B. Tech. course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c) The maximum No. of courses for the Honors is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d) The registration fee to be collected from the students by the College is Rs. 1000/- per one credit.

e) A fee for late registration may be imposed as per the norms.

H1.4 Academic Regulations/ Course Structure for Honors degree in B. Tech. Programs (Table H1.4) **:**

S. No.	*Year/ Semester*	*Course to be Chosen From/ Studied*	*Mode of Learning*	*No. of Credits*
1	III-1	PE1 OR PE2	Blended/ Conventional	3
2	III-2	Research Methodologies	Conventional	3
3	III-2	PE3	Conventional	3
4	IV-1	PE4	Conventional	3
5	IV-1	PE5	Conventional	3
6	IV-2	Technical Paper Writing	Under the Mentorship of a Supervisor	2
7	IV-2	PE6 or an Inter-disciplinary Subject as suggested by University	MOOCS	3
TOTAL CREDITS				20

Table: H1.4

Notes:

A) Professional Elective (PE) course should be selected (which is not studied) from each Professional Electives list provided in regular B. Tech. course.

B) Courses can be chosen as in above table.

C) **Technical paper writing:**

a) The student shall take up a problem/topic of engineering branches (inter-disciplinary nature) and apply the knowledge which she acquired while pursuing their engineering branch. It is expected to analyse, design and develop an application for the identified problem and write a technical paper/ document.

Alternatively, the student - i) shall identify a research topic, analyse the problem, carryout the experiments, write a technical paper and publish in /communicate for a Scopus indexed journal/any journal with decent reputation, or ii) demonstrate a talent/an idea/development of an innovative product.

b) The evaluation shall be done by the same committee which is constituted for project evaluation, along with the final semester project work.

c) The students should start exploration for the Technical Paper Writing immediately after the semester exams of III-II semester. Only the evaluation part shall be carried in IV-II semester.

D) The institute shall offer a course on Research Methodologies by combining the students of all branches (if the number of students is more, multiple parallel sessions may be conducted). The time slots in the time-tables of respective branches should be aligned. The external evaluation of Research Methodologies course shall be done by the University.

E) If the blended course option is chosen, for the subject in III-I semester, the learning should be partially in online mode and partially in offline mode. The external evaluation shall be done by the University; however, for the internal evaluation component, online assessment should also be taken into account while finalising the internal marks by the course teacher.

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ANNEXURE - M :

M1) JNTUH stipulated Regulations for B.Tech. Degree Course with Minors :

M1.1 Minor Courses and the Offering Departments (Table M1.1) :

S. No.	*Minor Programme*	*Eligible Branches of Students*	*Offering Departments @*	*Award of Degree*
1	Artificial Intelligence & Machine Learning	All Branches, except B.Tech. in CSE (AI & ML)/ B.Tech. (AI & ML)/B.Tech. (AI)/ B.Tech. CSE (AI)	CSE	B.Tech. in Branch Name with Minor in Artificial Intelligence & Machine Learning
2	Cyber Security	All Branches, except B.Tech. in CSE (Cyber Security)/ B.Tech. (Cyber Security)	CSE	B.Tech. in Branch Name with Minor in Cyber Security
3	Data Science	All Branches, except B.Tech. in CSE (Data Science)/ B.Tech. (Data Science)	CSE	B.Tech. in Branch Name with Minor in Data Science
4	IOT	All Branches, except B.Tech. in CSE (IOT)/ B.Tech. (IOT)	ECE	B.Tech. in Branch Name with Minor in IOT
5	Innovation and Entrepreneurship	All Branches	Management Science/ MBA	B.Tech. in Branch Name with Minor in Innovation and Entrepreneurship

@ as per AICTE guidelines.

Table M1.1

M1.2 Academic Regulations for B. Tech. Degree with Minor Programs :

a) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. program.

b) For B. Tech. with Minor, a student needs to earn additional 18 credits (over and above the required 160 credits for B. Tech degree). The list of courses of each Minor program, their respective credits weightage and semester-wise break-up of the courses are as specified by JNTUH authorities. All these 18 credits need to be completed in III year and IV year only.

c) After registering for the Minor programme, if a student is unable to earn all the required 18 credits in a specified duration (twice the duration of the course), she shall not be awarded Minor degree. However, if the student earns all the required 160 credits of B.Tech., he/she will be awarded only B. Tech degree in the concerned branch.

d) There is no transfer of credits from Minor program courses to regular B. Tech. degree course & vice versa.

e) These 18 credits are to be earned from the additional Courses offered by the host department in the college as well as from the MOOCS platform.

f) For the course selected under MOOCS platform following guidelines may be followed:
   i) **Prior to registration of MOOCS courses, formal approval of the courses, by the University is essential.** University, before the issue of approval, considers the parameters like the Institute / Agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.
   ii) Minimum credits for MOOCS course must be equal to or more than the credits specified in the Minor course structure provided by the University.
   iii) Only Pass-grade/marks or above shall be considered for inclusion of grades in Minor grade memo.
   iv) Any expenses incurred for the MOOCS courses are to be met by the students only.

g) The choice to opt/take a Minor program is purely on the choice of the students.

h) The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Minor program at any time; and in that case the student will be awarded only B. Tech. degree in the concerned branch on earning the required credits of 160.

i) The student can choose only one Minor program along with her basic engineering degree. A student who chooses an Honors program is not eligible to choose a Minor program and vice-versa.

j) The B. Tech. with a Minor program shall be offered from the AY 2021-22 onwards. The students who are pursuing their III year I semester in the current academic year can register for the Minor program if they fulfil the eligibility criteria.

k) A student can graduate with a Minor if she fulfils the requirements for her regular B. Tech. program as well as fulfils the requirements for Minor program.

l) The Institute shall maintain a record of students registered and pursuing their Minor programs, minor program-wise and parent branch-wise. The same report needs to be sent to the University once the enrolment process is complete.

m) The Institute / Department shall prepare the time-tables for each Minor course offered at their respective institutes without any overlap/clash with other courses of study in the respective semesters.

M1.3 Eligibility conditions for the student to register for Minor Course :

a) A student can opt for B.Tech. degree with Minor program if she/he has no active backlogs till II Year I Semester (III semester) at the time of entering into III year I semester.

b) Prior approval of mentor and Head of the Department for the enrolment into Minor program, before commencement of III year I Semester (V Semester), is mandatory.

c) If more than 50% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 50%.

M1.4 Registration for the courses in Minor Program :

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in the that semester.

b) The students should choose a course from the list against each semester (from Minors course structure) other than the courses they have studied/registered for regular B.Tech. programme. No course should be identical to that of the regular B.Tech course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c) The maximum No. of courses for the Minor is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d) The registration fee to be collected from the students by the College is Rs. 1000/- per one credit.

e) A fee for late registration may be imposed as per norms.

G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE (for WOMEN)
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ACADEMIC REGULATIONS (R22)

For CBCS Based B.Tech. Degree Programmes for Students Admitted under Lateral Entry Scheme (LES)

(Applicable for the students admitted into II year from the Academic Year **2023-24** and onwards)

A) Eligibility for Admission ~

A.1 The Admission to the B.Tech. Programme (UG Degree Programme) shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (TSECET), OR the University, OR on the basis of any other order of merit approved by the University, subject to the reservations as prescribed by the Government from time to time.

B) B.Tech. Degree Course Structure for LES Students ~

B.1 Regular Full Time B.Tech. Degree Courses at GNITS are of Semester Pattern, with 8 Semesters constituting 4 Academic Years and each Academic Year is of TWO Semesters (First/Odd and Second/Even Semesters). Students admitted under LES shall join - the II Year stream of the Regular B.Tech. students in the relevant branch of engineering (admitted for 4 Year UG Degree Programme in the previous year); and their UGDP period therefore shall be 3 Years (II, III and IV Years) or 6 Semesters of the Regular Full Time B.Tech. Programme (commencing from II Year I Semester).

B.2 The LES Students, after securing admission, shall pursue their UG Degree Programme of study for not less than 3 years and not more than 6 years, from the year of admission.

B.3 Each student shall Register for and secure the specified number of Credits (120 Credits) required for the completion of the UGDP and the Award of the B.Tech. Degree in the respective Branch of Engineering.

C) Academic Requirements ~

C.1 A student will not be promoted from the II Year to the III Year, unless she fulfills the Attendance and Academic Requirements and secures a total of 24 Credits out of 40 Credits specified up to and inclusive of the II Year II Semester, from all the relevant regular and supplementary examinations, whether she takes those examinations or not.

C.2 A student will not be promoted from the III Year to the IV Year, unless she fulfils the Attendance and Academic Requirements and secures a total of 48 Credits out of 80 Credits specified up to and inclusive of the III Year II Semester, from all the relevant regular and supplementary examinations, whether she takes those examinations or not.

C.3 A student shall register for all the Subjects covering 120 Credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, puts up all the Attendance and Academic requirements for 120 Credits securing a minimum of C Grade (Pass Grade) or above in each Subject, and earns ALL 120 Credits securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, to successfully complete the B.Tech. Degree Programme.

C.4 A student who fails to earn 120 Credits specified as per the Course Structure, and as indicated above, within 6 Academic Years from the year of admission (that corresponds to the II Year I Semester of the Regular Full Time B.Tech. Degree Programme), shall forfeit their seat in B.Tech. Programme and their admission shall stand cancelled.

D) Award of Degree

D.1 A student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire UG Degree Programme, and secures the required number of 120 Credits (with final CGPA ≥ 5.0), within 6 Academic Years from the year of admission, shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.

D.2 A student who qualifies for the Award of the Degree as listed under Clause **D.1**, shall be placed in the following Classes (Table D.2) :

AWARD OF CLASS BASED ON FINAL CGPA (at the end of the UG Degree Programme)

First Class with Distinction	Final CGPA 8.00 or more ##
First Class	Final CGPA below 8.00 but not less than 7.00
Second Class	Final CGPA below 7.00 but not less than 6.00
Pass Class	Final CGPA below 6.00 but not less than 5.00

Table D.2

Note

a) A student with Final CGPA (at the end of the UG Degree Programme) ≥ 8.00, and fulfilling the following conditions -

(i) should have passed all the Subjects/ Courses within the first 3 Academic Years (or 6 Sequential Semesters) from the Year of Admission,

(ii) should not have been detained or prevented from writing the End Semester Examinations in any semester due to shortage of attendance or any other reason, shall be placed in 'FIRST CLASS with DISTINCTION'.

A student fulfilling the conditions listed under (a) above, alone will be the eligible candidate for the 'University/College Rank' and/or 'Gold Medal' considerations.

b) A student with Final CGPA (at the end of UG Degree Programme) 8.00, but not fulfilling the above conditions, shall be placed in 'FIRST CLASS'.

c) A student with Final CGPA (at the end of the UG Degree Programme) < 5.00 will not be eligible for the Award of the Degree.

E) Other Regulations ~

All the Academic Regulations as applicable for the B.Tech. 4 Year (Regular) Degree Programme students shall hold good for the B.Tech. Lateral Entry Scheme students also, but for the variations as described above, under Clauses A, B, C and D for LES students.

F) LES Students are not eligible for the 2-Year UG Diploma Certificate (that provision is available for the Regular 4 Year B.Tech. Course Students only).

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MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the student:	
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 student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students 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 student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall beexpelled from examination hall. The student isalso debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student 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, 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 student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student 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 around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

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 student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student 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 student has alreadyappeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9.	If student of the college, who is not a student 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 colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. 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 student has already appeared including practical examinations andproject work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny	Cancellation of the performance in that subject and all other subjects the student has 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.	

B.Tech. 4 Year (8 Semesters) Regular Programme in

ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE

(Applicable for the Batches admitted from the Academic Year 2022-23)

I YEAR **I SEMESTER**

S.No.	Group	Subject Code	Subject	L	T	P	Credits
1)	BS	121AB	Applied Physics	3	0	0	3
2)	BS	121AA	Applied Chemistry	3	0	0	3
3)	BS	121AG	Linear Algebra and Multivariable Calculus	3	1	0	4
4)	ES	121AH	Programming for Problem Solving	3	0	0	3
5)	HS	121AF	English for Skill Enhancement	2	0	0	2
6)	BS	12102	Applied Physics Lab	0	0	3	1.5
7)	BS	12101	Applied Chemistry Lab	0	0	2	1
8)	ES	12108	Programming Lab	0	0	3	1.5
9)	HS	12105	English Language and Communication Skills Lab	0	0	2	1
10)	MC	12107	Gender Sensitization	0	0	2	-
			TOTAL	**14**	**1**	**12**	**20**

I YEAR **II SEMESTER**

S.No.	Group	Subject Code	Subject	L	T	P	Credits
1)	BS	122AK	Numerical Techniques and Transform Calculus	3	1	0	4
2)	ES	122AJ	Data Structures	3	0	0	3
3)	ES	122AC	Basic Electrical Engineering	3	0	0	3
4)	ES	122AE	Engineering Graphics	1	0	3	2.5
5)	ES	12204	Engineering Workshop	1	0	3	2.5
6)	ES	12209	Data Structures Lab	0	0	3	1.5
7)	ES	12203	Basic Electrical Engineering Lab	0	0	3	1.5
8)	ES	122AD	Design Thinking	2	0	0	2
9)	MC	12206	Environmental Science and Technology	2	0	0	-
			TOTAL	**15**	**1**	**12**	**20**

B.Tech. 4 Year (8 Semesters) Regular Programme in

ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE

(Applicable for the Batches admitted from the Academic Year 2022-23)

II YEAR **I SEMESTER**

S.No.	Group	Subject Code	Subject	L	T	P	Credits
1)	BS	123AX	Special Functions and Complex Variable Theory	3	0	0	3
2)	ES	123AV	Python Programing	2	0	0	2
3)	PC	123AL	Analog Electronics	3	0	0	3
4)	PC	123AS	Field Theory and DC Machines	3	1	0	4
5)	PC	123AQ	Electrical Circuit Analysis	3	1	0	4
6)	ES	12314	Electrical Circuit Analysis Lab	0	0	3	1.5
7)	ES	12317	Python Programing Lab	0	0	2	1
8)	PC	12310	Analog Electronics Lab	0	0	3	1.5
9)	MC	12312	Constitution of India	2	0	0	-
			TOTAL	**16**	**2**	**8**	**20**

II YEAR **II SEMESTER**

S.No.	Group	Subject Code	Subject	L	T	P	Credits
1)	BS	124BQ	Transform Techniques and Applications	3	0	0	3
2)	PC	124BM	Power Systems-I	3	0	0	3
3)	PC	124AY	AC Machines	3	0	0	3
4)	PC	124BF	Digital Electronics	3	0	0	3
5)	PC	124BD	Control Systems	3	0	0	3
6)	PC	12421	Electrical Machines Lab	0	0	3	1.5
7)	PC	12420	Digital Electronics Lab	0	0	3	1.5
8)	PW	12424	Mini Project - 1 (Real Time Project)	0	0	4	2
9)	MC	12422	Human Values and Professional Ethics	2	0	0	-
			TOTAL	**17**	**0**	**10**	**20**

B.Tech. 4 Year (8 Semesters) Regular Programme in

ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE

(Applicable for the Batches admitted from the Academic Year 2022-23)

III YEAR **I SEMESTER**

S.No.	Group	Subject Code	Subject	L	T	P	Credits
1)	PC	125DC	Power Systems-II	3	0	0	3
2)	PC	125DB	Power Electronics	3	1	0	4
3)	PC	125CY	Microprocessors and Micro Controllers	3	0	0	3
4)	PE1	**Professional Elective - 1 (Offline/Online)**		3	0	0	3
		125CG	Digital Control Systems				
		125BK	Object Oriented Programming Through Java				
		125DE	Programmable Logic controllers and Applications				
		125DL	Sensors and Transducers				
5)	PE2	**Professional Elective - 2 (Offline/Online)**		3	0	0	3
		125CE	Computer Organization				
		125DM	Special Machines				
		125CK	Electrical Machine Modeling and Analysis				
		125CM	Fuel Cell Technologies				
6)	HS	12828	Advanced Communication Skills Lab	0	0	2	1
7)	PC	12535	Microprocessors and Micro Controllers Lab	0	0	3	1.5
8)	PC	12532	Control Systems Lab	0	0	3	1.5
			TOTAL	**15**	**1**	**8**	**20**

III YEAR **II SEMESTER**

S.No.	Group	Subject Code	Subject	L	T	P	Credits
1)	HS	126EG	Managerial Economics and Financial Analysis	3	0	0	3
2)	PC	126EL	Power Systems Protection	3	0	0	3
3)	PC	126EK	Power System Analysis	3	1	0	4
4)	PE3	**Professional Elective - 3 (Offline/Online)**		3	0	0	3
		126ER	Utilization of Electrical Energy				
		126EN	Smart Electric Grid				
		126DZ	High Voltage Engineering				
		126DP	Computer Aided Machine Design				
5)	OE1	**Open Elective - 1 (Offline/Online)**		3	0	0	3
6)	PC	12646	Power Electronics Lab	0	0	2	1
7)	PC	12636	Advanced Programming Lab	0	0	2	1
8)	PW	12644	Mini Project – 2 (Industry Oriented Mini Project/ Industry Internship : during Summer between 2nd and 3rd years)	0	0	4	2
			TOTAL	**15**	**1**	**8**	**20**

B.Tech. 4 Year (8 Semesters) Regular Programme in

ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE

(Applicable for the Batches admitted from the Academic Year 2022-23)

