ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABUS

(I & II Years)

ELECTRONICS AND COMMUNICATION 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 ELECTRONICS & COMMUNICATION ENGINEERING

DEPARTMENT VISION

ECE dept envisions to develop high quality and technically competent women engineers who can address the growing challenges in the modern world with a keen sense of social responsibility.

DEPARTMENT MISSION

- Knowledge Based Engineering Education
- Analysis and Design Skills with Modelling Potential, Technical Competence
- Industry Compatibility and Women Empowerment with Societal Commitment
- Professional Career Growth with Values and Ethics

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

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

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

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

(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.

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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

ELECTRONICS & COMMUNICATION ENGINEERING

DEPARTMENT OF ECE

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

ELECTRONICS & COMMUNICATION ENGINEERING

DEPARTMENT OF ECE

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 Programming	2	0	0	2
3)	PC	123AR	Electronic Devices and Circuits	3	1	0	4
4)	PC	123AW	Signals and Systems	3	1	0	4
5)	PC	123AT	Network Theory and Analysis	3	0	0	3
6)	ES	12311	Basic Simulation Lab	0	0	3	1.5
7)	ES	12317	Python Programming Lab	0	0	2	1
8)	PC	12315	Electronic Devices and Circuits 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	124BN	Probability Theory and Stochastic Processes	3	0	0	3
2)	PC	124BJ	Electromagnetic Theory and Transmission Lines	3	0	0	3
3)	PC	124AZ	Analog Circuits	3	0	0	3
4)	PC	124BE	Digital Electronics and Logic Design	3	0	0	3
5)	PC	124BC	Control Systems Engineering	3	0	0	3
6)	PC	12418	Analog Circuits Lab	0	0	3	1.5
7)	PC	12419	Digital Electronics and Logic Design 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

ELECTRONICS & COMMUNICATION ENGINEERING

DEPARTMENT OF ECE

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	125BU	Analog and Digital Communications	3	1	0	4
2)	PC	125BV	Antennas and Wave Propagation	3	0	0	3
3)	PC	125CY	Microprocessors and Microcontrollers	3	0	0	3
4)	PE1	**Professional Elective - 1 (Offline/Online)**		3	0	0	3
		125CB	Computer Architecture and Organization				
		125CK	Electronic Measurements and Instrumentation				
		125BY	Bio-Medical Electronics				
		125CW	Introduction to Data Science				
5)	PE2	**Professional Elective – 2 (Offline/Online)**		3	0	0	3
		125CH	Digital Design Through Verilog HDL				
		125BK	Object Oriented Programming Through Java				
		125CU	Introduction to Internet of Things				
		125CV	Introduction to AI				
6)	PC	12529	Analog and Digital Communications Lab	0	0	3	1.5
7)	PC	12535	Microprocessors and Microcontrollers Lab	0	0	3	1.5
8)	HS	12528	Advanced Communication Skills Lab	0	0	2	1
			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	126DV	Digital Signal Processing	3	0	0	3
3)	PC	126ES	VLSI Design	3	1	0	4
4)	PE3	**Professional Elective - 3 (Offline/Online)**		3	0	0	3
		126DT	Data Communications and Computer Networks				
		126EB	Information Theory and Coding				
		126CF	Design for Testability				
		126DK	Sensors and Actuators				
5)	OE1	**Open Elective - 1 (Offline/Online)**		3	0	0	3
6)	PC	12640	Digital Signal Processing Lab	0	0	2	1
7)	PC	12647	VLSI Design 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

ELECTRONICS & COMMUNICATION ENGINEERING

DEPARTMENT OF ECE

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	127GH	Wireless Communications	3	0	0	3
3)	PE4	**Professional Elective - 4**		3	0	0	3
		127FR	Microwave Engineering and Optical Communications				
		127FH	Embedded System Design				
		127FL	Fundamentals of Machine Learning				
4)	PE5	**Professional Elective - 5(Offline/Online)**		3	0	0	3
		127FC	Digital Image and Video Processing				
		127GD	Voice over Internet Protocol				
		127GK	Wireless Sensor Networks				
		127FQ	Low Power VLSI Design				
5)	OE2	**Open Elective - 2 (Offline/Online)**		3	0	0	3
6)	PC	12768	Wireless Communication Lab	0	0	2	1
7)	PC	**Lab (Linked to PE4)**		0	0	2	1
		12759	Microwave Engineering Lab				
		12756	Embedded System Design Lab				
		12748	Artificial Intelligence & Machine Learning 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
		128HF	Radar Systems				
		128HA	Green Communications				
		128GY	FPGADesign and Architectures				
		128HH	Systems Engineering				
3)	OE3	**Open Elective - 3 (Offline/Online)**		3	0	0	3
4)	PW	12870	Seminar (Presentation with Report before 1st Mid Exams)	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 II Semester)	Open Elective-2 (B. Tech. IV Year I Semester)	Open Elective-3 (B.Tech. IV Year II Semester)
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 (126KA) • 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(126KJ) • Intellectual Property Rights(126KH)	• Industrial Management(127KX) • Behavioral Skills and Professional Communication(127KS)	• Marketing Management(128LM)
9	BS	• Disaster Management(126KB)		• Environmental Impact Assessment(128LH)