IV YEAR **I SEMESTER**

S.No	Group	Subject Code	Subject	L	T	P	Credits
1)	HS	127FN	Fundamentals of Management	3	0	0	3
2)	PC	127FE	Electric and Hybrid Vehicles	3	0	0	3
3)	PE4	**Professional Elective - 4**		3	0	0	3
		127DV	Digital Signal Processing				
		127FF	Electrical & Electronics Instrumentation				
		127FV	Power Semi Conductor Drives				
4)	PE5	**Professional Elective - 5 (Offline/Online)**		3	0	0	3
		127FW	Power System Operation and Control				
		127FU	Power Quality and FACTS				
		127FG	Electrical Distribution Systems				
		127FP	HVDC Transmission				
5)	PC	12762	Power Systems Lab	0	0	2	1
6)	OE2	**Open Elective - 2 (Offline/Online)**		3	0	0	3
7)	PC		Lab (Linked to PE4)	0	0	2	1
		12740	Digital Signal Processing Lab				
		12755	Electrical & Electronics Instrumentation Lab				
		12761	Power Semi Conductor Drives Lab				
8)	PW1	12763	PROJECT WORK (Phase – I)	0	0	6	3
			TOTAL	**15**	**0**	**10**	**20**

IV YEAR **II SEMESTER**

S.No	Group	Subject Code	Subject	L	T	P	Credits
1)	HS	128GW	Entrepreneurship and Project Management (Offline/Online)	2	0	0	2
2)	PE6	**Professional Elective - 6 (Offline/Online)**		3	0	0	3
		128GN	AI Techniques in Electrical Engineering				
		128HB	Grid Integration of Renewable Energy Sources				
		128HJ	VLSI Technology				
		128GV	EHVAC Transmission				
3)	OE3	**Open Elective - 3 (Offline/Online)**		3	0	0	3
4)	PW	12870	Seminar (Presentation with Report before 1st MidExams)	1	0	2	2
5)	PW2	12869	PROJECT WORK (Phase – II)	0	0	20	10
			TOTAL	**9**	**0**	**22**	**20**

List Of Open Elective Offered By Various Departments For B.Tech. Programme
(Applicable for the Batches admitted from the Academic year 2022-23 onwards)

S. No.	Name of the Department Offering Open Electives	Open Elective-1 (B. Tech. III Year IISemester)	Open Elective-2 (B. Tech. IV Year ISemester)	Open Elective-3 (B.Tech. IV Year IISemester)
1	CSE/IT/ CST	• Fundamentals of Data Structures (126KF) • Fundamentals of Database Management Systems(126KG) • Operating Systems(126KK) • Software Engineering (126KQ)	• Internet of Things (127KY) • Cyber Security (127KT)	• Cloud Computing (128LE) • Blockchain Technologies (128LD)
2	CSM	• R Programming(126KP)	• Machine Learning Basics (127KZ)	• Introduction to Natural Language Processing (128LL)
3	CSD	• Fundamentals of Data Science (126KE) • Fundamentals of Artificial Intelligence (126KD)	• Data Visualization using Python (127KU)	• Data Mining (128LF)
4	ECE	• Biomedical Electronics and Applications (126 KA) • Principles of Mobile Communications (126KN) • Verilog HDL Programming (126KR)	• Electronic Measuring Instruments (127KV) • Geo-Informatics (127KW)	• Wearable Devices (128LP) • Elements of Satellite Communications (128LG)
5	ETM	• Principles of Communications (126KM)	• Telecommunication Switching Systems (127LC)	
6	EEE	• Electrical Materials (126KC)	• Renewable Energy Sources (127LA)	• Waste Management Techniques and Power Generation (128LN)
7	Mech. Engg.	• Operations Research (126KL)	• Research Methodology (127LB)	
8	H&M	• Introduction to Data Analytics (126K**J**) • Intellectual Property Rights (126KH)	• Industrial Management (127KX) • Behavioral Skills andProfessional Communication (127KS)	• Marketing Management (128LM)
9	BS	• Disaster Management (126KB)		• Environmental Impact Assessment (128LH)

I Year B.Tech, EEE I Semester **L T P C**
Course Code :121AB **3 0 0 3**

APPLIED PHYSICS

(Common to ECE ,EEE, ETE & CST)

Prerequisites: -Nil-

Course Objectives:

Through this course the student is to:

1. Understand the fundamentals of quantum mechanics and study the behaviour of a particle quantum mechanically.
2. Analyze the semiconductors and semiconductor devices.
3. Be able to classify the types and properties of dielectric and magnetic materials
4. Understand the construction and working principle of different types of lasers and light propagation through optical fiber.
5. Learn the fundamentals of nano material synthesis and characterizations.

UNIT 1: Quantum Mechanics (~9 Lecture Hours)

Introduction to quantum physics, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

Kronig-Penny model (using Bloch theorem, qualitative analysis and conclusions), Energy bands in solids. E-k diagram, classification of materials: Metals, Semiconductors and Insulators. Density of states (Qualitative) and electron occupation probability (Fermi-Dirac Distribution function analysis)

UNIT 2: Semiconductor Physics (~9 Lecture Hours)

Intrinsic and Extrinsic semiconductors, Carrier concentrations of Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination (Qualitative), Hall effect and calculation of Hall Coefficient (R_H).

Semiconductor Devices

Radiative and non-radiative recombination in semiconductors(Qualitative), Direct and Indirect band gap semiconductors, Diffusion and Drift currents , p-n junction diode, Zener diode and their V-I Characteristics, LED and Solar cell :construction, principle of operation and characteristics.

UNIT 3: Dielectric and Magnetic materials (~9 Lecture Hours)

Dielectric materials: Electric dipole, Dipole moment, Oscillating dipole, Dielectric constant, Polarizability, Electric susceptibility, Displacement vector, Polarization Vector, Qualitative study of electronic, ionic and orientation polarizations, Local field (Qualitative treatment) and Clausius-Mossotti equation; Ferro-electricity –Behaviour of $BaTiO_3$, Piezoelectricity, Pyro-electricity.

Magnetic materials: Permeability, field intensity, magnetic field induction, magnetization, magnetic susceptibility, origin of magnetic moment: Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Domain theory (Qualitative), Hysteresis curve based on domain theory, soft and hard magnetic materials, properties of antiferro and ferri magnetic materials.

UNIT 4: Lasers and Fibre Optics (~9 Lecture Hours)

***Lasers*:** Characteristics of Lasers, Absorption, Spontaneous and stimulated emission process, Pumping, Population inversion, Lasing action, Einstein's Coefficients and their relations. Types of Lasers: Ruby laser, Carbon dioxide

(CO_2) laser, Semiconductor diode laser, Applications of laser.

Fibre Optics: Introduction, Optical fiber as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Types of Optical fibers, Losses associated with optical fibers, Applications of optical fibers (communication system, sensors).

UNIT 5: Nanomaterials: (~8 Lecture Hours)

Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-Gel, Precipitation, Combustion Methods; Top-Down Fabrication: Ball milling method, Chemical Vapor Deposition, Physical Vapor Deposition, Characterization Techniques (XRD, SEM & TEM) and Applications.

Text Books:

1. M.N.Avadhanulu, P.G.Kshirsagar & T.V. S.Arun Murthy, "A Text book of Engineering Physics"-S.Chand Publications, 11th Edition, 2019.
2. J.P Srivastava, "Elements of Solid state physics", 2nd edition, Prentice Hall India Publishers.
3. Donald A, Neamen, "Semiconductor Physics and Devices-Basic Principle", McGraw Hill, 4th Edition, 2021.
4. Palani Swamy, "Applied Physics", Scitech Publications.
5. Narasimha Reddy Katta, "Essentials of Nano science & Nanotechnology", Typical Creatives NANO DIGEST, 1st Edition, 2021.

Reference Books:

1. H.C.Verma, "Quantum Physics", TBS Publication, 2nd Edition2012.
2. Halliday, Resnick and Walker, "Fundamentals of Physics", John Wiley & Sons, 11th Edition, 2018.
3. Charles Kittel, "Introduction to Solid State Physics", Wiley Eastern, 2019.
4. S.L.Gupta and V.Kumar, "Elementary Solid State Physics", Pragathi Prakashan,2019.
5. A.K. Bhandhopadhya, "Nano Materials", New Age International, 1st Edition, 2007.
6. Aliaksandr S. Bandarenka, "Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage" CRC Press Taylor & Francis Group.
7. M.C.Narayan, "International encyclopedia of Nanotechnology, Science and Physics"

Online Resources:

1. https://www.youtube.com/channel/UCNNlt5I3Z-Qbswfo_7KAzNA/videos

Course Outcomes:

After completion of the course, student will be able to

1. Explain the quantum mechanical aspects in physics and apply the same in differentiating the conducting properties of solids.
2. Asses and modify the carrier concentration of different types of semiconductors and also be able to understand the working of semiconducting devices.
3. Choose materials on the basis of their electric and magnetic behaviour for different engineering applications.
4. Differentiate different types of Lasers, optical fibers and realize their application in engineering fields.
5. Appreciate the importance of nano materials and their applicability in modern engineering applications.

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I Year B.Tech, EEE I Semester **L T P C**
Course code:121AA **3 0 0 3**

APPLIED CHEMISTRY

(Common to EEE, ECE, ETE, & CST)

Prerequisites: - Nil-

Course Objectives:

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To acquire the knowledge of water treatment, electrochemistry and corrosion which are essential for the engineers and in industry.
3. To acquire the skills pertaining to Polymers and Energy sources to apply them for various engineering fields etc.
4. To impart the knowledge of engineering materials and their aspects useful for understanding material chemistry.

UNIT 1: (~8 Lecture Hours)

Water and its treatment: Introduction to hardness of water: Causes of hardness and its units . Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications: Steps involved in the treatment of potable water, Disinfection of potable water by chlorination and break-point chlorination. Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of boiler feed water: Calgon conditioning, Phosphate conditioning, Colloidal conditioning. External treatment methods :Softening of water by Ion exchange process. Desalination of Brackish water–Reverse osmosis.

UNIT 2: (~12 Lecture Hours)

Electrochemistry and corrosion: Electrochemistry: Electrochemical cells, Electrode potential, Standard electrode potential. Nernst equation: derivation and significance. Electrochemical series and its applications. Construction and functioning of Hydrogen and Calomel electrode. pH determination using Calomel electrode. Batteries :Primary and Secondary batteries. Construction, working of Lithium Cell and Lithium-ion battery and its applications to electrical vehicles. Fuel cells: Construction and applications of Methanol Oxygen fuel cell.

Corrosion: Causes and effects of corrosion. Theories of chemical and electrochemical corrosion. Mechanism of electrochemical corrosion. Types of corrosion: Galvanic corrosion, Concentration cell corrosion, Waterline and Pitting corrosion. Factors affecting rate of corrosion. Corrosion control methods-Cathodic protection: Sacrificial anodic protection and Impressed current cathodic methods. Surface coatings: Metallic coatings – Methods of coatings: Hot dipping, galvanization, tinning.

UNIT 3: (~8 Lecture Hours)

Polymeric materials: Definition of polymers, Classification of polymers with examples. Types of polymerization: Addition Polymerization (free radical mechanism) and condensation polymerization with examples – Nylon 6:6, Terylene. **Plastics:** Definition and characteristics. Plastics: thermosetting and thermoplastics. Preparation, properties and engineering applications of PVC, Bakelite, Teflon.**Rubbers:** Natural rubber and its vulcanization. **Elastomers:** Characteristics, preparation, properties and applications of Buna-S, Butyl and Thiokol rubber. **Conducting polymers:** Characteristics and Classification with examples, mechanism of conduction in trans-polyacetylene and applications of conducting polymers. **Biodegradable polymers:** Concept and advantages of biodegradable polymers. Preparation of Polylactic acid and poly vinyl alcohol and their applications.

UNIT 4: (~8 Lecture Hours)

Energy sources: Fuels-Introduction, Calorific value of fuel: HCV, LCV, Dulong's formula. Classification of fuels: Solid fuels: coal, analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels : Petroleum and its refining. Cracking types: Moving bed catalytic cracking. Knocking: Octane and Cetane rating. Synthetic petrol - Fischer-Tropsch's process. Gaseous fuels: Composition and uses of natural gas, LPG and CNG. Combustion: Definition, Calculation of air required for the combustion of fuel, numerical problems related to calorific value and combustion. Solar cells: Introduction and applications of Solar cells. Biodiesel: Transesterification and applications. 2G-Ethanol: Synthesis and applications.

UNIT 5: (~8 Lecture Hours)

Engineering Materials: Cement: Portland cement, its composition, setting and hardening of Portland cement. Special cement: Properties and uses of High alumina cement, White cement, and Waterproof cement. **Refractories:** Classification and Characteristics of a good refractory. Properties- Refractoriness and RUL**. Lubricants:** Functions and Classification of lubricants with examples. Characteristics of good lubricants. Mechanism of Lubrication: Thick film, thin film, and extreme pressure. Properties: Viscosity, Cloud and pour point, Flash and fire point.

Text Books:

1. Engineering Chemistry by P.C.Jain and M.Jain,Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by RamaDevi, and Rath, Cengage learning, 2022.
3. A text book of Engineering Chemistry by M. Thirumala Chary,
E. Laxminarayana and K.Shashikala, Pearson Publications,2021.
4. A Textbook of Engineering Chemistry by Y. Bharathi kumari , VGS publications

Reference Books:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi(2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

Online Resources:

1. https://archive.nptel.ac.in/courses/108/106/108106170/
2. https://nptel.ac.in/courses/113105028
3. https://nptel.ac.in/courses/115107116

Course Outcomes:

The basic concepts included in this course will help the students to acquire the knowledge of:

1. The concepts to identify and analyse the hardness of water and its softening techniques in industry and daily usage.
2. The working principles of batteries and their applications in automobile field , corrosion and its prevention.
3. The concepts of various types of polymers, conducting polymers, biodegradable polymers and their applications in industrial and medical fields.
4. Different types of energy sources and their applications in various engineering fields.
5. The usage and applications of various types of cements, lubricants and refractories in engineering field.
6. The potential applications of chemistry in practical utility to become good engineers and entrepreneurs.

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I Year B.Tech, EEE I Semester **L T P C**
Course code:121AG **3 1 0 4**

LINEAR ALGEBRA AND MULTI VARIABLE CALCULUS

(Common to CSE, CSM, CSD, IT, ECE, EEE, ETE & CST)

Prerequisites: Nil

Course Objectives:

1. To learn the concepts of rank of a matrix and applying it to understand the consistency of the system of equations.
2. To solve a system of linear equations.
3. To study properties of Eigen values and Eigen vectors.
4. To find extreme values for functions of several variables.
5. To find the solutions of first and higher order ODE.
6. To evaluate the double and triple integrals for functions of several variables.

UNIT 1: Linear System of Equations (~ 8 Lecture Hours)

Types of real matrices and complex matrices, rank, echelon form, normal form, consistency and solution of linear systems (Homogeneous and Non- homogeneous), LU decomposition method.

UNIT 2:Eigen values and Eigen Vectors (~8 Lecture Hours)

Eigen values, Eigen vectors and their properties. Cayley - Hamilton theorem (only statement), Inverse and powers of a matrix using Cayley - Hamilton theorem, Diagonalization.

UNIT 3:Functions of Several Variables (~ 10 Lecture Hours))

Limit & Continuity (Definitions), Partial derivatives, Chain rules, Total derivative, Differentiation of implicit functions, Jacobian, functional dependency. Maxima and Minima of functions of two variables (with and without constraints) and Lagrange's method of undetermined multipliers.

UNIT 4: Ordinary Differential Equations (~12 Lecture Hours)

First Order ODE – Exact Differential Equations, Differential Equations reducible to exact, Orthogonal trajectories, Law of natural growth & decay.

Linear differential equations of higher order with constant coefficients: Non-homogeneous differential equations with RHS term of the type e^{ax}, *sinax, cosax,* polynomials in *x,* $e^{ax}V(x)$, $xV(x)$, Method of variation of parameters, Applications to Electrical circuits.

UNIT 5: Multiple Integrals and its Applications (~10 Lecture Hours)

Multiple Integrals - Double and Triple integrals, Change of variables, Change of order of integration.

Applications: Finding area as double integrals and volume as triple integrals.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics,1st Edition, Lakshmi Publications.

Reference Books:

1. B.V.Ramana, Higher Engineering Mathematics,1st Edition,Tata McGraw-Hill Publications.
2. E.Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley and Sons Publisher.
3. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, 1st Edition, Oxford Higher Education.
4. R K Jain & S R K Iyengar, Advanced Engineering Mathematics, 5th Edition, Narosa Publishers.

Online Resources:

1. https://nptel.ac.in/courses/111106051
2. https://www.youtube.com/watch?v=mIeeVrv447s

Course Outcomes :

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

CO1 Solve and analyse the solution for the system of equations.
CO2 Compute the Eigen values and Eigen vectors which come across under linear transformations.
CO3 Determine the extreme values of functions of two variables with/ without constraints
CO4 Find the solutions of ordinary differential equations.
CO5 Evaluate double and triple integrals.
CO6 Apply the knowledge of mathematics for real situations.

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I Year B.Tech, EEE I Semester **L T P C**
Course code:121AH **3 0 0 3**

PROGRAMMING FOR PROBLEM SOLVING

(Common to CSE, CSM, CSD, IT,ECE, EEE, ETE & CST)

Prerequisites: -Nil-

Course Objectives:

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To use the syntax and semantics of C Programming Language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To implement C programs in structured programming approach to solve problems.

UNIT 1: (~10 Lecture Hours)
Introduction to Computers: Computer systems, computing environments, computer languages, creating and running programs, program development, algorithms and flowcharts, number systems - binary, decimal, hexadecimal and conversions. **Introduction to C Language**: Background, C programs, identifiers, types, variables, constants, input / output, operators (arithmetic, relational, logical, bitwise etc.), expressions, precedence and associativity, expression evaluation, type conversions.
Statements: Selection statements (making decisions) – if and switch statements.

UNIT 2: (~9 Lecture Hours)
Repetition Statements (Loops): while, for, do-while statements, Loop examples, other statements related to looping – break, continue.
Functions: Designing structured programs, functions, user defined functions, inter function communication, standard functions, scope, storage classes - auto, register, static, extern, scope rules, type qualifiers, recursion-recursive functions, limitations of recursion.

UNIT 3: (~10 Lecture Hours)
Arrays: Concepts, using arrays in C - declaration and definition, accessing elements in array, storing values in arrays, array applications- linear search, binary search and bubble sort, two dimensional arrays, multi-dimensional arrays.
Pointers: Introduction (basic concepts), pointers for inter function communication, pointers to pointers, compatibility, pointer applications - arrays and pointers, pointer arithmetic and arrays, passing an array to a function, memory allocation functions, array of pointers, pointers to void, strings - concepts, C strings, string input / output functions, arrays of strings, string manipulation functions.

UNIT 4: (~9 Lecture Hours)
Enumerated, Structure and Union Types: The type definition (typedef), enumerated types, structures - declaration, initialization, accessing structures, operations on structures, complex structures - nested structures, structures containing arrays, structures containing pointers, arrays of structures, structures and functions, passing structures through pointers, self-referential structures, unions, bit fields.

UNIT 5: (~8 Lecture Hours)
Introduction to files, using files in C, reading data from files- fscanf(), fgets(), fgetc(), fread(), writing data to files- fprintf(), fputs(), fputc(), fwrite(), detecting the end-of-file, error handling during file operations, random access to files, command line arguments, preprocessor commands.

Text Books:

1. B.A.Forouzan and R.F.Gilberg, Computer Science: A Structured Programming Approach Using C, 3rd Edition, Cengage learning.
2. Reema Thareja, Introduction to C Programming, 2nd Edition, Oxford University Press.

Reference Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, 2nd Edition, McGraw-Hill.
2. E.Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
3. B.W.Kernighan and Dennis Ritchie, C Programming Language, 2nd Edition, PHI.

Online Resources:

1. https://drive.google.com/file/d/1Yvq27-sSPOxjJakf1cXpWq76L0F0cu_/view
2. https://cs50.harvard.edu/college/2022/spring/

Course Outcomes:

After completion of the course, students will be able to

1. Relate various computing environments and formulate solutions to problems using algorithms and flowcharts.
2. Understand data types and control structures to solve problems.
3. Divide a problem into functions and synthesize a complete program.
4. Use arrays, pointers and strings to formulate programs.
5. Apply user defined data types to model real world data.
6. Develop solutions to problems using file handling functions.

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I Year B.Tech, EEE I Semester **L T P C**
Course code:121AF **2 0 0 2**

ENGLISH FOR SKILL ENHANCEMENT
(Common to ECE, EEE, ETE & CST)

Prerequisites: NIL

Course Objectives: This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

UNIT 1: (~7 Lecture Hours)

Chapter entitled **'Toasted English'** by R.K.Narayan from "English: Language, Context and Culture" published by Orient Blackswan, Hyderabad. **Vocabulary:** The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading. **Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT 2: (~7 Lecture Hours)

Chapter entitled **'Appro JRD'** by Sudha Murthy from "English: Language, Context and Culture" published by Orient Blackswan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun- pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT 3: (~6 Lecture Hours)

Chapter entitled **'Lessons from Online Learning'** by F.Haider Alvi, Deborah Hurst et al from "English: Language, Context and Culture" published by Orient Blackswan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading
– Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT 4: (~ 6 Lecture Hours)

Chapter entitled **'Art and Literature' by Abdul Kalam** from "English: Language, Context and Culture" published by Orient Blackswan, Hyderabad. **Vocabulary**: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication. **Reading**: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

UNIT 5: (~ 6 Lecture Hours)

Chapter entitled **'Go, Kiss the World'** by Subroto Bagchifrom "English: Language, Context and Culture" published by Orient Blackswan, Hyderabad. **Vocabulary**: Technical Vocabulary and their Usage

Grammar: Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) - Types of Reports - Writing a Report.

Note: Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.

Note: 1. As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is **Open-ended**, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

Note: 2. Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised to teach 40 percent of each topic from the syllabus in blended mode.

Text Books:

1. "English: Language, Context and Culture" published by Orient BlackSwan Pvt. Ltd, Hyderabad. 2023 Print.
2. Fusion: Integrated Reading & Writing by Kepler published by CENGAGE [e-Book]

Reference Books:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood,F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

Online Resources:

1. https://nptel.ac.in/courses/109106116 [English Language for Competitive Exams by Prof.Aysha Iqbal, IIT Madras.]
2. https://onlinecourses.nptel.ac.in/noc22_hs77/preview [Developing Soft skills and Personality by Prof.T.Ravichandran, IIT Kanpur.]

Course Outcomes:

After learning the contents of this course, the students will be able to

CO1 Solve and analyse the solution for the system of equations.
CO2 Compute the Eigen values and Eigen vectors which come across under linear transformations.
CO3 Determine the extreme values of functions of two variables with/ without constraints
CO4 Find the solutions of ordinary differential equations.
CO5 Evaluate double and triple integrals.
CO6 Apply the knowledge of mathematics for real situations.

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Year B.Tech, EEE I Semester **L T P C**
Course code:12102 **0 0 3 1.5**

APPLIED PHYSICS LAB

(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

Course Objectives: Through this course the student is to

1. Determine and classify magnetic materials and electro-magnetization.
2. Determine the type of semiconductor and Study the temperature dependence of resistivity.
3. Bring out the basic characteristics of semiconductor devices.
4. Construct basic electrical circuits and understand the effect of different components of the circuit on the electric parameters.
5. Learn the fundamentals of fiber optics and apply diffraction phenomenon.

Any of the following Ten experiments to be performed :

List of Experiments

1. Biot – Savart's law to verify Magnetic field along the axis of current carrying coil – Stewart and Gees method.
2. Study B-H curve of a magnetic material.
3. To determine Energy gap of a material taken in the form of p-n junction diode.
4. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
5. To study V-I characteristics of a solar cell.
6. V-I characteristics of a p-n junction diode and Zener diode.
7. Measurement of Time constant of an R-C circuit (Charging and Discharging).
8. Resonance Phenomena & Q-factor of L-C-R circuit (Series/Parallel).
9. Evaluation of numerical aperture of a given optical fiber.
10. Bending and attenuation losses of fibers.
11. Dispersive power of the material of a prism – Spectrometer.
12. Wavelength of light and determining the LPI of unknown grating of a diffraction grating using laser.
13. To find Rigidity modulus of given material using Torsional pendulum experiment.
14. Melde's experiment – Transverse and longitudinal modes.
15. Quantum dots.
16. Polarimeter-Polarization of light.

Text Books:

Manual as prepared for the college by the faculty.

Web resources:

1. https://www.vlab.co.in/broad-area-physical-sciences
2. http://www.bsauniv.ac.in/UploadImages/Downloads/PHYSICS-LAB- MANUAL2017-(new-regulation).pdf
3. http://jnec.org/Lab-manuals/FE/Physics.pdf
4. https://www.myphysicslab.com/ (simple simulations)
5. https://www.iist.ac.in/departments/physics-lab
6. https://wci.llnl.gov/simulation

Course Outcomes:

The students will be able to:

1. Handle different instruments, interpret the data and correlate the same with their understanding of its theory.
2. Study the electro-magnetic characteristics and determine hysteresis loss.
3. Determine hall coefficient and energy gap of the semiconductor (taken as a diode).
4. Differentiate Zener and p-n junction diode and to determine fill factor of a semiconductor solar cell.
5. Determine the time constant, resonance and quality of the circuit consisting of R, C &/ L components.
6. Determine wavelength of laser light and differentiate different types of lasers, optical fibers losses.

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I Year B.Tech, EEE I Semester **L T P C**
Course code:12101 **0 0 2 1**

APPLIED CHEMISTRY LAB

(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

Course Objectives: The course consists of experiments related to the principles of chemistry required for an engineering student. The student will learn:

1. To estimate the hardness of water to check its suitability for drinking purpose.
2. To perform the estimation of acids and bases using conductometry, potentiometry and pH metry methods.
3. To prepare polymers such as Bakelite and nylon-6 in the laboratory.
4. The skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Any of the following Ten experiments to be performed: List of Experiments:

I . Volumetric Analysis:
1. Estimation of hardness of water complexometric titration by using EDTA
2. Estimation of ferrous iron by Dichrometry.
3. Estimation of ferrous iron by Permanganometry.

II. Conductometry:
Estimation of the amount of given acid by Conductometry.

III. Potentiometry:
1. Estimation of the amount of given acid by Potentiometry.
2. Estimation of the amount of Fe^{2+} by Potentiometry using Potassium dichromate.

IV. pH Metry:
Determination of an acid concentration using pH meter.

V. Colorimetry:
Estimation of Copper using Colorimetry.

VI. Preparations:
a. Preparation of Bakelite.
b. Preparation Nylon – 6

VII. Lubricants:
a. Estimation of saponification value of a given lubricant oil.
b. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VIII. Virtual lab experiments
a. Batteries for electrical vehicles.
b. Functioning of solar cell and its applications.

Reference Books:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007)

Online Resources:

1. https://www.youtube.com/watch?v=EGV9MBzqdoA
2. http://www.titrations.info/EDTA-titration-water-hardness
3. https://www.youtube.com/watch?v=_0MteudoAqA
4. https://archive.nptel.ac.in/content/storage2/courses/104103071/pdf/m od16.pdf

Course Outcomes:

The experiments will make the student to

1. Understand the concepts of error , its analysis and also to develop the skills to tabulate the experimental data and derive valid conclusions.
2. Have hands on experience in performing the electro-analytical techniques such as Conductometry, Potentiometry and pHmetry.
3. Gain the ability to prepare polymeric materials like Bakelite and Nylon-6.
4. Estimate the Saponification value and viscosity of Lubricant oil.
5. Compare the experimental results with those introduced in lecture, draw relevant conclusions and substantiate.

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I Year B.Tech, EEE I Semester **L T P C**
Course code:12108 **0 0 3 1.5**

PROGRAMMING LAB

(Common to CSE, CSM, CSD, IT,ECE, EEE, ETE & CST)

Prerequisites: -Nil-

Course Objectives:

1. To gain familiarity with the programming environment to edit, compile, run and debug programs.
2. To apply the syntax and semantics of C Programming Language.
3. To develop modular, reusable and readable C programs using the concepts like arrays, functions etc.
4. To implement programs using file handling functions.

List of Experiments:

Week 1: Familiarization with programming environment

Introduction to the working environment, compiling, running and debugging c programs, simple C programs.

Week 2: Simple computational problems using arithmetic expressions

a. Write a C program which reads time required (in hours and minutes) to complete two tasks and then print the total time in hours and minutes.
b. Write a C program which reads five students marks in a test and then prints average mark of passed students (assume that a minimum of 35 is needed to pass) using operators.
c. Assume an object is thrown upwards with some initial velocity, u (in m/sec). Write a C program to find the maximum height which it can reach. Assume acceleration due to gravity is $9.8m^2$ /sec.

Hint: Maximum height, $h=u^2/2g$.

Week 3: Problems involving if-then-else structures and switch statement

a. Write a C program to check whether a given number is even or odd using bitwise operator.
b. Write a C program to find the roots of a quadratic equation.
c. Write a C program to carry out the arithmetic operations addition, subtraction, multiplication, division and modulus using switch statement.

Week 4: Iterative problems

a. Write a C program to find whether a given number is Armstrong or not.
b. Write a C program to determine if the given number is a prime number or not.
c. Write a C program to calculate the following Series:
   $Sum=1-x^2/2!+x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$
d. Write a C program to find the number of even and odd digits in a given number.

Week 5: Simple functions

a. The least common multiple (LCM) of two positive integers a and b is the smallest integer that is evenly divisible by both a and b. Write a C program that reads two integers and calls LCM (a, b) function that takes

two integer arguments and returns their LCM. The LCM (a, b) function should calculate the least common multiple by calling the GCD (a, b) function and using the following relation: LCM (a, b) = ab / GCD (a, b).

b. Write a function to find the factorial of a positive integer.

c. Write a menu-driven C program that allows a user to enter 3 numbers and then choose between finding the smallest, largest, sum, or average. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

d. Write a C program that reads two integers and calls a factorial function to compute ${}^{n}\mathbf{c}_{r}$ value.

Week 6: Recursive functions

a. Write a C program that reads two integers x and n and calls a recursive function to compute x^n.

b. Write a C program that uses a recursive function to solve the Towers of Hanoi problem.

c. Write a C program that uses a recursive function to generate Pascal's triangle.

d. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program which calls a recursive function to generate the first n terms of the sequence.

Week 7: Applications of 1D Array

a. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user using Sieve of Eratosthenes algorithm.

b. Write a C program to implement linear search on a list of integers.

c. Write a C program to implement binary search on a list of integers.

d. Write a C program to implement Bubble sort to sort a given list of integers in ascending order.

Week 8: Applications of 2D arrays

a. Write a C program that reads two matrices and performs Addition of two matrices using functions.

b. Write a C program that reads two matrices and performs Multiplication of two matrices using functions.

Week 9: Applications of Strings

a. Write a C program to perform the following

i) To insert a sub-string into a main string at a given position.

ii) To delete n characters from a given position in a string.

b. Write a C program to determine whether the given string is a palindrome or not.

c. Write a C program to replace a substring with another in a given line of text.

d. Write a C program to Sort Array of Strings.

Week 10: Pointers and Dynamic Memory Allocation

a. Write a C program to find the number of times a given word (i.e., a short string) occurs in a sentence. (i.e., a long string).

b. Using pointers, write a function that receives a character string and a character as argument and deletes all occurrences of this character in the string. Function should return the corrected string with no spaces.

c. Write a C program to find the maximum element from a set of elements. The number of elements will be decided during the execution of the program.

Week 11: Structures

a. Write a menu-based program in C that uses a set of functions to perform the following Operations:
   i) Reading a Complex number
   ii) Writing a complex number
   iii) Addition of two complex numbers
   iv) Subtraction of two complex numbers
   v) Multiplication of two complex numbers
   Represent the complex number using a structure

b. Declare a structure to store the following information of an employee: Employee code, Employee name, Salary, Department number, Date of joining (it is itself a structure consisting of day, month and year). Write a C program to store the data of N employees where N is given by the user (Use dynamic memory allocation). Include a Menu that allows user to select any of the following features:
   i) Use a function to display the employee information who are drawing the maximum and minimum salary.
   ii) Use a function to display the employee records in ascending order according to their date of joining.

Week 12: File Handling

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command-line arguments.
d. Write a C program to reverse the first n characters in a file. The file name and n are specified on the command line. Use fseek function.

Text Books:

1. B.A.Forouzan and R.F.Gilberg, Computer Science: A Structured Programming Approach Using C, 3rd Edition, Cengage learning.

Reference Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, 2nd Edition, McGraw-Hill.
2. Yashavant P. Kanetkar, Let Us C, 13th Edition, Bpb Publications.
3. B.W.Kernighan & Dennis Ritchie, C Programming Language, 2nd Edition, PHI.
4. E.Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill.

Online Resources:

1. https://drive.google.com/file/d/1Yvq27-qsSPOxjJakf1cXpWq76L0F0cu_/view
2. https://cs50.harvard.edu/college/2022/spring/

Course Outcomes:

After completion of the course, students will be able to

1. Use tools to compile, debug, run and test the program.
2. Translate algorithms into executable programs.
3. Implement programs using control structures and arrays.
4. Develop modular and reusable code using functions.
5. Demonstrate usage of pointers, strings and structures.
6. Solve problems using file concepts.

I Year B.Tech, EEE I Semester **L T P C**
Course Code:12105 **0 0 2 1**

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

(Common to ECE, EEE, ETE & CST)

Prerequisites: -Nil-

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

To facilitate computer assisted multimedia instruction enabling individualized and independent language learning.

1. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
2. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
3. To improve the fluency of students in spoken English and neutralize the impact of dialects.
4. To train students to use language appropriately for public speaking, group discussions and interviews

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Listening Skills:

Objectives

1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation.
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions

   Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

   - Listening for general content
   - Listening to fill up information
   - Intensive listening
   - Listening for specific information

Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
   - Oral practice
   - Describing objects/situations/people
   - Role play – Individual/Group activities
   - Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – I CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types-Barriers- Effective Listening. *Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written language- Formal and Informal English. *Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II CALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong

Forms – Stress pattern in sentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises* **ICS Lab**:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III CALL Lab:

Understand: Errors in Pronunciation-Neutralising Mother Tongue

Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*

ICS Lab:

Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks - Non- verbal Communication- Presentation Skills.

Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:

Understand: Group Discussion

Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer *network with LAN facility(minimum40 systems with multimedia) with the following specifications:*

i) Computers with Suitable Configuration

ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab :

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio- visual aids with a Public Address System, a T.