I Year B.Tech. ECE I-Semester **L T P C**
Course Code: BS121AB **3 0 0 3**

APPLIED PHYSICS

(Common to EEE, ECE, 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", second 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,2ndEdition2012.
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

CO1 Explain the quantum mechanical aspects in physics and apply the same in differentiating the conducting properties of solids.

CO2 Asses and modify the carrier concentration of different types of semiconductors and also be able to understand the working of semiconducting devices.

CO3 Choose materials on the basis of their electric and magnetic behaviour for different engineering applications.

CO4 Differentiate different types of Lasers, optical fibers and realize their application in engineering fields.

CO5 Appreciate the importance of nano materials and their applicability in modern engineering applications.

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I Year B.Tech. ECE I-Semester **L T P C**
Course Code: BS121AA **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. ECE I-Semester **L T P C**
Course Code: BS121AG **3 1 0 4**

LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS

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

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.

UNIT1: 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 , polynomials in, 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, SubodhC.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, students will be able to

1. Solve and analyse the solution for the system of equations.
2. Compute the Eigen values and Eigen vectors which come across under linear transformations.
3. Determine the extreme values of functions of two variables with/ without constraints.
4. Find the solutions of ordinary differential equations.
5. Evaluate double and triple integrals.
6. Apply the knowledge of mathematics for real situations.

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I Year B.Tech. ECE I-Semester **L T P C**
Course Code: ES21AH **3 0 0 3**

PROGRAMMING FOR PROBLEM SOLVING

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

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. ECE I-Semester **L T P C**
Course Code: HS121AF **2 0 0 2**

ENGLISH FOR SKILL ENHANCEMENT

(Common to EEE, ECE, 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 – I (~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 – II (~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 – III (~6 Lecture Hours)

Chapter entitled **'Lessons from Online Learning'** by F.HaiderAlvi, 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 – IV (~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 – V (~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 (COs)

1. After learning the contents of this course, the students will be able to Understand the importance of vocabulary and sentence structures
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

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I Year B.Tech. ECE I-Semester **L T P C**
Course Code: BS12102 **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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Year B.Tech. ECE I-Semester **L T P C**
Course Code: BS12101 **0 0 2 1**

APPLIED CHEMISTRY LAB
(Common to EEE, ECE, CSE, IT, ETE,CSM, CSD & 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 thehardness of water to check its suitability for drinkingpurpose.
2. To perform the estimation of acids and bases using conductometry, potentiometry and pH metrymethods.
3. To prepare polymers such as Bakelite and nylon-6 in thelaboratory.
4. The skillsrelatedtothelubricantpropertiessuchassaponificationvalue,surface tension and viscosity ofoils.

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 byConductometry.

III. Potentiometry:

1. Estimation of the amount of given acid byPotentiometry.
2. Estimation of the amount of Fe^{2+} byPotentiometry using Potassium dichromate.

IV. pH Metry:

Determination of an acid concentration using pHmeter.

V. Colorimetry:

EstimationofCopper using Colorimetry.

VI. Preparations:

1. Preparation of Bakelite.
2. Preparation Nylon –6

VII. Lubricants:

a. Estimation of saponification value of a given lubricantoil.
b. Estimation of Viscosity of lubricant oil using Ostwald'sViscometer.

VIII. Virtual lab experiments

a. Batteries for electricalvehicles.
b. Functioning of solar cell and itsapplications.