V. or LCD, a digital stereo –audio & video system and camcorder etc.

Source of Material (Master Copy):

Exercises in Spoken English. Part 1,2,3. CIEFL and Oxford University Press

Note: *Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.*

Suggested Software:

1. Cambridge Advanced Learners' English Dictionary with CD.
2. Grammar Made Easy by Darling Kindersley.
3. Punctuation Made Easy by Darling Kindersley.
4. Oxford Advanced Learner's Compass, 10th Edition.
5. English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
6. English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
7. English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
8. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
9. Digital All Orell Digital Language Lab (Licensed Version)

Referred Lab Manual: English Language Communication Skills – Manual cum Workbook published by CENGAGE, 2022

Reference Books:

1. *English Language Communication Skills (2022)– Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN&Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press

NPTEL Courses:

1. https://nptel.ac.in/courses/109103183 [Phonetics and Phonology: A broad overview by Prof. Shakuntala Mahanta, IIT Guwahati]
2. https://nptel.ac.in/courses/109104031 [Communication Skills by Dr T.Ravichandran, IIT Kanpur]

Course Outcomes:

After learning the contents of this course, the students will be able to

CO1 Differentiate between the letters of the alphabet and the phonetic symbols.

CO2 Demonstrate the right pronunciation of the words in English using phonetic transcription and word stress.

CO3 Speak with proper intonation, voice modulation and tonal groups.

CO4 Maximise the listening comprehension skills through various language modules.

CO5 Develop Speaking skills with clarity and confidence individually and in groups to discuss and present the topics chosen and understand the nuances of team dynamics.

CO6 Work individually and discuss in teams to present the topics and demonstrate their public speaking skills and presentation skills through various aids like posters, PPTs etc.,

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I Year B.Tech, EEE I Semester **L T P C**
Course Code:12107 **0 0 2 -**

GENDER SENSITIZATION

(Mandatory Course)
(Common to ECE, EEE, ETE & CST)

Prerequisites: NIL

Course Objectives:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

UNIT 1:

UNDERSTANDING GENDER

Gender: Why Should We Study It? (*Towards a World of Equals:* Unit -1) **Socialization:** Making Women - Making Men (*Towards a World of Equals:* Unit -2) Introduction - Preparing for Womanhood - Growing up Male - First lessons in Caste - Different Masculinities.

UNIT 2:

GENDER AND BIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals:* Unit -4) Declining Sex Ratio - Demographic Consequences. **Gender Spectrum:** Beyond the Binary (*Towards a World of Equals:* Unit -10) Two or Many? - Struggles with Discrimination.

UNIT 3:

GENDER AND LABOUR

Housework: The Invisible Labour (*Towards a World of Equals:* Unit -3) "My Mother doesn't Work." - "Share the Load." **Women's Work:** Its Politics and Economics (*Towards a World of Equals:* Unit -7) Fact and Fiction - Unrecognized and Unaccounted work - Additional Reading: Wages and Conditions of Work.

UNIT 4:

Issues Of Violence

Sexual Harassment: Say No! (*Towards a World of Equals:* Unit -6) Sexual Harassment, not Eve-teasing - Coping with Everyday Harassment- Further Reading: "Chupulu".

Domestic Violence: Speaking Out (*Towards a World of Equals:* Unit -8)

Is Home a Safe Place? -When Women Unite [Film] - Rebuilding Lives - Additional Reading: New Forums for Justice - Thinking about Sexual Violence (*Towards a World of Equals:* Unit -11) - Blaming the Victim -"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT 5:

Gender: Co – Existence

Just Relationships: Being Together as Equals (*Towards a World of Equals:* Unit -12) Mary Kom and Onler - Love and Acid just do not Mix - Love Letters. Mothers and Fathers - Additional Reading: Rosa Parks-The Brave Heart.

Text Book:

"Towards a World of Equals: A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, DeepaSreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

Reference Books:

1. Menon, Nivedita. Seeing like a Feminist, 2012, New Delhi: Zubaan- Penguin Books.
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won- sohaila-abdulal/

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_hs51/preview [Contexualising Gender by Prof.Rasmi Gaur, IIT Roorkee]
2. https://onlinecourses.nptel.ac.in/noc19_hs57/preview [Gender justice and Workplace security by Prof.Dipa Dube, IIT Kharagpur]

Course Outcomes:

After learning the contents of this course, the students will be able to

CO1 Relate the understanding of gender sensitization to basic dimensions of the biological, sociological, psychological and legal aspects of gender throughdiscussion of materials derived from research, facts, everyday life, literature and film.

CO2 Develop a finer grasp of how gender discrimination works in our society and how to counter it.

CO3 Maximize their insight into the gendered division of labour and its relationto politics and economics.

CO4 Perceive the genders Men and women as professionals equipped to work and live together as equals.

CO5 Develop a sense of appreciation of women in all occupations.

CO6 Identify, Understand and respond to Gender issues and to address them legally protecting and safeguarding the individual's rights.

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I Year B.Tech, EEE II Semester **L T P C**
Course Code:122AK **3 1 0 4**

NUMERICAL TECHNIQUES AND TRANSFORM CALCULUS
(Common to CSE, CSM,CSD, IT,ECE, EEE, ETE & CST)

Prerequisites: -Nil-

Course Objectives:

1. To learn an alternative method for analytical methods in mathematical concepts.
2. To apply numerical techniques in solving ordinary differential equations.
3. To study the properties of vector valued functions and differential operators.
4. To attain the knowledge on integrals of vector valued functions.

UNIT 1: Numerical Techniques - I (~9 Lecture Hours)

Numerical Solutions of Algebraic and Transcendental Equations: Introduction, Bisection Method, Regula-Falsi method, Iteration method and Newton Raphson method.

Solving linear system of equations by Gauss-Jacobi and Gauss-Seidel method.

Curve Fitting: Fitting a linear, second degree, exponential curve by method of least squares for the discrete data.

UNIT 2: Numerical Techniques - II (~9 Lecture Hours)

Numerical integration: Newton-Cote's Quadrature Formula, Trapezoidal Rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ Rule.

Numerical solution of Ordinary Differential Equations: Solution of ordinary differential equations by Taylor's Series, Picard's method of successive approximations, Euler's and Modified Euler's method, Fourth Order Runge-Kutta Method.

UNIT 3: Laplace Transforms (~ 10 Lecture Hours)

Laplace Transforms - Laplace Transform of Standard functions, First and Second Shifting Theorems, Transforms of derivatives and integrals, Multiplication and Division by 't', Laplace Transform of Periodic Function, Unit Step function, Dirac's Delta function.

Inverse Laplace Transform- Method of Partial Fractions, Convolution theorem (only statement), First and Second shifting theorem.

Applications of Laplace Transforms to Ordinary Differential Equations.

UNIT 4: Vector Differentiation (~10 Lecture Hours)

Scalar and Vector point functions, Gradient, Divergence, Curl and related properties, Unit Normal Vector, Directional Derivatives and Angle between the surfaces, Laplacian operator, Vector identities.

UNIT 5:Vector Integration and Integral Theorems (~10 Lecture Hours) **Vector Integration** - Line Integral-Work Done-Potential function, Area, Surface and Volume Integral.

Vector Integral Theorems: Green's theorem, Stoke's theorem and Gauss's divergence theorem (only statements) and their Verification.

Text Books:

1. Dr.B.S Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, Numerical Methods for Science and Engineering Computation, 6th edition, New Age International Publishers.

Reference Books:

1. R K Jain & S R K Iyengar, Advanced Engineering Mathematics, 5th Edition, Narosa Publishers.
2. Murray R Spiegel and Seymour Lipschutz, Vector Analysis, 2nd Edition, Schaums' Outlilne Series.
3. S.S.Sastry, Introductory Methods of Numerical Analysis, 5th edition, PHI Learning Pvt. Ltd.

Online Resources:

1. https://nptel.ac.in/courses/111106101
2. https://nptel.ac.in/courses/111107108

Course Outcomes:

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

CO1 Find the root of the algebraic and Transcendental equation and solution of a linear system of equations.

CO2 Fit a curve for the given data.

CO3 Find the Numerical solutions for a given first order initial value problem and evaluate definite integral numerically.

CO4 Learn Laplace Transform techniques and apply for solving ODE.

CO5 Understand the concepts of Gradient, Divergence and Curl of a Vector and scalar point functions.

CO6 Evaluate the line, surface and volume integrals.

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I Year B.Tech, EEE II Semester **L T P C**
Course Code: 122AJ **3 0 0 3**

DATA STRUCTURES

(Common to ECE,EEE,ETE & CST)

Prerequisites: Programming for Problem Solving

Course Objectives:

1. Understand the notations used to analyze the performance of algorithms.
2. Understand and analyze various searching and sorting algorithms.
3. Understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, graphs and their representations.
4. Choose an appropriate data structure for a specified application.

UNIT 1: (~10 Lecture Hours)

Basic Concepts: Algorithm-Introduction, Performance analysis – Time Complexity and Space Complexity, Asymptotic Notation – Big O, Omega and Theta notations, Complexity Analysis Examples.

Introduction to Data Structures: Linear and Non-linear data structures.

Review of Pointers: Pointers, Self-referential structures

Linear List: Array and Linked Representations, Singly Linked List, Operations – Insertion, Deletion and Searching, Circularly Linked List, Operations – Insertion, Deletion and Searching, Doubly Linked List, Operations– Insertion, Deletion and Searching, Applications of Linked List – Sparse matrix**.**

UNIT 2: (~9 Lecture Hours)

Stack: Definition, Array and Linked implementations, Applications– Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion.

Queue: Definition, Array and Linked implementations, Circular Queues–Insertion and Deletion Operations.

UNIT 3: (~8 Lecture Hours)

Trees: Definitions, Terminology, Applications, Properties, Binary Tree - Array and Linked representations, Binary Tree Traversals, Threaded Binary Tree-Definition.

Priority Queues: Definition and Applications, Max Priority Queue – Implementation, Max Heap - Definition, Insertion and Deletion.

UNIT 4: (~8 Lecture Hours)

Searching: Linear Search, Binary Search, Hashing: Introduction, Hash Tables, Hash Functions, Overflow Handling.

Dictionaries: Linear List Representation, Hash Table Representations, Operations - Insertion, Deletion and Searching.

Sorting: Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Methods.

UNIT 5: (~ 10 Lecture Hours)

Graph: Definitions, Terminology, Applications, Properties, Graph Representations - Adjacency Matrix, Adjacency Lists, Graph Traversal Methods – DFS and BFS

Search Trees: Binary Search Trees, Definition, Operations- Searching, Insertion and Deletion.

Balanced Search Trees: AVL Trees- Definition and Insertion, B-Trees-Definition and Examples, Comparison of Search Trees.

Text Books:

1. E. Horowitz, S. Sahni and Susan Anderson Freed, Fundamentals of Data Structures in C, 2nd Edition, Universities Press.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson.

Reference Books:

1. Reema Thareja, Data structures using C, 2nd Edition, Oxford higher education.
2. A. S. Tanenbaum, Y. Langsam and M.J. Augenstein, Data Structures using C, PHI/Pearson Education.
3. R. F. Gilberg and B.A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd Edition, Cengage Learning.
4. D. Malhotra, N. Malhotra, Data Structures and Program Design Using C: A Self-Teaching Introduction, Mercury Learning and Information.
5. D. Samanta, Classic Data Structures, 2nd Edition, PHI.

Online Resources:

1. www.geeksforgeeks.org/data-structures
2. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

Course Outcomes:

After completion of the course, students will be able to

1. Determine and analyze the complexity of given algorithms.
2. Use basic data structures such as linked list, stack and queue.
3. Implement various kinds of searching and sorting techniques.
4. Design programs using advanced data structures like hash tables, binary trees, heaps and graphs.
5. Build and compare search trees and balanced search trees.
6. Choose appropriate data structures as applied to specified problem definition.

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I Year B.Tech. EEE II -Semester **L T P C**
Course Code: 122AC **3 0 0 3**

BASIC ELECTRICAL ENGINEERING

(Common to EEE, ECE, ETE & CST) Pre Requisites: Physics

Course Objectives:

1. Concepts of Basic Magnetic and Electrical AC&DC Circuits.
2. Understand the concepts of Electrical Machines
3. To understand the VI characteristics of various Electronic components like Diode, BJT and SCR.

Unit-1: Magnetic Circuits and DC Circuits (~11 Lecture Hours)

Magnetic Circuits: Flux, flux density, Magnetic field Intensity, reluctance, MMF, Faraday's laws of Electromagnetic induction – statically & dynamically induced EMF-Lenz's law - Fleming's rules, Simple problems

DC Circuits: Electrical Circuit elements: R, L and C, voltage and current sources, KCL & KVL, Analysis of simple DC Circuits, Nodal and Mesh analysis of simple circuits with DC excitation, Simple problems.

Unit -2: Single Phase AC Circuits (~10 Lecture Hours)

Network Theorems: Superposition, Thevenin's and Norton's Theorems with independent sources (DC excitation only), Simple Problems.

1- φAC Circuits: Representation of sinusoidal waveforms, Average and RMS values, phasor representation, power factor; Impedance and Power triangles, Resonance in Series RLC Circuit.

Unit-3: DC Machines & Batteries (~9 Lecture Hours)

DC Machines:

DC Generators: Construction, principle of operations and types, EMF equations, simple problems.

DC Motors: Principle of operation, significance of Back EMF, Torque equation, Characteristics & applications, losses & efficiency, Direct Load test.

Batteries: Types, ratings and Applications.

Unit-4: AC Machines (~7 Lecture Hours)

Transformers: Construction, Principle of Operation, EMF Equation, Losses and efficiency (Direct Load Test)

Induction motors: Construction, Principle of Operation, Production of rotating magnetic field, Speed-Torque characteristics, Applications, simple Problems.

Synchronous Generators – Construction, Classification, Principle of Operation.

Synchronous Motors – Principle of operation and applications.

Unit-5: Basic Electronics (~7 Lecture Hours)

Operation of PN Junction Diode, BJT & SCR and their Static Characteristics, Half wave and Full wave Diode bridge rectifiers.

Text Books:

1. T.K.Nagasarkar and M.S.Sukhija, Basic Electrical Engineering, Oxford University Press, 3rd Edition, 2018.
2. D.P.Kothari and I.J.Nagrath Basic Electrical Engineering, Tata McGraw Hill, 3rd Edition, 2010.
3. Dell, Ronald M Rand, David A J, 'Understanding Batteries', Royal Society of Chemistry, (2001).
4. D.P.Kothari and I.J.Nagrath Theory and problems of Basic Electrical Engineering, PHI, 2016.

Reference Books:

1. P. S. Bimbhra, Power Electronics Khanna Publications, 2018.
2. D.C.Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 1st Edition, 2009.
3. Jimmie J. Cathey , Syed A. Nasar, Basic Electrical Engineering, Schaum's Outline.
4. Huges, Electrical and Electronic Technology, Person, 2010.

Course Outcomes:

After completion of the course students should be able to:

1. Explain and analyze the magnetic and electric circuits.
2. Analyze the basic circuits with application of Network Reduction Techniques and Network Theorems.
3. Demonstrate the working principles of DC Electrical machines.
4. Demonstrate the working principles of transformers and various AC Machines.
5. Demonstrate the principle and operation of various Electronic devices like Diode, BJT and SCR.

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I Year B.Tech. EEE II -Semester **L T P C**
Course Code: 122AE **1 0 3 2.5**

ENGINEERING GRAPHICS

(Common to ECE, EEE, ETE & CST)

Course Objectives:

The course will enable the students

1. To impart skills of drawing instruments and their use to convey exact and complete information of any object.
2. To construct conics and cycloidal curves used for various engineering applications.
3. To impart knowledge about standard principles of orthographic projection of objects
4. To develop different surfaces of simple solids.
5. To differentiate between isometric view and projection and conversion of isometric views to orthographic views vice-versa.
6. To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products.

UNIT 1: (~ 3 Lecture Hours and 9 Practical Hours)

Introduction to Engineering Graphics: Principles of Engineering Graphics and their significance.

Scales- Plain & diagonal.

Conic Sections-Construction of ellipse, parabola and hyperbola (general method only).

Cycloidal curves: Cycloid, Epicycloid and Hypocycloid (general methods only).

UNIT 2: (~ 3 Lecture Hours and 9 Practical Hours)

Orthographic Projections: Principles of orthographic projections- conventions- Projections of points in all positions; projection of straight lines-line inclined to one reference plane and with two reference planes (excluding traces and midpoint problems).

UNIT 3: (~ 3 Lecture Hours and 9 Practical Hours)

Projections of Planes: Plane inclined to one reference plane and with two reference planes.

Projections of Solids: Projections of solids (prisms, pyramids, cylinders and cones) in simple position and axis inclined to one reference plane only.

UNIT 4: (~ 3 Lecture Hours and 9 Practical Hours)

Development of Surfaces: Basic concepts of development of surfaces, Methods of development – Parallel line development and radial line development, Development of prisms, pyramids, Cylinders and cones.

UNIT 5: (~ 4 Lecture Hours and 12 Practical Hours)

Isometric Projection: Principles of Isometric Projection – Isometric Scale Isometric Views – Isometric views of Lines, Planes and Simple Solids only. **Orthographic Views:** Conversion of Isometric Views to Orthographic Views.

Introduction to computer aided drafting (**For internal evaluation weightage only**) Introduction to Computer Aided Drafting, views and commands, orthographic projection of points, lines, planes and solids. Conversion of orthographic projection into isometric view.

Note: Syllabus for external examination will be from 1-5 units in conventional mode and introduction to computer aided drafting is exempted from the external examination.

Text Books:

1. Basanth Agrawal, Agrawal C.M., Engineering Graphics, First Edition, 2018, Tata McGraw Hill.
2. Bhatt N.D., Engineering Drawing, fifty third edition, 2016, Charotar Publishing house pvt. limited.

Reference Books:

1. Venugopal.K, Engineering Drawing and Graphics Plus Autocad, 2010, New Age International (P) Ltd., New Delhi.
2. Dhananjay A Jolhe, Engineering Drawing, 2014, Tata McGraw Hill.
3. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.
4. Computer Aided Engineering Drawing – K Balaveera Reddy – CBS Publishers & distributors,2015

Online Resources:

1. www.engineeringdrawing.org
2. Virtual labs (www.vlab.co.in)

Course Outcomes:

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

1. Acquire proficiency in instrumental drawing and will be able to visualize the object, draw conic sections and cycloidal curves.
2. Draw and understand about orthographic projections of points, straight lines.
3. Improve visualization skills in different types of planes and solids.
4. Draw and understand about the development of surfaces of various solids.
5. Ability to read, understand and interpret engineering drawings.
6. Apply computer aided drafting tools to create objects.

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I Year B.Tech. EEE II -Semester **L T P C**
Course Code: 12204 **1 0 3 2.5**

ENGINEERING WORKSHOP

(Common to ECE, EEE, ETE & CST)

COURSE OBJECTIVES: The course will enable the students

1. To gain a good basic working knowledge required for the production of various engineering products.
2. To provide hands on experience about use of different Engineering materials, tools, equipment's and processes that are common in the Engineering field.
3. To develop a right attitude, team working, precision and safety at work place.
4. To study commonly used carpentry joints.
5. To have practical exposure to various welding and joining processes.

I) TRADES FOR EXERCISES: (12 lectures +36Practices)

At least two exercises from each trade:

i) Carpentry
ii) Fitting
iii) Tin-Smithy and Development of jobs carried out and Soldering
iv) House-wiring
v) Foundry
vi) Black smithy

II) TRADES FOR DEMONSTRATION and EXPOSURE:

i) Plumbing
ii) Welding

Text Books:

1. B.L. Juneja , "Workshop Practice", Cengage publications.
2. K. Venugopal , " Workshop Manual", Anuradha Publications.

Reference Books:

1. P. Kannaiah & K. L. Narayana, "Workshop Manual", 2nd Ed., Scitech publications (I) Pvt. Ltd., Hyderabad, 2015
2. K. Venugopal, Dr. V. Prabhu Raja, G. Sreekanjana ,"Workshop Manual" 1st Edition, Anuradha Publications, 2012
3. Hajra Choudury S.K., Hajra Choudury A.K. and Nirjhar Roy S.K.," Elements of Workshop Technology", Media Promoters and Publishers private limited, Mumbai, vol I 2008 and Vol II 2010

Online Resources:

1. www.technologystudent.com

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

1. Demonstrate and understand the Engineering workshop safety regulations.
2. Identify and use marking tools, measuring equipment and to work to prescribed accuracies.
3. Understand the practical difficulties encountered in industries during any assembly work.
4. Do simple electrical work through their carrier.
5. Design different prototype in the fittings, carpentry, foundry, black smithy and sheet metal work.

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I Year B.Tech.EEE II-Semester **L T P C**
Course Code: 12209 **0 0 3 1.5**

DATA STRUCTURES LAB

(Common to ECE, EEE, ETE & CST)

Prerequisites: Programming for Problem Solving

Course Objectives:

1. Write data structure programs using arrays, structures and pointers.
2. Develop applications using linear data structures such as linked lists, stacks and queues.
3. Learn to write programs to implement various sorting and searching algorithms.
4. Write programs to implement various non-linear data structures like trees, graphs and search trees.

List of Experiments:

Week 1: Write a C program to create structure with the name – student, which contains the fields - name, rollno and gender. With the help of pointer read and display the student details.

Week 2: Write a C program that uses functions to perform the following operations on a singly linked list of integers:
a. Creation b. Insertion c. Deletion d. Display

Week 3: Write a C program that uses functions to perform the following operations on a doubly linked list:
a. Creation b. Insertion c. Deletion d. Display

Week 4: Write a C program to implement stack using an array and a linked list.

Week 5: Write a C program that uses stack operations to convert a given infix expression into its postfix equivalent. Implement the stack using an array.

Week 6: Write a C program to implement a queue using an array and a singly linked list.

Week 7: Write a C program that uses functions to perform the following:
a. Search for a key element in a list of elements using linear search.
b. Search for a key element in a list of sorted elements using binary search.
c. To arrange a list of elements in ascending order using insertion sort.

Week 8: a. Write a C program that implements selection sort algorithm to arrange a list of elements in descending order.
b. Write a C program that implements heap sort algorithm for sorting a list of integers in ascending order.

Week 9: a. Write a C program that implements quick sort algorithm to arrange a list of elements in ascending order.
b. Write a C program that implements merge sort algorithm for sorting a list of integers in ascending order.

Week 10: Write a C program to implement all the functions of a dictionary using hashing.

Week 11: Write a C program that uses functions to perform the following:
a. Create a binary search tree of integers.
b. Traverse the above binary search tree recursively in preorder, inorder and postorder.
c. Search for an integer key in the above binary search tree recursively.
d. Traverse the above binary search tree non-recursively in inorder.

Week 12: Write a C program to perform the following:
a. Traverse a given graph using DFS algorithm.
b. Traverse a given graph using BFS algorithm.

Text Books:

1. E. Horowitz, S. Sahni and Susan Anderson Freed, Fundamentals of Data Structures in C, 2nd Edition, Universities Press.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson.

Reference Books:

1. Reema Thareja, Data structures using C, 2nd Edition, Oxford higher education.
2. A. S. Tanenbaum, Y. Langsam and M.J. Augenstein, Data Structures using C, PHI/Pearson Education.
3. R. F. Gilberg and B.A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd Edition, Cengage Learning.
4. D. Malhotra, N. Malhotra, Data Structures and Program Design Using C: A Self-Teaching Introduction, Mercury Learning and Information.
5. D. Samanta, Classic Data Structures, 2nd Edition, PHI.

Online Resources:

1. www.geeksforgeeks.org/data-structures
2. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

Course Outcomes:

After completion of the course, students will be able to
1. Use arrays, structures and pointers for implementing various data structures.
2. Implement various kinds of searching algorithms.
3. Implement various internal and external sorting algorithms.
4. Develop the programs for various linear data structures like stack, queue and linked list.
5. Implement non-linear data structures like graphs and trees.
6. Choose the appropriate data structure for solving real world problems.

I Year B.Tech.EEE II-Semester **L T P C**
Course Code: 12203 **0 0 3 1.5**

BASIC ELECTRICAL ENGINEERING LAB

(Common to EEE, ECE, ETE & CST)

Course Objectives:

1. To verify the Network Theorems and understand the usage of common electrical measuring instruments.
2. To understand the basic characteristics of Transformers and Electrical Machines.
3. To understand the VI characteristics of various Electronic components like Diode, BJT and SCR.

PART-A (Compulsory)

1. Verification of KCL&KVL.
2. Verification of Superposition theorem with DC excitation.
3. Verification of Thevenin's & Norton's theorems with DC excitation.
4. Direct Load Test on Single Phase Transformer
5. OCC Test on DC Shunt Generator
6. Torque-Speed characteristics of a 3 -φ Induction Motor by conducting Load Test.
7. V- I Characteristics of PN Junction Diode and Zener Diode.
8. V-I Characteristics of SCR.

PART-B(Any two experiments)

1. Study of different types of batteries.
2. Determination of Resonant frequency & Bandwidth for a series RLC resonance circuit.
3. Output waveforms of Half wave and full wave bridge Rectifiers.
4. Static output and input characteristics of BJT.

Course Outcomes:

After completion of the course students should be able to:

1. Perform and verify different theorems with D.C excitation.
2. Perform and analysethe simple D.C circuits .
3. Perform the characteristics of DC Machines.
4. Perform different tests on the transformers and various AC Machines.
5. Perform various characteristics on Electronic devices like Diode and SCR.

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I Year B.Tech.EEE II-Semester **L T P C**
Course Code: 122AD **2 0 0 2**

DESIGN THINKING

(Common to ECE, EEE, ETE & CST)

Course Objectives: The main objectives of this course are to

1. To inculcate attitude to solve societal problems using design thinking tools.
2. To come-up with proper design which further leads to successful products or enterprises.
3. To instill a sense of significance towards applying creativity to product and service design.

UNIT 1: (~ 6 Lecture Hrs)

Introduction to Design Thinking: Origin of Design thinking, Importance of Design thinking, Understanding Design thinking: A non- linear process - 5- stage d.school process model, Application of design thinking.

UNIT 2: (~ 7 Lecture Hrs)

Empathy: Difference between Empathy and Sympathy, Role of Empathy in design thinking, Empathy mapping, Understanding empathy tools: Customer Journey map, Persona; Importance of Empathizing before Ideating.

Define: Explore define phase in Design Thinking, Methods of Define phase.

UNIT 3: (~ 6 Lecture Hrs)

Ideation: Introduction, Types of Thinking- convergent, divergent, critical and creative thinking; Ideation Methods- Brainstorming, Storyboarding, Bingo Selection**,** Six Thinking Hats, Mind mapping.

UNIT 4: (~ 6 Lecture Hrs)

Prototyping and Testing: Prototyping and methods of prototyping. User testing methods, Advantages and disadvantages of user Testing/ Validation. Iteration and Pitching.

UNIT 5: (~ 7 Lecture Hrs)

Innovation: Definition, Innovation and creativity, Innovation Triangle- Desirability, Feasibility and Viability; Types of Innovation – Product Innovation, Process Innovation and Business model Innovation.

Design thinking in various sectors: Design thinking to meet corporate needs. Case studies in Information Technology, Finance, Education, Management, Health care and Retail sector.

Textbooks:

1. Daniel Ling, Complete Design Thinking Guide for Successful Professionals, 2015, Create Space Independent Publishing.
2. Andrew Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone, 2019, Routledge Taylor and Francis group.

References:

1. Idris Mootee, Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design school, 2013, John Wiley & Sons.

2. TimBrown,Change by Design_ How Design Thinking Transforms Organizations and Inspires Innovation, 2009, Harper Bollins.
3. George E Dieter, Engineering Design, 5th-edition, 2013, The McGraw- Hill Companies.

Online Resources:

1. https://www.interaction-design.org/
2. https://designthinking.ideo.com/
3. https://www.innovationtraining.org/design-thinking-mindsets/
4. https://onlinecourses.nptel.ac.in/noc20_mg38/preview
5. https://www.ideou.com/blogs/inspiration/what-is-design-thinking

Course Outcomes:

After completion of this course, student will be able to

1. Understand the importance of various phases of Design Thinking.
2. Empathize with the customers and formulate specific problem statement.
3. Generate an idea through ideation techniques.
4. Understand various prototyping methods and Iterate solutions.
5. Understand innovation, and application of design thinking in various sectors.

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I Year B.Tech. EEE II -Semester **L T P C**
Course Code:12206 **2 0 0 -**

ENVIRONMENTAL SCIENCE AND TECHNOLOGY

(Common to ECE, EEE, ETE & CST)

Pre requisites: Knowledge on Environmental Issues, natural resources, biodiversity, sustainable development.

Course Objectives:

1. To imbibe the importance of ecological balance for sustainable development.
2. To acquire the knowledge on the impacts of developmental activities and mitigation measures.
3. To study the international and national environmental policies and regulations.

UNIT 1: (~ 6 Lecture Hours)

Eco Systems: Definition, Scope, and Importance of ecosystem (ecosystem value, services and carrying capacity), classification, structure, and functions of an ecosystem (food chains, food webs, and ecological pyramids. flow of energy, Bio - Geo Chemical Cycles), Bio accumulation, Bio-magnification, Field visits.

UNIT 2: (~ 6 Lecture Hours)

Natural Resources: Classification of Natural Resources and their uses: Living and Non-Living resources, **Water resources:** use and over utilization of surface and ground water, floods and droughts, dams benefits and problems.**Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources: Forest resources**, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT 3: (~ 6 Lecture Hours)

Bio diversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; (consumptive use, productive use, social, ethical, aesthetic and optional values). India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: (habitat loss, poaching of wildlife, man-wildlife conflicts); conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act, Field Trip to nearby lake.

UNIT 4: (~ 7 Lecture Hours)

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, causes, effects and control methods of **Air Pollution, Water Pollution, Soil Pollution and Noise Pollution: Solid Waste and its Management:** and characteristics of e -Waste and its management. Swach Bharat Mission – Save Soil Campaign

Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone Depleting Substances (ODS). International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives. Environmental Control of Epidemics and Pandemics.

UNIT 5: (~ 7 Lecture Hours)

Environmental Policy, Legislation & EIA: Salient Features of Environmental Protection Act, Air Act-1981, Water Act, Forest Act, Wild life Act, National Green Tribunal Act, 2010 Municipal Solid Waste (Management and Handling) Rules, Bio- medical Waste (Management and Handling) Rules, Hazardous Waste (Management

and Handling) Rules, e -Waste (Management and Handling) Rules. EIA: Concept of EIA and importance of EIA.

Towards Sustainable Future: Concept of Sustainable Development Goals, Crazy Consumerism, Urban Sprawl, Human health, Concept of Green Building, Ecological Foot Print, Life Cycle Assessment (LCA), Low Carbon Life Style. Environmental Ethics and Economics.

Text Books:

1. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, University Grants Commission.
2. R. Rajagopalan, Environmental Studies, Oxford University Press.

Reference Books:

1. Richard T. Wright., Environmental Science: towards a sustainable future, PHL Learning Private Ltd. New Delhi, 2008.
2. Gilbert M. Masters and Wendell P. Ela., Environmental Engineering and science PHI Learning Pvt. Ltd., 2008.
3. Daniel B. Botkin & Edward A. Keller, Environmental Science, Wiley INDIA Edition.
4. Anubha Kaushik, Environmental Studies, 4th Edition, New age international publishers.
5. Dr. M. Anji Reddy, Textbook of Environmental Science and Technology, BS Publications, 2007.
6. Y. Anjaneyulu, Introduction to Environmental Science, BS. Publication.

Online Resources:

1. https://www.epa.gov/students/lesson-plans-teacher-guides-and- online-environmental-resources-educators.
2. https://onlinecourses.swayam2.ac.in/cec20_hs10/preview
3. https://open.ed.ac.uk/environment-sustainability-resources/
4. https://onlinepublichealth.gwu.edu/resources/sources-for- climate-news/

Course Outcomes:

After completion of the course, students will be able to

1. Based on this course, the Engineering graduate will understand/evaluate/develop technologies based on ecological principles and environmental regulations, which in turn helps in sustainable development.
2. Acquire the knowledge on ecological principles and functions of eco systems and their importance for survival.
3. Develop the knowledge on role of natural resources for sustenance of life.
4. Analyze the concepts of bio - diversity and its role in the maintenance of ecological balance.
5. Evaluate the various causes, effects, control/mitigation of environmental pollution on man and environment.
6. Follow the environmental legislations in their daily life and professional practice to protect the environment.

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II Year B.Tech. EEE I -Semester **L T P C**
Course Code: 123AX **3 0 0 3**

SPECIAL FUNCTIONS AND COMPLEX VARIABLE THEORY

(Common to ECE, EEE, ETE & CST)

Prerequisites: Nil

Course Objectives:

1. To introduce effective mathematical tools for the solution of partial differential equations.
2. Differentiation and integration of functions of complex variable that are used in various techniques dealing in engineering problems.
3. To evaluate the real integrals by representing into Beta and Gamma functions

UNIT 1 : Beta and Gamma Functions (~ 08 lectures)

Beta function, Properties of Beta function, express the integral in terms of Beta function.

Gamma function, properties of gamma function, relation between Beta and Gamma functions, evaluation of integrals by using Beta - Gamma functions.

UNIT 2 :First Order Partial Differential Equations (~ 08 lectures)

Formation of partial differential equations by the elimination of arbitrary constants and arbitrary functions. Lagrange's method to solve first order linear equations and the standard type methods to solve first order non linear equations.

UNIT 3 : Analyticity of complex functions (~12 lectures)

Limit, continuity, differentiability, analyticity of complex functions and its properties, Cauchy-Riemann equations in Cartesian and polar coordinates, Harmonic functions, Milne-Thomson Method.

UNIT 4 :Complex Integration (~10 lectures)

Simply and multiply connected domains (definitions), Cauchy's integral theorem, Cauchy's integral formula, Cauchy's generalized integral formula.

Power series, Taylor's theorem, Laurent's theorem (only statement), classification of singular points.

UNIT 5 : Residue Calculus (≅10 lectures**)**

Calculus of residues, Residue theorem (only statement), evaluation of real definite integrals of the types

a) $\int_c^{c+2\pi} f(cos\theta, sin\theta)d\theta$ b) $\int_{-\infty}^{\infty} f(x)dx$

Text Books:

1. J.N.Sharma, Functions of A Complex Variables, 49th Edition, Krishna Prakashan Publishers.
2. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

Reference Books:

1. H.S.Kasana, Complex Variables-Theory and Applications, 2nd Edition, Eastern Economy Edition.
2. Ravish R Singh and Mukhul Bhatt, Engineering Mathematics: A Tutorial Approach, 2nd Edition, McGraw Hill Education.
3. James Ward Brown & Ruel, V.Churchill, Complex Variables and Applications, 8th Edition, International Edition.