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 5thedition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBSPublications.
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/mod16.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. ECE I-Semester **L T P C**
Course Code: ES12108 **0 0 3 1.5**

PROGRAMMING LAB

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

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 ${}^{n}C_{r}$ 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. ECE I-Semester **L T P C**
Course Code: HS12105 **0 0 2 1**

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

(Common to EEE, ECE, 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 (minimum 40 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. (2022). *English Language Communication Skills – 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 (COs):

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

1. Differentiate between the letters of the alphabet and the phonetic symbols.
2. Demonstrate the right pronunciation of the words in English using phonetic transcription and word stress.
3. Speak with proper intonation, voice modulation and tonal groups.
4. Maximise the listening comprehension skills through various language modules.
5. 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.
6. 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. ECE I-Semester **L T P C**
Course Code: MC12107 **0 0 2 -**

GENDER SENSITIZATION

(Mandatory Course)
(Common to EEE, ECE, 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 (COs)

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

1. Relate the understanding of gender sensitization to basic dimensions of the biological, sociological, psychological and legal aspects of gender through discussion of materials derived from research, facts, everyday life, literature and film.
2. Develop a finer grasp of how gender discrimination works in our society and how to counter it.
3. Maximize their insight into the gendered division of labour and its relation to politics and economics.
4. Perceive the genders Men and women as professionals equipped to work and live together as equals.
5. Develop a sense of appreciation of women in all occupations.
6. 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. ECE II-Semester **L T P C**
Course Code: BS122AK **3 1 0 4**

NUMERICAL TECHNIQUES AND TRANSFORM CALCULUS

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

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 (COs)

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

1. Find the root of the algebraic and Transcendental equation and solution of a linear system of equations.
2. Fit a curve for the given data.
3. Numerical solutions for a given first order initial value problem and evaluate definite integral numerically.
4. Laplace Transform techniques and apply for solving ODE.
5. Understand the concepts of Gradient, Divergence and Curl of a Vector and scalar point functions.
6. Evaluate the line, surface and volume integrals.

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I Year B.Tech. ECE II-Semester **L T P C**
Course Code: ES122AJ **3 0 0 3**

DATA STRUCTURES

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

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 reupresentations.
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. ECE II-Semester **L T P C**
Course Code: ES122AC **3 0 0 3**

BASIC ELECTRICAL ENGINEERING

(Common to EEE, ECE, ETE, CST)

Pre Requisites: Physics

CourseObjectives:

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 & dynamicallyinducedEMF-Lenz'slaw-Fleming'srules,Simpleproblems

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 in dependent sources (DC excitation only),Simple Problems.

1-φ AC Circuits: Representation of sinusoidal waveforms, Average and RMS values, phasorrepresentation, power factor; Impedance and Power triangles, Resonancein 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 fficiency (Direct Load Test)

Inductionmotors: 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 PNJunction Diode, BJT & SCR and their Static Characteristics, Halfwave and Full wave Diodebridge 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.

ReferenceBooks:

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. ECE II-Semester **L T P C**
Course Code: ES122AE **1 0 3 2.5**

ENGINEERING GRAPHICS

(Common to EEE, ECE, ETE, CST)

Prerequisites: -Nil-

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 anyobject.
2. To construct conics and cycloidal curves used for various engineering applications.
3. To impart knowledge about standard principles of orthographic projection ofobjects
4. To develop different surfaces of simplesolids.
5. To differentiate between isometric view and projection and conversion of isometric views to orthographic viewsvice-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 andhyperbola (general method only).

Cycloidal curves: Cycloid, Epicycloid andHypocycloid (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)

IsometricProjection: 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 McGrawHill.
2. Bhatt N.D., Engineering Drawing, fifty third edition, 2016, CharotarPublishing house pvt. limited.

Reference Books:

1. Venugopal.K, Engineering Drawing and Graphics Plus Autocad, 2010, New Age International (P) Ltd., NewDelhi.
2. Dhananjay A Jolhe, Engineering Drawing, 2014, Tata McGrawHill.
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 engineeringdrawings.
6. Apply computer aided drafting tools to create objects.

I Year B.Tech. ECE II-Semester **L T P C**
Course Code: ES12204 **1 0 3 2.5**

ENGINEERING WORKSHOP

(Common to EEE, ECE, ETE, CST)

Prerequisites: -Nil-

Course Objectives: The course will enable the students

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

I) Trades for Exercises: (~12 Lectures + 36 Practices)

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 Edition, 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 students will be 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. ECE II-Semester **L T P C**
Course Code: ES12209 **0 0 3 1.5**

DATA STRUCTURES LAB

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

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.