Online Resources:

1. https://www.youtube.com/watch?v=JoyvDWZ0aMY
2. https://youtu.be/Mwpz1zjPlzI

Course Outcomes:

After completing the course the student will be able to

CO1 Evaluate the integral using Beta – Gamma functions.
CO2 Solve first order partial differential equations.
CO3 Understand about analyticity of complex valued functions and its properties.
CO4 Integrate a complex function over a given contour.
CO5 Expand a complex function in a given region of convergence using Taylor's and Laurent's series.
CO6 Apply knowledge of complex integrals for evaluation of real integrals.

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II Year B.Tech.EEE, I-Semester **L T P C**
Course Code:123AV **2 0 0 2**

PYTHON PROGRAMMING

(Common to CSE, CSM, CSD, IT, ECE, EEE, ETE & CST)

Prerequisites: -Nil-

Course Objectives:

1. Learn syntax and semantics and create functions in Python.
2. Facilitate learning to use lists, tuples, strings and dictionaries in Python programs.
3. Impart knowledge on files and exception handling in Python.
4. Introduce GUI programming and data handling.

UNIT 1: (~5 Lecture Hours)

Introduction to Python Programming: Using Python, The IDLE Programming Environment, Input, Processing and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, More about Data Output: New line, Item Separator, Escape Characters, Formatting parameters.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

UNIT 2: (~5 Lecture Hours)

Repetition Structures: Introduction, while loop, for loop, Sentinels, Input Validation Loops, Nested Loops.

Functions: Introduction, Defining and Calling a Function, designing a Program to use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions: Generating Random Numbers, Writing Our Own Value-Returning Functions, Recursion.

UNIT 3: (~6 Lecture Hours)

Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples.

Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings.

Dictionaries and Sets: Dictionaries, Sets, Serializing Objects.

UNIT 4: (~6 Lecture Hours)

Files and Exception: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.

Modules: Namespaces, Importing Modules, Importing Module attributes, Module built-in functions, Packages, other features of Module.

Regular Expressions: Introduction, Special Symbols and Characters, REs and Python.

UNIT 5: (~ 6 Lecture Hours)

GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Introduction to Plotting in Python – Basic Plots- Line and Scatter Plot, box plot, bar plots, Histograms and plotting data contained in files.

Text Books:

1. Tony Gaddis, "Starting Out with Python", 3rd Edition, Pearson, 2015.
2. Wesley J. Chun, Core Python Programming, 2nd Edition, Pearson.

Reference Books:

1. Reema Thareja "Python Programming", Oxford Press, 2017.
2. Allen Downe, "Think Python: How to Think like Computer Scientist", 2nd Edition, O'Reilly publications.

Online Resources:

1. https://www.python.org/
2. https://www.w3schools.com/python/
3. https://www.tutorialspoint.com/python/index.htm
4. https://www.digimat.in/nptel/courses/video/106106182/L01.html
5. https://www.geeksforgeeks.org/simple-plot-in-python-using-matplotlib/

Course Outcomes:

After completion of the course, students will be able to

1. Understand the fundamental concepts of Python Programming.
2. Apply the concepts of control structures and usage of functions in Python Programming.
3. Design Python programs using data structures like List, Tuple, Strings and Dictionaries.
4. Develop proficiency in handling files, exceptions and modules.
5. Construct regular expressions and design GUI based applications using Python.
6. Interpret various data visualization techniques.

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II Year B.Tech. EEE I -Semester **L T P C**
Course Code: 123AL **3 0 0 3**

ANALOG ELECTRONICS

Prerequisites: Physics

Course Objectives:

1. To understand the characteristics of Diodes, Transistors and Op- Amp.
2. To analyze various configurations of BJT and MOSFET.
3. To Design various biasing and amplifier circuits.
4. To explore various applications of Diodes and Op-Amp.

UNIT 1: (~ 8 lecture Hours)

Review on Diodes: V-I characteristics of PN Junction Diode, Diode current equation, piecewise linear characteristics of PN diode, Zener Diode.

Applications of P-N Junction Diode: Basic operation of half wave and full wave rectifiers without filters, clippers (Series and Shunt Clippers, Clipping at two independent levels), Clampers, Voltage regulators using Zener diode, Varactor Diodes and applications.

UNIT 2: (~10 lecture Hours)

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, BJT as a switch, BJT as an Amplifier: Common Emitter,Common Base and Common Collector configurations.

Transistor Biasing: Operating point, DC & AC load lines, Biasing - Voltage divider bias, Bias stability.

Small Signal Low Frequency Model of BJT: BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, direct coupled multistage amplifiers.

UNIT 3: (~9 lecture Hours)

MOSFET: MOSFET Construction and Principle of operation, Symbol, V-I Characteristics (Enhancement and depletion mode), Small Signal Model and Biasing MOSFET, Common source, Common Drain, Common Gate amplifiers: Small signal equivalent circuits-gain, input and output impedances, transconductance.

UNIT4: (~8 lecture Hours)

Power Amplifiers: Class A and Class B power Amplifiers.

Operational-Amplifiers: Internal Structure of an Op-Amp, ideal Op-Amp, non-idealities in an Op- Amp.

UNIT 5: (~10 lecture Hours)

Linear Applications of Op-Amp: Inverting and Non-inverting amplifiers, differential Amplifier, integrator, active filters (LPF and HPF), P, PI and PID controllers and lead/lag compensator using an Op-Amp, General Purpose Voltage regulator IC 723, Oscillators (Wein bridge and Phase Shift)

Non-Linear Applications of Op-Amp: Schmitt Trigger, Zero crossing Detector, Square wave and triangular wave generators, Monostable multi vibrator.

Text Books:

1. J. Millman and A. Grabel, Microelectronics, 2nd Edition, McGraw Hill, 1988.
2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, 4th Edition, Saunder's College 11 Publishing.
3. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, PHI, 2003.

References:

1. D. Roy Chowdhury, Linear Integrated Circuits, 2nd Edition, New AgeInternational (p) Ltd, 2003.
2. J. Millman, H. TaubandMothiki S. PrakashRao, Pulse, Digital and Switching Waveforms, 2nd Edition, McGraw Hill, 2008.
3. Curtis D.Johnson, Process Control Instrumentation Technology, 8th Edition, Pearson New International.

Online Resources:

1. http://www.radio-electronics.com
2. https://users.encs.concordia.ca/~rabinr
3. https://www.elprocus.com

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the fundamental behavior of various diodes, transistors and OP-AMP.
2. Illustrate the construction, operation and characteristics of BJT and MOSFET.
3. Analyze the various amplifier circuits using small signal hybrid model.
4. Classify various MOSFET configurations.
5. Distinguish between various power amplifiers.
6. Apply the knowledge of Diodes, OP-AMPs in designing circuits.

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II Year B.Tech. EEE I-Semester **L T P C**
Course code:123AS **3 1 0 4**

FIELD THEORY & DC MACHINES

Prerequisites: Physics & BEE

Course Objectives:

1. To understand and apply the concepts of electric fields and magnetic fields.
2. To gain Knowledge of Maxwell's equations for both static and time varying fields.
3. To acquire knowledge on working and applications of DC machines and to understand performance and analysis of DC Machines.

Unit 1: (~10 Lecture Hours)
Electric Fields
Coulomb's Law, Electric Field Intensity (EFI), EFI due to Point, Line Charges – Gauss's Law – Divergence - Maxwell's First Equation - Divergence Theorem – Electric Potential - Maxwell's Second Equation - Potential Gradient – Properties of Conductors - Continuity Equation - Point Form of Ohm's Law, Dielectrics – Polarization – Dielectric Constant

Unit 2: (~10 Lecture Hours)
Magnetic Fields
Biot-Savart's Law - Magnetic Field Intensity (MFI) – MFI due to Straight Current Carrying conductor, Ampere's Circuital Law - CURL –Maxwell's Third Equation - Stoke's Theorem, Magnetic Flux Density - Maxwell's Fourth Equation - Lorentz's Force Equation -Force between Two Straight Long Parallel Current Carrying Conductors, Magnetic Dipole-Magnetization and Relative Permeability.
Time Varying Fields
Faraday's Laws, Displacement Current - Modification of Maxwell's Equations for Time Varying Fields.
(Elementary treatment only – Numerical problems are not envisaged in this topic)

Unit 3: (~10 Lecture Hours)
Electro Mechanical Energy Conversion
Principles of energy conversion, single excited and doubly excited magnetic systems, singly excited electric field systems. Constructional features of rotating electrical machines, generating EMFs, EMF polygon, MMF produced by distribution windings, concepts of torque production

Unit 4: (~7 Lecture Hours)
DC Generators – Construction, Classifications, Commutation, EMF equation, Armature Reaction – Cross Magnetizing and De-Magnetizing AT/pole – Compensating Winding – Commutation process, Reactance Voltage – Methods of Improving Commutation.

Unit 5: (~5 Lecture Hours)
DC Motors –Torque Equation, Characteristics and Applications of Shunt, Series and Compound Motors, Starting Methods, Speed Control Methods of DC Motors, Losses and efficiency.

Methods of Testing – Swinburne's test-Brake test (Direct Load Test) — Series Field Test- Retardation test and Hopkinson's test.

Electrical braking – Plugging, Dynamic braking, Regenerative braking (Qualitative Treatment only).

Text Books:

1. William H Hayt, John A Buck, Akhtar, "Engineering Electromagnetics", McGraw Hill, 8th Ed, 2017.
2. Mathew N O. Sadiku, S.V. Kulkarni, "Electromagnetic Fields", Oxford University Press, 6th Ed, 2015.
3. P.S. Bimbhra, Electrical Machinery, 7th Edition, Khanna Publishers, 2011.
4. J.B. Gupta Theory & Performance of Electrical Machines, S.K. Kataria & Sons, 15th Edition, 2015.

Reference Books:

1. Ashutosh Pramanik, "Electromagnetism –Theory and Applications", Prentice Hall of India Pvt. Ltd, 2nd Ed, 2009.
2. William H Hayt & John A Buck, "Electromagnetics – Problems and Solutions", McGraw Hill Education, 2017.
3. A.E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 6th Edition, 2005.
4. H.Cotton, Electrical Technology, CBS Publishers and distributors pvt limited, 2018.
5. D.P. Kothari, I.J.Nagrath, Electrical Machines, McGraw-Hill Education (India) Pvt Limited, Sigma Series, 2006.
6. Syed Nasar, Electric Machines and Electromechanics, Schaum's outline series, 2nd Edition

Online Resource:

https://archive.nptel.ac.in/courses/108/102/108102146/# https://archive.nptel.ac.in/courses/108/102/108102146/ https://archive.nptel.ac.in/courses/108/102/108102146/ https://archive.nptel.ac.in/courses/108/102/108102146/# https://archive.nptel.ac.in/courses/108/106/108106073/

Course Outcomes:

1. Formulate and Solve typical problems w.r.t. electrostatics and magneto statics in different media.
2. Analyze/interpret various field equations in both point form and integral form.
3. Analyze the problems related to both static and time varying fields by using Maxwell's Equations.
4. Identify different parts of a DC machine & understand its operation and control.
5. Analyze the differences in operation of different dc machine configurations.
6. Identify proper type of motors suitable for a given application.

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II Year B.Tech. EEE I-Semester **L T P C**
Course code:123AQ **3 1 0 4**

ELECTRICAL CIRCUIT ANALYSIS

Prerequisites: Basic Electrical Engineering Course Objectives:

1. To introduce the basic concepts of circuit analysis, which is the foundation for all subjects of the electrical engineering.
2. To introduce basic analysis of circuits which includes three phase circuits, magnetic circuits, theorems, transient analysis, network parameters, network topology.
3. To introduce basic analysis of various types of filters.

UNIT 1: Network Analysis (~12 Lecture Hours)

Series and Parallel Magnetic Circuits- Dot Convention- Coupled circuits - Coefficient of coupling- Numericals.

Mesh and Nodal analysis of Networks with independent & dependent voltage and current sources –Current locus diagrams of Series and parallel combination of RL, RC, RLC circuits.

Superposition Theorem- Thevenin's Theorem- Norton's Theorem-Maximum Power Transfer Theorem- Reciprocity Theorem-Millman's Theorem with DC and AC Excitation- Numericals.

UNIT 2: Transient Analysis (~10 Lecture Hours)

Transient response of RL, RC and RLC networks with different excitations DC and AC excitations-Initial conditions, Step, ramp and impulse response by using both classical method and Laplace transform methods.

UNIT 3: Network Topology (~8 Lecture Hours)

Impedance parameters-Admittance parameters-Transmission parameters- Hybrid parameters- Equivalent circuits-Conversion of one parameter to other-Interconnections of two port networks.

Definitions-Graph, Tree, Basic Cut-set and Basic Tie-set matrices for planar networks- Duality & Dual networks.

UNIT 4: Filters (~8 Lecture Hours)

Symmetrical networks, Image Impedance, Characteristic impedance, Attenuation, Propagation constant, Filter characteristics, -Types of filters- Low Pass-High pass and Band pass, Band stop filters. Analysis and design of constant K filter, Chebyshev filter, Butterworth filter.

UNIT 5 : Poly Phase Circuits (~8 Lecture Hours)

Phase Sequence-Star and delta connections Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced 3 phase Circuits-Measurement of active and reactive power.

Text Books:

1. N. C. Jagan & C. Lakshminarayana, Network Theory, B.S Publications, 2014.
2. M. E.Van Valkenburg, T.S. Rathore, Network Analysis, Pearson Education, 3rd Edition, 2019.
3. W. H. Hayt Jr, J. E. Kemmerly, Engineering Circuit Analysis, McGraw Hill Education, 8th Edition, 2013.

Reference Books:

1. C. K. Alexander and M. N. O. Sadiku, Electric Circuits, McGraw Hill Education, 6th Edition, 2019.
2. Chakrabarthy, Circuit Theory – Analysis & Synthesis, Dhanpat Rai, 7th Edition, 2018.

Course Outcomes:

1. Analyze circuits and solve the same to obtain the required parameters.
2. Apply network theorems for the analysis of electrical circuits.
3. Obtain the transient and steady-state response of electrical circuits.
4. Basic concepts of three phase circuits, and power calculations for different configurations.
5. Understand the basic concepts of two-port networks, apply the same for circuit realization.
6. Apply the concept of basic filters and design of filters based on applications.

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II Year B.Tech. EEE I-Semester **L T P C**
Course code:12314 **0 0 3 1.5**

ELECTRICAL CIRCUIT ANALYSIS LAB

Prerequisites: Basic Electrical Engineering Course objectives:

1. To Construct and verify various electrical circuits applying network theorems(AC).
2. To Learn different transient responses for various electrical circuits like RL, RC and RLC.
3. To understand the concepts of three phase, magnetic circuits and filters.
4. To evaluate various circuits using two–port network parameters.
5. To develop and analyze electrical circuits in the simulation environment.

List of Experiments:

1. Determination of Self and Mutual inductance in a Coupled Circuit. Determination of Coefficient of Coupling.
2. Verification of Thevenin's and Norton's Theorems. (with A.C. Excitation)
3. Verification of Superposition and Maximum Power Transfer Theorems. (with A.C. Excitation)
4. Measurement of Active Power for Star and Delta connected balanced loads using two-wattmeter method.
5. Time response of first order RC / RL network for periodic non – Sinusoidal inputs –Time constant and Steady state error determination.
6. Two port network parameters – Z, Y, Transmission Line & Hybrid parameters - Analytical verification.
7. Generation of various signals and sequences (unit Impulse, Step, Square,Saw tooth, Triangular, Sinusoidal, Ramp) and operations on signals and sequences (Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy, and Average Power) using software.
8. Simulation of Transient response of RL, RC and RLC Circuits.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted.

9. Locus Diagrams of RL and RC Series Circuits.
10. Frequency response of R-L, R-C circuits, Low Pass and High Pass Filters using software simulation.
11. Waveform Synthesis using Laplace Transforms.
12. Simulation of Solar PV System.

Course Outcomes:

After completion of this course student should be able to

1. Verify various theorems for linear AC networks.
2. Evaluate two port network parameters for various electrical circuits.
3. Analyze the transient and steady state behavior of AC circuits and wave form synthesis using Laplace transforms.
4. Understand the concepts of magnetic circuits and three phase balanced networks.
5. Design passive filters.
6. Generate different signals and apply the same to different systems.

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II Year B.Tech. EEE, I-Semester **L T P C**
Course Code: 12317 **0 0 2 1**

PYTHON PROGRAMMING LAB

(Common to CSE, CSM, CSD, IT, ECE, EEE, ETE & CST)

Prerequisites: Programming for Problem Solving

Course Objectives:

1. Describe the core syntax and semantics of Python programming language.
2. Learn the fundamental sequence types like lists, dictionaries, tuples, sets.
3. Handle files and modules in python.
4. Learn how to write string, Exception Handling programs in python.

List of Experiments:

Week 1:

a) Write a program to demonstrate different number data types in Python.
b) Write a program to illustrate various types of operations in Python.

Week 2:

a) Write a Python program to find largest of three numbers.
b) Write a Python program to convert temperatures to and from Celsius, Fahrenheit.
[Formula: c/5 = f-32/9]
c) Write a Python program that prints prime numbers less than 20 (using for-else).
d) Write a Python program to construct the following pattern, using a nested for loop.

```
1
2 2
3 3 3
4 4 4 4
5 5 5 5 5
4 4 4 4
3 3 3
2 2
1
```

e) Write a program to get the binary form of a given number.

Week 3:

a) Write a program to demonstrate various list methods in Python.
b) Write a program to get a list of even numbers from a given list of numbers.
(use only list comprehensions).

Week 4:

a) Write a program to add an item in a tuple without converting into a list.
b) Write a program to count the elements in a list until an element is a tuple.
c) Write a Python program to demonstrate set operations.

Week 5:

a) Write a program to access a sub string from a given string (Use slicing)
   - Get the first 5 characters of a string.
   - Get a substring of length 4 from the 3rd character of the string.
   - Get the last 5 characters of a string.
   - Get a substring which contains all characters except the last 4 characters and the 1st character.
   - Get every other character from a string.

b) Get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself Eg: restart output: resta$t
c) Write a program to sort a dictionary by a value.
d) Write a program to display the count of individual vowels in the input string-using dictionary. (Ex: Input String: "welcome" Output: {'a':0,'e':2,'i':0,'o':1,'u':0})

Week 6:

a) Write a Python program to find N largest element from given list of integers using functions.
b) Write a Python program to find sum of elements of nested list using recursion.
   (Input: [9, 1, [3,4], [5,2]], Output:24)
c) Write a Python program to define a module to find Fibonacci Numbers and import the module to another program.
d) Define a module that consist of factorial and sum of individual digits of a number as functions.
e) Write a program to find ncr by importing only factorial function from the above module.

Week 7:

a) Write a program to handle exceptions using try..except..finally…else
b) Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered. (Handle exceptions)
c) Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.

Week 8: Write a Python application to create basic calculator to demonstrate following GUI components.

i) Button ii) Text box iii) Text area

Week 9: Write a Python application to create basic Registration form to demonstrate following GUI components.

i) Text box ii) Button iii) Submit button iv) Combo box
v) Check button vi) Text widget vii) Radio button viii)Scrolled Text

Week 10: Write a Python program to draw following plots

i) Bar graph. ii) Scatter plot iii) Box plot.

Text Books

1. Wesley J. Chun, Core Python Programming, 2nd Edition, Pearson.
2. Gowrishankar S, Veena A, Introduction to Python Programming, 1st Edition, CRC Press/Taylor Francis, 2018. ISBN-13: 978-0815394372.

Reference Books:

1. Y Daniel Liang, Introduction to Programming Using Python, 1st Edition, Pearson India, 2017.

Online Resources:

1. www.w3schools.org.in
2. https://www.sgul.ac.uk/about/ourprofessionalservices/informationservices/library/documents/training-manuals/ExcelFundamentals-Manual.pdf
3. www.lynda.com
4. www.coursera.org

Course Outcomes:

After completion of the course, students will be able to

1. Understand and Apply basic concepts of Python.
2. Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
3. Determine the methods to create Python programs by utilizing lists, dictionaries, tuples, sets and strings.
4. Develop the proficiency in handling of files and modules.
5. Implement the concept of Exception handling using Python.
6. Utilize Python libraries for data visualization.

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II Year B.Tech EEE I-Semester **L T P C**
Course Code: 12310 **0 0 3 1.5**

ANALOG ELECTRONICS LAB

Prerequisites:-Nil-

Course Objectives:

1. To familiarize with various circuit components, Display devices.
2. To understand the characteristics of various semiconductor devices.
3. To plot the frequency response of various Amplifiers.
4. To verify practically different applications of Op-Amp.

List of Experiments: (Minimum of 10 Experiments to be conducted)

1. Plot V-I characteristics of PN junction: Diode under Forward and Reverse Bias to obtain cut in voltage, Rf, Rr.
2. Obtain ripple factor, ratio of rectification and efficiency for HWR, FWR with filter.
3. Plot Input and output Characteristics of a BJT in CE configuration and derive h-parameters from Characteristics.
4. Plot Drain and Transfer characteristics of MOSFET.
5. Plot the Frequency response of CE Amplifier.
6. Plot the Frequency response of CC Amplifier.
7. Design an Inverting Amplifier and Non-Inverting Amplifier using Op- amp 741.
8. Design an Integrator using Op-amp 741.
9. Design a Wein Bridge Oscillator using Op-amp 741.
10. Design a Square wave and Triangular wave generator using Op-amp 741.
11. Design a Schmitt Trigger using Op-amp 741
12. Design a Zero Crossing Detector and Differential Amplifier using Op-amp 741.
13. Design Active (Low Pass and High Pass) Filter using Op-amp 741.

Online Resources:

1. https://circuitdigest.com/electronic-circuits
2. https://www.elprocus.com/semiconductor-devices-types- and- applications/

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Illustrate the utility of various semiconductor devices, passive elements, circuit behavior and parameters to be estimated.
2. Identify specifications, choice of device and equipment required; develop of the circuit and measurement of various diodes and transistor circuit characteristics.
3. Set up different types of rectifiers, circuits to interpret the different applications of op-Amps.
4. Design, develop and test BJT and FET amplifier circuits and estimate the relevant parameters.
5. Compare the experimental results with theoretical results, explain the parameters involved and justify the results obtained.
6. Interpret the results for further development of circuit features and subsequent applications.

II Year B.Tech. EEE, I-Semester **L T P C**
Course Code:12312 **2 0 0 -**

CONSTITUTION OF INDIA

(Mandatory Course)
(Common to CSE, CSM, CSD, IT, ECE, EEE, ETE & CST)

Prerequisites: NIL

Course Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To realise the significance of constitution of India from all walks of life and to understand the basic concepts of Indian constitution.

UNIT 1: (~8 Lecture Hours)

HISTORY OF MAKING OF THE INDIAN CONSTITUTION & PHILOSOPHY OF THE INDIAN CONSTITUTION HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History, Drafting Committee (Composition & Working) **Philosophy of the Indian Constitution**: Preamble, Salient Features.

UNIT 2: (~6 Lecture Hours)

CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

Fundamental Rights - Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies; Directive Principles of State Policy, Fundamental Duties.

UNIT 3: (~6 Lecture Hours)

ORGANS OF GOVERNANCE

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions- Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT 4: (~ 6 Lecture Hours)

LOCAL ADMINISTRATION

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Panchayati Raj : Introduction, PRI : Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Position and role, Block Level

: Organizational Hierarchy (Different departments), Village level : Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT 5: (~6 Lecture Hours)

ELECTION COMMISSION

Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Reference Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr.S.N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edition, Lexis Nexis, 2014.

Online Resources:

1. https://nptel.ac.in/courses/129106003 [Constitutional Studies by Prof. Sudhir Krishna Swami, IIT Madras]
2. https://onlinecourses.swayam2.ac.in/cec20_hs38/preview [Indian Government and Politics by Dr.Aijaz Ashraf Wani, University of Kashmir, Srinagar]

Course Outcomes:

After learning the contents of this course, the students will be able to

CO1 Tell about function of Indian constitution with clarity andunderstanding.
CO2 Identify the Rights of equality, the Right of freedom and the Right toconstitutional remedies
CO3 Mark the knowledge of union government & their powers and function.
CO4 Define the state and central policies, fundamental duties
CO5 Explain the powers and functions of Municipalities, Panchayats andCo-operative Societies
CO6 Discuss the Electoral Process, special provisions

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II Year B. Tech. EEE II-Semester **L T P C**
Course Code:124BQ **3 0 0 3**

TRANSFORM TECHNIQUES AND APPLICATIONS

Prerequisites: Nil

Course Objectives:

1. To study the different types of Transforms.
2. To understand the Random Variables and Probability theoretical distributions.
3. To understand the different types of elementary signals.
4. To apply Transforms for Signals and Systems.

UNIT1: Fourier series and Transforms (~10 Lecture Hours)

Fourier Series – Fourier series representation (0 to 2π and $-\pi$ to π)

Fourier Transforms - Fourier integral theorem (only statement), Fourier transform, Fourier sine and cosine transforms, Properties, Transforms of simple functions, Convolution theorem.

UNIT 2: Z-Transforms (~8 Lecture Hours)

Definition, Standard Z-transforms, Linearity Property, Damping rule, Standard results, Shifting Property, Multiplication by n, Initial value theorem, Final value theorem,

Inverse Z-transform – Power series method, Partial fractions, Inversion Integral method, Convolution theorem (only statement), solution of difference equation using Z-transform.

UNIT 3: Random Variables (~12 Lecture Hours)

Random Variables - Introduction to Random variables, Discrete Random Variable, Continuous Random Variable, Probability distribution function, Probability density function.

Probability Theory Distributions: Binomial Distribution, Poisson Distribution, Normal Distribution, Exponential Distribution– Properties (only statement).

UNIT 4: Signals and Systems(~ 8LectureHours)

Elementary Signals - Unit Step Function, Unit Ramp Function, Unit Parabolic Function, Unit Impulse Function, Sinusoidal Signal, Real Exponential Signal, Rectangular Pulse Function, Triangular Pulse Function. Classification of Signals - Continuous Time and Discrete Time Signals, Periodic and Non-Periodic Signals, Causal and Non-Causal Signals, Even and Odd Signals, Energy and Power signals.

Systems: Classification of Systems- Continuous Time and Discrete Time Systems, Causal and Non-Causal Systems, Linear and Non - Linear Systems, Time Varying Systems, Stable and Unstable Systems, Static and Dynamic systems, Invertible and Non - Invertible systems.

UNIT 5: Applications of Transforms to Signals and Systems (~10LectureHours)

Fourier Transform of Complex and Real functions, Fourier transform of Periodic Signal, System analysis with Fourier transform, Transform Analysis of LTI Systems – Relationship between Transfer function and Difference function, Stability analysis, Jury's test for stability criteria.

Text Books:

1. Dr. B. S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. Anand Kumar, Text Book of Signals and Systems, 3rd Edition, PHI Learning Publications.

Reference Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition John Wiley and Sons Publisher.
2. Srimanta Pal, Subodh C. Bhunia, Engineering Mathematics, 1st Edition, Oxford Higher Education.
3. Hwei P Hsu,Signals and Systems, Tata McGraw-Hill Publications, 2nd edition.

Online Resources:

1. https://www.youtube.com/watch?v=lkAvgVUvYvY
2. https://www.youtube.com/watch?v=c_YLkvk_ZXI&list=PLBlnK6fEyqR hG6s3jYIU48CqsT5cyiDTO&index=14

Course Outcomes:

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

CO1 Express a periodic function as Fourier series.
CO2 Determine the Fourier Transform of a given function.
CO3 Evaluate the Z transform of the given function and apply it to solve the difference equation.
CO4 Understand the theory of probability distributions.
CO5 Identify & Classify different Types of Elementary Signals and Systems.
CO6 Apply the concepts of Fourier transforms and Z transforms toSignals and Systems.

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II Year B.Tech. EEE II-Semester **L T P C**
Course Code: 124BM **3 0 0 3**

POWER SYSTEMS-I

Prerequisites: Field Theory & DC Machines and Electrical Circuit Analysis.

Objectives:

1. To Understand the Conventional and Non-Conventional power generating stations.
2. To Analyze Economic aspects of power generation.
3. To get familiar with Air insulated Substation and Gas insulated substations.
4. To Analyze D.C and A.C Distribution systems and to Understand underground cables.

UNIT 1: **Power Generating Stations** (~11 Lecture Hours) Introduction to Power systems and present scenario.
Thermal Power Stations: Schematic diagram of Thermal Power Station (TPS)–Brief description of TPS components.
Hydroelectric Power Stations: Schematic arrangement of hydro-electric power station-types; Components of Hydro- electric power station. Estimation of power developed from a given catchment area; heads and efficiencies.
Nuclear Power Stations: Schematic diagram of nuclear PowerStation (NPS). Principle of operation of nuclear reactor. Brief description of NPS components.
Gas Power Stations: Principle of Operation and Components
Renewable Energy source: Concept of Solar power generation, wind power generation, Tidal Generation, Geo Thermal Generation and Bio Gas Generation

UNIT 2: Economic Aspects & Tariff methods (~9 Lecture Hours)
EconomicAspects of Power Generation: Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors. Power factor - disadvantages of low power factor –causes of low power factor, power factor improvement techniques – Numerical Problems.
Tariff Methods: Cost of Generation and their division into Fixed, Semi fixed and Running Costs. Desirable Characteristics of a Tariff, Tariff Methods: Active, Reactive and availability based tariff methods.

UNIT 3: Substations (~8 Lecture Hours)
Air Insulated Substations(AIS): Classification of substations: Air insulated substations -Indoor & Outdoor substations: layout and equipment. Bus bar arrangements in the Sub-Stations.
Gas Insulated Substations (GIS) –Schematic diagram of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT 4: Distribution Systems (~9 Lecture Hours)
Classification- Comparison of AC & DC distribution systems, Underground & Overhead Distribution Systems-Design of Distribution Systems for AC and DC Systems-Voltage Drop Calculations -Radial Distributor fed at one end and at both ends with equal and unequal Voltages - Ring Main Distributor.

UNIT 5: Underground Cables (~8 Lecture Hours)

Types of Cables, Construction, Types of Insulating materials, Calculation of Insulation resistance and dielectric-stress, Capacitance of Single and 3-Core Belted Cables, Grading of Cables -Capacitance Grading - Inter-Sheath Grading.

Earthing - Types and installation of earthing.

Text Books:

1. C. L. Wadhwa, Generation and utilization of Electrical Energy, 4th Edition, New age International (P) Limited, 2017.
2. J.B. Gupta, A course in Power systems, 11th Edition, S.K.Kataria & Sons Publishers,2013 .
3. C. L. Wadhwa, Electrical Power Systems, 7th Edition, New age International (P) Limited, 2016.

Reference Books:

1. S.N.Singh, Electrical Power Generation,Transmission and Distribution, 2nd Edition, PHI publications, 2008.
2. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarti, A Text Book on Power System Engineering, Dhanpat Rai & Co. Pvt. Ltd., 2009.
3. Syed Nasar, Electric Power Systems, Schaum's outline series, 2nd Edition

Online Resources:

1. https://www.digimat.in/nptel/courses/video/108102047/L01.html
2. https://nptel.ac.in/courses/112103243
3. https://powermin.gov.in/en/content/power-sector-glance-all-india

Course Outcomes:

The students will be able to

CO1 Understand the operation of conventional power generating stationslike Thermal, Hydro, Nuclear and Renewable power generation.

CO2 Interpret Economic aspects and Tariff methods of power system.

CO3 Categorize Air and Gas Insulated Substations.

CO4 Model D.C and A.C distribution systems.

CO5 Understand structure of different underground cables and design.

CO6 Summarize power generation and Distribution system.

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II Year B.Tech. EEE II-Semester **L T P C**
Course Code: 124AY **3 0 0 3**

AC MACHINES

Prerequisites: Basic Electrical Engineering, Electro Magnetic Fields& DC machines

Course Objectives:

1. To understand the construction and operating characteristics of transformers, Induction motors, synchronous machines and fractional KW machines.
2. To Analyse the transformers, Induction motors and Synchronous machines performance for different loading conditions, as well operating in parallel.
3. To know Different starting methods of Induction motor, Synchronous motor and fractional KW machines.
4. To identify different speed control methods and various tests to assess the performance of AC Machines.

UNIT 1: (~9 Lecture Hours)

Single Phase Transformers

Construction and principle of operation, equivalent circuit, phasor diagrams, voltage regulation, losses and efficiency, Testing – open circuit and short circuit tests, polarity test, back to back test, separation of hysteresis and eddy current losses, Auto transformers – construction, principle of operation, applications, comparison with two winding transformer.

UNIT 2: (~9 Lecture Hours)

Three Phase Transformers

Construction, types of connection and their comparative features, parallel, operation of transformers, phase conversion – Scott connection, open delta connection, three phase to single phase conversion, Tap changing techniques and induction regulators, three winding transformers.

UNIT 3: (~10 Lecture Hours)

Poly-Phase Induction Motors:

Constructional details of cage and wound rotor machines-production of a rotating magnetic field - equivalent circuit –phasor diagram, torque equation, relation between Full load Torque, maximum Torque and starting Torque, Losses and efficiency. Torque slip characteristics- crawling and cogging, Methods of Starting & Speed Control. Principle of induction generator.

UNIT 4: (~10 Lecture Hours)

Synchronous Generators: Constructional Features of round rotor and salient pole machines – Armature windings (single layer and double layer) – winding factors – E.M.F Equation- armature reaction - leakage reactance – synchronous reactance and impedance - phasor diagram – load characteristics. Regulation by synchronous impedance method, M.M.F. method and Z.P.F. methods–Numerical Problems-salient pole alternators – two reaction analysis –Phasor diagrams- Slip test.

UNIT 5: (~7 Lecture Hours)

Parallel operation of Synchronous Generators:

Synchronizing methods of alternators– synchronizing power& torque – parallel operation -Effect of change of excitation and mechanical power input-Alternators in parallel with infinite bus bar.

Synchronous Motors: Principle of operation –Methods of starting, applications-phasor diagram –Mathematical analysis of power developed -V and inverted V Curves-synchronous condenser – hunting and its suppression.

Single Phase Induction Motors: Constructional features, double revolving field theory, equivalent circuit-starting methods.