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I Year B.Tech. ECE II-Semester **L T P C**
Course Code: ES12203 **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. ECE II-Semester **L T P C**
Course Code: ES122AD **2 0 0 2**

DESIGN THINKING

(Common to EEE, ECE, ETE & CST)

Prerequisites: -Nil-

Course Objectives: The main objectives of this course are

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, CreateSpace 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. Tim Brown, 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. ECE II-Semester **L T P C**
Course Code: MC12206 **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:

- To imbibe the importance of ecological balance for sustainable development.
- To acquire the knowledge on the impacts of developmental activities and mitigation measures.
- 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 NaturalResources 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 ofEnvironmental 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, Text book of Environmental Studies for Undergraduate Courses, University Grants Commission.
2. R.Rajagopalan, Environmental Studies,Oxford University Press.

Reference Books:

1. RichardT.Wright., Environmental Science:towards a sustainable future, PHL Learning Private Ltd. NewDelhi, 2008.
2. Gilbert M.Masters and WendellP.Ela., Environmental Engineering and science PHI Learning Pvt.Ltd., 2008.
3. DanielB.Botkin&EdwardA.Keller,EnvironmentalScience, WileyINDIAEdition.
4. AnubhaKaushik, Environmental tudies, 4th Edition, New age international publishers.
5. Dr.M.AnjiReddy, 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. I-Semester **L T P C**
Course Code: BS123AX **3 0 0 3**

SPECIAL FUNCTIONS AND COMPLEX VARIABLE THEORY

(Common to ECE, EEE, ETE)

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 (COs):

After completing the course the student will be able to

1. Evaluate the integral using Beta – Gamma functions.
2. Solve first order partial differential equations.
3. Understand about analyticity of complex valued functions and its properties.
4. Integrate a complex function over a given contour.
5. Expand a complex function in a given region of convergence using Taylor's and Laurent's series.
6. Apply knowledge of complex integrals for evaluation of real integrals.

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II Year B.Tech. I-Semester **L T P C**
Course Code: ES123AV **2 0 0 2**

PYTHON PROGRAMMING

(Common to ECE, CSE, IT, CST, CSE(AI&ML) & CSE(DS)

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 (COs):

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.ECEI-Semester **L T P C**
CourseCode: PC123AR **3 1 0 4**

ELECTRONIC DEVICES AND CIRCUITS

(Common to ECE, ETE)

Prerequisites: Physics.

Course Objectives:

1. To review the basic concepts of semiconductor devices.
2. To explore the construction, operation and characteristics of various electronic devices like diodes and transistors (BJTs and FETs).
3. To Analyze the low frequency response of BJT and FET and to understand different transistor Biasing circuits.
4. To differentiate between various feedback Amplifiers.

UNIT 1: (~10 Lecture Hours)

P-N Junction Diode: Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuits, Load line analysis, Diffusion and Transition Capacitances. Break down Mechanisms-Avalanche breakdown, Zener breakdown, Zener Diode as a Regulator, Tunneling Phenomenon.

Rectifiers: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor, Full Wave Rectifier, Bridge Rectifier. Rectifiers with Inductive, Capacitive, L and π filters.

UNIT 2: (~10 Lecture Hours)

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations.

Transistor Biasing and Stabilization: Operating point, DC & AC load lines, Biasing - Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in VBE and β.

UNIT 3: (~8 Lecture Hours)

Small Signal Low Frequency Model of BJT: BJT modelling, Hybrid model (Exact and simplified), Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors, Comparison of CE, CB and CC configurations.

UNIT 4: (~8 Lecture Hours)

Field Effect Transistors: JFET Construction and Principle of operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Small Signal Model, Biasing FET, MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET, Comparison of BJT and FET.

UNIT 5: (~9 Lecture Hours)

Positive & Negative Feedback in Amplifiers: Introduction to feedback circuits, Concepts of feedback-

Classification of feedback amplifiers - General characteristics of negative feedback amplifiers-Effect of Feedback on Amplifier characteristics-Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations-Simple problems. Barkhausen criterion, RC oscillators (phase shift, Wienbridge), LC oscillators (Hartley, Colpitts), Crystal oscillators.

Text Books:

1. J.Millman, C.C.Halkias, and SatyabrathaJit, Electronic Devices and Circuits, 2nd Edition, Tata McGraw Hill, 2007.
2. R.L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits, 9th Edition, Pearson/Prentice Hall, 2006.