Text Books:

1. P. S. Bimbhra, Electrical Machinery, 7th Edition, Khanna Publishers, 2011.
2. J. Nagrath and D.P. Kothari, Electric Machines, 5th Edition, Mc GrawHill Education, 2017
3. J.B. Gupta Theory & Performance of Electrical Machines, S.K. Kataria & Sons, Edition, 2015.

Reference Books:

1. E. Fitzgerald and C. Kingsley, Electric Machinery, McGraw Hill Education, 6th Edition, 2005.
2. M. G. Say, Performance and design of AC machines, CBS Publishers, 2002.
3. S. Langsdorf, Theory of Alternating current machinery, 2nd Edition, McGraw Hill Education, 1984.
4. P.S.Bimbhra, Generalized Theory of Electrical Machines, 7th Edition, Khanna publishers, 2021.
5. Syed Nasar, Electric Machines and Electromechanics, Schaum's outline series, 2nd Edition

Online Resource:

https://nptel.ac.in/courses/108106072 https://archive.nptel.ac.in/noc/courses/noc19/SEM1/noc19-ee01/

Course Outcomes:

After completion of this course student should be able to:

1. Analyze the construction and operating characteristics of Transformers, Induction motors, synchronous machines and fractional KW machines.
2. Analyze the Transformers, Induction motors and Synchronous machines performance for different loading conditions, as well operating in parallel.
3. Carry out different speed control methods and various tests to assess the performance of AC Machines.
4. Identify and design the suitable AC machine for the desired application based on their characteristics.
5. Understand Different starting methods of AC Machines.
6. Apply conceptual things to implement real time electrical problems in commercial and domestic application.

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II Year B.Tech. EEE II-Semester **L T P C**
Course Code: 124BF **3 0 0 3**

DIGITAL ELECTRONICS

Prerequisites:-Nil-

Course Objectives:

1. To understand common forms of number representation in digital electronic circuits and convert between different representations.
2. To design combinational logic circuits.
3. To design sequential logic circuits.
4. To understand logic families and data converters

UNIT 1: (~8 Lecture Hours)

Number Systems: Review of number systems, Complements of Numbers, Codes - Binary Codes, Binary Coded Decimal Code and its Properties. **Boolean Algebra and Switching Functions:** Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Universal Gates, Multilevel NAND/ NOR realizations.

UNIT 2: (~10 Lecture Hours)

Minimization of Combinational Circuits: Introduction, The minimization of switching function using theorem, The Karnaugh Map Method-Up to Six Variable Maps, Don't Care Map Entries, Tabular Method. **Design of Combinational Logic:** Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Carry Look Ahead Adder, Comparators, Multiplexers, Demultiplexers, Decoders, Encoders and Code Converters, Decoders for Display Drivers, PLD's: PROM, PLA, PAL, Realization of circuits using PLD's

UNIT 3: (~8 Lecture Hours)

Sequential Machines Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, Latches: SR, JK, Race Around Condition in JK, Flip Flops: JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.

UNIT 4: (~8 Lecture Hours)

Registers and Counters: Shift Registers, Shift Register Configuration, Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Asynchronous and Synchronous Counters, mod-n Counters.

UNIT 5: (~10 Lecture Hours)

Logic Families: Introduction, Characteristics of Digital ICs, Transistor Transistor Logic, Emitter Coupled Logic, MOS Logic, CMOS Logic, Interfacing ECL and TTL, Interfacing CMOS and TTL, Interfacing CMOS and ECL.

A/D and D/A Converters: Digital to Analog convertors: Weighted resistor/convertor, R-2R Ladder D/A converter, specifications for D/ Aconverters, examples of D/Aconverter ICs, sample and hold circuit, Analog to Digital

convertors: Quantization and encoding, parallel comparator, A/D converter, successive approximation A/D converter, Counting A/D comparator, A/D converter, Successive approximation A/D converter, Counting A/D converter, dual slope A/D Converter, A/D Converter using voltage to frequency and voltage to time conversion, Specifications of A/D Converters, Example of A/D Convertor ICs.

Text Books :

1. Morris Mano, Digital Design, 5th Edition, Pearson.
2. R.P. Jain, Modern Digital Electronics, 4th Edition, Tata McGraw Hill.
3. ZviKohavi & Niraj K.Jha, Switching and Finite Automata Theory, 3rd Edition, Cambridge.

References:

1. W.H. Gothmann, Digital Electronics- An introduction to theory and practice, 2nd Edition, PHI.
2. AAnand Kumar, Switching Theory and Logic Design, 3rd Edition, PHI.

Online Resources:

1. https://courses.cs.washington.edu/courses/cse370/08wi/pdfs/lectu res/ 04-Logic%20gates.pdf
2. http://www.cs.utoronto.ca/~sengels/csc258/lectures/Gates_1up.pdf
3. http://www.site.uottawa.ca/~petriu/Digital-Logic.pdf
4. https://www.slideshare.net/wewemahir/adc-dac-54832376
5. www.cse.cuhk.edu.hk/~khwong/www2/ceng4480/ceng4480_A3.pp
6. http://www.electronics-tutorial.net/digital-logic-families/
7. http://digitalbyte.weebly.com/logic-families.html
8. https://www.tutorialspoint.com/digital_circuits/digital_circuits _ shift_registers.

Course Outcomes:

At the end of this course students will demonstrate the ability o

1. Recall fundamental concepts and techniques involved in the design of digital circuits.
2. Comprehend the concepts to design basic combinational and sequential circuits.
3. Demonstrate building of various designs using basic digital blocks.
4. Verify the digital designs for required functionality.
5. Interface ICs from different logic families.
6. Analyse the design and performance of different Data Converters.

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II Year B.Tech. EEE II-Semester **L T P C**
Course Code: 124BD **3 0 0 3**

CONTROL SYSTEMS

Prerequisites: Electrical Circuit Analysis

Course Objectives:

1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response.
2. To assess the system performance using time domain analysis and methods for improving it.
3. To assess the system performance using frequency domain analysis and techniques for improving the performance.
4. To understand the different types compensators performance.

UNIT 1: (~9 Lecture Hours)

Introduction: Concepts of Control Systems- Classification of control systems, Open Loop and closed loop control systems - Examples of control systems- Feed Back Characteristics, Effects of feedback.

Modeling of Physical Systems – Differential equations, Impulse Response and transfer functions –Electrical systems, Translational and Rotational mechanical systems, electrical analogy.

UNIT 2: (~9 Lecture Hours)

Transfer Function Representation: Definition, Differential equation, Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems -Block diagram algebra –Signal flow graph - Mason's gain formula.

UNIT 3: (~10 Lecture Hours)

Time Response & Stability Analysis: Standard test signals - Time response of first order systems and second order systems– Characteristic Equation, Time domain specifications – Steady state response - Steady state errors and error constants – Effects of P, PI, PD, PID controllers.

The concept of stability – Routh's stability criterion– limitations of Routh's stability. Root Locus Technique-construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT 4: (~9 Lecture Hours)

Frequency Response & Stability Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots- Stability Analysis.

Compensation techniques– Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers.

UNIT 5: (~9 Lecture Hours)

State Space Analysis of Continuous Systems: Concepts of state, state variables and state space model, derivation of state space model– Solution of state space equation - State Transition Matrix and its Properties – Concepts of Controllability and Observability.

Text Books:

1. B.C.Kuo, Automatic Control Systems, 9th edition John wiley and son's 2014.
2. I. J. Nagrath and M. Gopal, Control Systems Engineering, New Age International(P) Limited, Publishers, 7th edition, 2021.

Reference Books:

1. NagoorKani, Control systems, RBA Publishers 2nd Edition, 2014.
2. Katsuhiko Ogata, Modern Control Engineering, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
3. Narciso F. Macia George J. Thaler, Modelling & Control of Dynamic Systems, Thomson Publishers. 1st Edition December 16, 2004
4. Joseph J Distefano, Allen R Stubberud, Ivan J Williams,Control Systems, Schaum's outline series, 3rd Edition

Course Outcomes:

After completion of this course the student is able to

1. Obtain the mathematical model of Translational and rotational mechanical systems
2. Obtain the mathematical models of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver
3. Improve the system performance by selecting a suitable controller and/or compensator for a specific application.
4. Apply various time domain and frequency domain techniques to assess the system performance.
5. Able to design Lag,Lead and Lag- Lead compensators.
6. Test system Controllability and Observability using state space representation.

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II Year B.Tech. EEE II-Semester **L T P C**
Course Code:12421 **0 0 3 1.5**

ELECTRICAL MACHINES LAB

Prerequisites: Basic Electrical Engineering, Electro Magnetic Fields & DC machines, AC Machines.

Course Objectives:

1. To gain thorough knowledge about operation and the performance of DC & AC Machines.
2. To understand Different starting methods of DC& AC Machines.
3. To draw the performance characteristics of DC& AC Machines for different load conditions.

PART-A (Compulsory)

1. Swinburne's Test & Retardation Test on DC shunt motor.
2. Internal & External Characteristics of a DC Shunt Generator
3. Parallel operation of single phase transformers.
4. OC and SC Test on Single Phase Transformer – Equivalent circuit- Efficiency and Regulation
5. Brake test on a 3 phase Induction Motor.
6. No load and blocked rotor test on three phase induction motor (Equivalent circuit and circle diagram)
7. Regulation of a three phase alternator by Synchronous Impedance & MMF methods.
8. V & inverted V curves of a three phase synchronous motor. Determination of Xd & Xq of a salient pole synchronous machine.

PART-B (Any two from the following list)

1. Speed control of DC shunt motor.
2. Series Fields Test on a Pair of Two Identical Dc Series Machines
3. Hopkinson's Test on a Two DC Shunt machines
4. Scott connection of Transformers.
5. Sumpner's test on a pair of single phase transformers.

Course Outcomes:

After completion of this course student should be able to:

1. Analyze the characteristics of DC& AC machines.
2. Carry out various tests to assess the performance of DC & AC Machines
3. Understand different starting methods of DC & AC Machines.
4. Know conceptual things to implement in real time applications.
5. Choose suitable DC & AC machine for a specific application.
6. Draw the equivalent circuits of different DC & AC machines by conducting suitable experiments.

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II Year B.Tech EEE II-Semester **L T P C**
Course Code: 12420 **0 0 3 1.5**

DIGITAL ELECTRONICS LAB

Prerequisites:-Nil-

Course Objectives:

1. To test and verify digital subsystems used in digital systems.
2. To design combinational logic circuits using Digital ICs.
3. To design sequential logic circuits using Digital ICs.
4. To Calculate and Verify resolution of ADC and DACs.

List of Experiments:

(Any 12 from given the list to be done)

1. Realize and design Logic gates using discrete components and devices. Realize and verify the functionality of the following circuits. (Experiments 2-6)
2. Logic Gates using ICs.
3. 3 to 8 Decoder using LS74138 IC.
4. 8 to 1 Multiplexer using LS74151 IC.
5. 2 to 4 De-Multiplexer using LS74155 IC.
6. 4-bit Comparator using LS7485 IC.
7. Realize and design 4-bit Binary to Grey Code Converter using logic gates.
8. Design a 16-bit Adder/Subtractor using 4-bit Adder/Subtractor.
9. Design a 16 to 4 Priority Encoder using two 8 to 3 Priority Encoders. Realize and verify the functionality of the following circuits. (Experiments 10-13)
10. D and JK-Flip-Flops using LS7474 and LS7476 ICs.
11. Verify all the functions of the Universal Shift Register using LS74194/195 IC.
12. Up/Down Counter using LS74192/193 IC.
13. Decade Counter using LS7490 IC.
14. Convert the given Analog signal to Digital signal using ADC0808.
15. Generate ramp waveform, square waveform using DAC0808
16. Verify the Read and Write operations on a 16X4 RAM using LS74189 IC.

Online Resources:

1. https://courses.cs.washington.edu/courses/cse370/08wi/pdf s/ lectures/04- Logic%20gates.pdf
2. http://www.cs.utoronto.ca/~sengels/csc258/lectures/Gates_1up.pdf
3. http://www.site.uottawa.ca/~petriu/Digital-Logic.pdf
4. https://www.slideshare.net/wewemahir/adc-dac-54832376
5. www.cse.cuhk.edu.hk/~khwong/www2/ceng4480/ceng4480_A3.pp
6. http://www.electronics-tutorial.net/digital-logic-families/
7. http://digitalbyte.weebly.com/logic-families.html
8. https://www.tutorialspoint.com/digital_circuits/ digital_circuits_shift_registers.htm

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Identify Digital ICs.
2. Identify function of Digital ICs. Test and Verify the Digital ICs.
3. Design Combinational logic circuits.
4. Design Sequential logic circuits.
5. Calculate Resolution of ADCs and DACs.

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II Year B.Tech. EEE, II-Semester **L T P C**
Course Code:12422 **2 0 0 -**

HUMAN VALUES AND PROFESSIONAL ETHICS

(Mandatory Course)
(Common to CSE, CSM, CSD, IT, ECE, EEE, ETE & CST)

Prerequisites: -NIL-

Course Objectives:

1. To instill among the Engineering professionals, the need to follow ethical principles in life.
2. To stimulate thinking and help internalize the value systems and ethical behavior.
3. To enablethe students to understand the need for value based education.
4. To inculcate a sense of moral responsibility and professional ethics as Engineers.
5. To understand the impact of ethical perspectives globally.

UNIT 1: (~7 Lecture Hours)
UNDERSTANDING VALUE EDUCATION

Basic Concepts: Moral and Morality, Ethics, Values, Principles – Thoughts of Ethics: Indian Thought versus Global Thought – Objectives of Value Education – Importance of Value Education – Personal Ethics – Professional Ethics.

UNIT 2: (~7 Lecture Hours)
UNDERSTANDING THE HARMONY AT VARIOUS LEVELS

Harmony in the Self – Harmony in the Family – Harmony in the Society – Harmony in the Nature – Harmony in Existence – Understanding the Interconnectedness and Mutual fulfilment – Understanding Existence as Co-existence – CASE STUDIES.

UNIT 3: (~6 Lecture Hours)
ETHICAL THEORIES

Utilitarian Ethics – Kant's Deontological Theory – Virtue Ethics – Kohlberg's Levels of Moral Development – Gilligen's Theory - CASE STUDIES

UNIT 4: (~6 Lecture Hours)
PROFESSIONAL ETHICS

Profession and Professionalism – Ethics in Engineering – Role of Engineers – Responsibilities of Engineers – Engineering Code of Ethics – Ethical Dilemmas – CASE STUDIES

UNIT 5: (~6 Lecture Hours)
GLOBAL ISSUES AND ETHICAL PERSPECTIVES

Business Ethics – Environment Ethics – Computer Ethics – Media Ethics – Research Ethics – Intellectual Property Rights – Social Responsibility – CASE STUDIES

Text Books:

1. *A foundation course in Human Values and Professional* Ethics by RR Gaur, R.Sangal and G.P.Bargaria, Excel Books (2011).
2. *Human Values and Professional* Ethics by Tanu Shukla, Anupam Yadav, Gajendra Singh Chauhan, Cengage Publications (2018)

Reference Books:

1. *Fundamentals of Ethics for Scientists and Engineers* by Edmund G, SeeBauer, Robert L, Barry Oxford University Press (2015)
2. *Professional Ethics* by R.Subramanian, Oxford University Press (2013)

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_mg54/preview [Ethics in Engineering Practice by Prof.Susmita Mukhopadhyay, IIT Kharagpur]
2. https://nptel.ac.in/courses/109104068 [Exploring Human Values by Prof.A.K.Sharma, IIT Kanpur]

Course Outcomes:

After learning the contents of this course, the students will be able to:

CO1 Understand the importance of imbibing and inhering Ethics and values as an individual and professional

CO2 Relate the need for establishing harmony at various levels.

CO3 Evaluate the relevance of ethical values in their academic and professional environment.

CO4 Develop right understanding about oneself and the rest of reality through self-exploration.

CO5 Identify the basis for universal human values based on right understanding providing the vision for the holistic way of living.

CO6 Value oneself as professionals with professional ethics and right code of conduct and behaviour in the working environment.

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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1	To Excel in chosen career
PEO2	To work effectively as an individual and as a team member, keeping in mind the high importance currently being given to sustainability and emerging Green Energy Technologies in the current scenario
PEO3	To contribute to the community/society development through acquired knowledge and skills
PEO4	Continuous up gradation of knowledge and skills.

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 asses 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)

PSO1	Graduates will be able to analyze, develop and demonstrate Projects, both Software and Hardware in relevant topics of Electrical and Electronics Engineering.
PSO2	Graduates will be able to identify and solve problems in different core areas of Electrical and Electronics Engineering to meet the industry requirements along with overall personality and skills development.

G.NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE (For Women)
(AUTONOMOUS)

INSTITUTE VISION

To become a center of quality education in Engineering and Technology for women empowerment.

INSTITUTE MISSION

- To fulfill the academic aspirations of women engineers for enhancing their intellectual capabilities and technical competency.
- To Leverage Leading – Edge Technologies and cultivate exemplary work culture.
- To facilitate success in their desired career in the field of engineering to build a progressive nation.

INSTITUTE QUALITY POLICY

G. Narayanamma Institute of Technology and Science (For Women), Hyderabad is committed in imparting Quality Education and Training for women empowerment in the field of "Engineering and Technology" and to satisfy applicable requirements through continual improvement of the Quality Management System by facilitating and supporting the staff and students to work as a team in upgrading their knowledge and skill in tune with the industrial and technological developments through a set of Quality objectives.