Reference Books:

1. G. Streetman, and S. K. Banerjee, Solid State Electronic Devices, 7th Edition, Pearson, 2014.
2. Millman, Christos Halkias, Chetan D Parikh Integrated Electronics, 2nd Edition, Tata McGraw Hill, 2011.
3. S.G.Burns and P.R.Bond, Principles of Electronic Circuits, 2nd Edition, Galgotia Publications, 1998.
4. C.T. Sah, Fundamentals of Solid State Electronics, World Scientific Publishing Co. Inc,1991.
5. T.F. Bogart Jr., J.S.Beasley and G.Rico, Electronic Devices and Circuits, 6th Edition, Pearson Education, 2004.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_ee45/preview ('Analog Electronic Circuits' by Prof.Pradip Mandal, IIT Kharagpur)
2. https://onlinecourses.nptel.ac.in/noc21_ee80/preview ('Semiconductor Devices and Circuits' by Prof.Sanjiv Sambandan, IISc)

Course Outcomes (COs)

After completion of the course, students will be able to

1. Define and narrate the basic features of different semiconductor diodes, rectifiers, BJTs and FETs.
2. Explain the construction, operation and characteristics of PN junction diode, Zener diode, BJT, JFET and MOSFET and to outline the transistor biasing circuits.
3. Apply small signal low frequency model for BJT and develop CE, CB and CC configurations using h-parameters.
4. Analyze low frequency response of BJT and FET amplifiers with suitable biasing and facilitate comparison of BJT and FET models.
5. Differentiate between different types of feedback amplifiers and deduce the effects of feedback on Amplifier Characteristics.
6. To distinguish between Amplifiers and Oscillators, discuss and design different RC and LC oscillators and verify their performance characteristics.

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II Year B.Tech. ECE I-Semester **L T P C**
CourseCode:PC123AW **3 1 0 4**

SIGNALS AND SYSTEMS

(Common to ECE & ETE)

Prerequisites: Linear Algebra and Multivariable Calculus

Course Objectives:

1. To provide basics of signals and systems required for analyzing various areas related to signal processing.
2. To analyze spectral behavior of signals and systems using different transform techniques.
3. To develop mathematical skills to solve problems involving convolution.
4. To understand the importance of sampling theorem

UNIT 1: (~9 Lecture Hours)

Classification of continuous time signals and systems

Classification of Signals– continuous & discrete, periodic & non-periodic, energy & power signals, even & odd, deterministic & random signals, causal ,non causal & anti casual signals, right sided ,left sided and two sided signals ,problems ,Elementary Signals- Impulse function, Unit Step function, Signum function, rectangular pulse, triangular signal, Exponential and Sinusoidal signals, Operation on signals-Addition,Subtraction,multiplication ,Amplitude scaling, Time shifting, Time scaling ,Time folding, problems

Classification of continuous time systems- linear & non Linear, time-invariant & time-variant , causal & non causal, stable & unstable , dynamic & static, invertible & non invertible (problems on each category).

UNIT 2: (~9 Lecture Hours)

Fourier representation of continuous time periodic signals

Orthogonality concept, Fourier Series representation of Continuous time periodic signals, Dirichlet conditions, derivation of co-efficients of Trigonometric Fourier Series and Exponential Fourier Series, Problems, Properties of Exponential Fourier Series(with proof) –Linearity, time shifting, frequency shifting, conjugation, time reversal, time scaling, periodic convolution, multiplication, differentiation in time, integration in time,Parseval's theorem for periodic signals.

UNIT 3: (~9 Lecture Hours)

Fourier Transform for continuous time aperiodic signals

Deriving Fourier Transform from Fourier series, Fourier Transform of elementary signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform(with proof)- Linearity, time shifting, frequency shifting, conjugation, time reversal, time scaling, multiplication in time, differentiation in time, differentiation in frequency, integration in time, Parseval's theorem for aperiodic signals, problems using properties of Fourier Transform.

UNIT 4: (~9 Lecture Hours)

Convolution :

Continuous time LTI system – convolution integral (derivation), problems, properties of impulse response of LTI system, step response, sinusoidal response, Concept of convolution in Time domain and Frequency domain. Graphical representation of Convolution of- two finite duration signals, finite duration and infinite duration signals & two infinite duration signals, Convolution property of Fourier Transform.

Sampling :

Sampling theorem - Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

UNIT 5: (~9 Lecture Hours)

Laplace Transform:

Representation of Signals Using Continuous Time Complex Exponential-Laplace Transform: Introduction, Laplace transform (LT), region of convergence (ROC) & properties of ROC, LT of standard signals, unilateral LT, properties of LT w.r.t to ROC(with proofs)- linearity, time scaling & shifting, S-domain shift, convolution, differentiation in time & S-domain, integrity property, initial & final value theorems). Inverse Laplace transform w.r.t ROC, solving differential equation using Laplace transform.

Text Books:

1. B.P. Lathi Signals, Systems & Communications, BS Publications, 2009
2. Simon Haykin and Van Veen, Signals & Systems,2nd edition,Wiley ,2003
3. A. V. Oppenheim, A.S. Willsky and S.H. Nawab ,Signals and Systems , 2nd edition, 2013, PHI.

References:

1. Michel J. Robert, Fundamentals of Signals and Systems,2nd edition, 2008, MGH International Edition.
2. B.P. Lathi, Principles of Signal Processing and Linear Systems, 1st edition , 2014, Oxford University Press
3. Signals & systems ,Tarun Kumar Rawat, 1stedition, 2010, Oxford university press.
4. Ashok Ambardar, Analog and Digital Signal Processing 2nd Edition, 2001, Brooks/ Cole Publishing Company (An international Thomson Publishing Company).

Online Resources:

1. Signals and Systems,Prof. Dennis Freeman,Massachusetts Institute of Technology https://ocw.mit.edu/courses/6-003-signals-and-systems-fall-2011/video_galleries/lecture-videos/
2. Principles of Signals and Systems,Prof.Aditya K.Jagannatham,IIT Kanpur https://www.digimat.in/nptel/courses/video/108104100/L01.html

Course Outcomes (COs)

After the completion of the course students will be able :

1. To define the basic concepts of signals and describe the classification of continuous signals and systems
2. To outline and express the spectral characteristics of continuous time signals using Fourier series representation and Fourier transform techniques.
3. To applythe contents of convolution in time domain, frequency domain and construct the graphical representation of convolution of two different signals to interpret the response of an LTI system.
4. To establish sampling theorem for band limited signals, distinguishing between different types of samplings and examine the signal reconstruction.
5. To explain the need for Laplace Transformation, evaluate the Laplace Transform and Inverse Laplace Transform of different types of signals assessing Region of Convergence and apply the Laplace Transform techniques to engineering problems.

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II Year B.Tech.ECEI-Semester **L T P C**

CourseCode:PC123AT **3 0 0 3**

NETWORK THEORY AND ANALYSIS

(Common to ECE & ETE)

Prerequisites: Basic Electrical Engineering

Course Objectives:

1. To Analyze the given network using Theorems, Transient, Laplace transform and Network topology.
2. To Distinguish between Series and Parallel resonance.
3. To Classify a given network in terms of different two port network parameters.
4. To Design different Passive filters and resistance attenuators.

UNIT 1: (~10 Lecture Hours)

Review of DC Network basics, Nodal and Mesh Analysis.

Network Topology: Terminology, Cut-set and Tie-set matrices for Planar Networks with DC sources, related definitions and problems, Source Transformation and Duality.

Network Theorems: Thevenin's, Norton's, Maximum Power Transfer, Superposition, Tellegan's, Reciprocity, Millers, Millman's and Compensation theorems with DC and AC excitations.

UNIT 2: (~9 Lecture Hours)

Transient analysis: RC, RL and RLC series and parallel Circuits with DC, step, impulse, ramp, exponential and AC response using Time Domain and Laplace transform methods.

UNIT 3: (~10 Lecture Hours)

Two port networks: Z, Y, h, g, ABCD and inverse ABCD parameters, Relationship among all the parameters, interconnection of 2 two port networks and problems.

Network function: Driving point and transfer functions and their properties and problems.

UNIT 4: (~8 Lecture Hours)

Resonance: Series resonance, parallel resonance circuits, resonance frequency, impedance variation, current variation, voltage variations, bandwidth and Q factor

UNIT 5: (~8 Lecture Hours)

Filters: Image impedance, iterative impedance of T, π, L Sections, Characteristic impedance, Image transfer constants, Filter fundamentals, design of LP, HP and BP Filters using constant-k, m derived and composite filters, Attenuators.

Text Books:

1. Van Valkenburg, Network Analysis, 3rd Edition, Prentice Hall of India, 2000.
2. A. Sudhakar and Shyammohan S.Palli, Circuits & Networks, 3rd Edition, Tata Mc Graw- Hill company, 2006.

3. William Hayt and Jack E. Kemmerly, Engineering Circuit Analysis, 8th Edition, Tata Mc Graw Hill Company, 2013

Reference Books:

1. J.D.Ryder, "Networks, Lines and Fields" 2nd Edition, PHI, 1999.
2. Charles K Alexander and Mathew N O Sadiku, "Fundamentals of electric circuits", Mc Graw Hill Company, 2013.

Online Resources :

1. https://onlinecourses.nptel.ac.in/noc20_ee64/preview ('Basic Electrical Circuits': by Prof. Nagendra Krishnapura, IIT Madras)
2. https://onlinecourses.nptel.ac.in/noc21_ee14/preview ('Network Analysis': by Prof. Tapas Kumar Bhattacharya, IIT Kharagpur)

Course Outcomes (COs)

After completion of the course students will be able to

1. Label the network topology parameters, define the network theorems, source transformations and duality features.
2. Illustrate the features of RC/RL/RLC series and parallel circuits and outline their transient responses using time domain and Laplace transform methods.
3. Model two port networks using Z/Y/h/g/ABCD parameters and network functions and develop the relationship between different two port network parameters.
4. Differentiate and distinguish between series and parallel resonant circuits and examine their response characteristics.
5. Define, differentiate and estimate the image/iterative/characteristic impedance of T/π/L section networks and explain their significance for filter circuits.
6. Study the filter fundamentals, design LP/HP/BP filters using Constant K, m-derived and composite filters, discuss their response characteristics and construct different types of resistance attenuators.

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II Year B.Tech. ECE I-Semester **L T P C**
Course Code:ES12311 **0 0 3 1.5**

BASIC SIMULATION LAB

(Common to ECE & ETE)

Prerequisites:- Nil

Course Objectives:

1. To introduce MATLAB software.
2. To demonstrate the concepts learnt in Signals and Systems in MATLAB software
3. To enable students use graphical programming environment for modeling, simulating and analyzing few concepts of signals and systems using MATLAB software.
4. To prepare students on how to make use of MATLAB software for various Engineering problems.

List of Experiments:

1. Basic operations on matrices.
2. Generation of various signals (Periodic and Aperiodic), such as unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp, sinc.
3. Operations on signals such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
4. Finding the even and odd parts of signals and real and imaginary parts of signals.
5. Convolution for signals.
6. Verification of linearity and time invariance properties of a given continuous time system.
7. Computation of unit sample, unit step and sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
8. Gibbs phenomenon simulation.
9. Finding the Fourier transform of all elementary signals and plotting their respective magnitude and phase spectrums.
10. Finding the Inverse Fourier Transform of a given X(f) signal.
11. Finding the trigonometric and exponential Fourier series coefficients of a periodic rectangular signal and plotting the discrete spectrum of the signal
12. Finding the frequency response of LTI system given in differential equation/ transfer function form
13. Computing Laplace Transform of all elementary signals
14. Computing Inverse Laplace Transform of a given X(S) signal
15. Waveform synthesis using Laplace transforms.
16. Locating the zeroes and poles and plotting the pole-zero maps in S- plane for the given transfer function.
17. Sampling theorem verification.

Note:

1. Minimum 12 experiments should be conducted. All these experiments are to be simulated using MATLAB.
2. Experiment numbers 3, 5, 6, 12 are also to be simulated using Simulink.

Online Resources:

1. https://ocw.mit.edu/courses/6-003-signals-and-systems-fall-2011/video_galleries/lecture-videos/
2. https://www.digimat.in/nptel/courses/video/108104100/L01.html

Course Outcomes (COs)

After completion of the course students will be able to

1. To narrate the basic features of MATLAB software as applicable to generation of elementary signals and simulation of the mathematical operations
2. To demonstrate the convolution of signals in time domain and to illustrate responses of LTI system to various inputs using MATLAB simulations
3. To develop MATLAB codes for computing Fourier series, Fourier transforms to estimate the signal spectral characteristics.
4. To categorize MATLAB codes for computation of Laplace transform and Inverse Laplace transforms of given signals and examine the pole-zero plots.
5. To construct MATLAB simulations for verification of Gibb's phenomenon and Sampling theorem.
6. To build relevant simulation codes, with and without usage of built in functions and estimate the numerical results with supporting plots.

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II Year B.Tech. I-Semester **L T P C**
Course Code: ES12317 **0 0 2 1**

PYTHON PROGRAMMING LAB

(Common to ECE,CSE, IT, CST, CSE (AI&ML) & CSE(DS))

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 ncrby 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(COs):

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.ECEI-Semester **L T P C**
CourseCode:PC12315 **0 0 3 1.5**

ELECTRONIC DEVICES AND CIRCUITS LAB

(Common to ECE, ETE)

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 know the functionality of different oscillators.

Part A: Electronic Workshop Practice (in 3 lab sessions)

1. Identification, Specification, testing of R,L,C components (color codes), Potentiometers (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Board, PCB's.
2. Identification, Specification, testing of Active devices: Diodes, BJT, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.
3. Study and operation of: i. Millimeters (Analog and Digital) ii. Function Generator iii. Regulated Power Supplies iv. CRO.

Part B: (Minimum of 12 experiments to be conducted)

1. V-I characteristics of PN junction Diode under Forward and Reverse Bias.
2. V-I characteristics of Zener diode and Zener diode as voltage regulator.
3. Input and output Characteristics of a BJT in CE configuration.
4. Input and output Characteristics of a BJT in CB configuration.
5. Drain and Transfer characteristics of JFET.
6. HWR with and without filter.
7. FWR with and without filter.
8. Transistor as a Switch.
9. BJT Biasing circuits (Calculation of Operating point).
10. Frequency response of CE Amplifier.
11. Frequency response of CC Amplifier.
12. Frequency response of JFET CS Amplifier.
13. RC phase shift and Hartley Oscillator.
14. Voltage Series Feedback Amplifier.
15. Current Shunt Feedback Amplifier.

Online Resources :

https://circuitdigest.com/electronic-circuits
https://www.elprocus.com/simple-electronic-circuits-for-beginners/

Course Outcomes (COs)

After completion of the course, students will be able to

1. Illustrate the utility of various semiconductor devices, passive elements, basic measuring instruments and label the parameters to be estimated.
2. Identify specifications, choice of semiconductor device and equipment required and demonstrate their V-I characteristics.
3. Construct different types of rectifier circuits and estimate their performance characteristics with and without filters.
4. Test and examine BJT and FET amplifier circuits and analyze their frequency response characteristics.
5. Configure BJT amplifier with and without feedback and access their performance characteristics.
6. Design, develop and test RC and LC oscillators and estimate their Circuit Characteristics.

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II Year B.Tech. I-Semester **L T P C**
CourseCode:MC12312 **2 0 0 0**

CONSTITUTION OF INDIA

(Mandatory Course)

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 : ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: 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 (COs)

After completion of the course, students will be able to

1. Tell about function of Indian constitution with clarity and understanding.
2. Identify the Rights of equality, the Right of freedom and the Right to constitutional remedies
3. Mark the knowledge of union government & their powers and function.
4. Define the state and central policies, fundamental duties.
5. Explain the powers and functions of Municipalities, Panchayats and Co-operative Societies.
6. Discuss the Electoral Process, special provisions.

II Year B.Tech. II-Semester **L T P C**
CourseCode:BS124BN **3 0 0 3**

PROBABILITY THEORY AND STOCHASTIC PROCESSES

(Common to ECE, ETE)

Prerequisites: -

Course Objectives:

1. To introduce a basic methodology of randomness in nature and a general overview of statistical methods, probability theory, and random variables
2. To deal with multiple random variables.
3. To analyse random processes and obtain statistical characteristics of the response of LTI system.
4. To study spectral characteristics of the response of the LTI system.

UNIT 1 : (≅ 09 lectures)

Probability: Probability introduced through sets and relative frequency – experiments and sample spaces, discrete and continuous sample spaces, events, probability definitions and axioms, mathematical model of experiments, Probability as a relative frequency, joint and conditional probabilities, total probability, Baye's theorem, independent events.

Random Variable: Definition of a random variable, conditions for a function to be a random variable, discrete, continuous and mixed random variables.

UNIT 2 : (≅10 lectures)

Distribution & Density Functions of Random Variable: Distribution function, density function, The Gaussian random variable, other distribution and density examples, conditional distribution and density functions.

Operation on One Random Variable – Expectations: Introduction, expectation – expected value of a random variable, expected value of function of a random variable, moments, Chebychev's inequality, Markov's inequality, Chernoff's bound, functions that give moments – characteristic function, moment generating function, Transformations of a random variable.

UNIT 3 : (≅11 lectures)

Multiple Random Variables: Vector random variables, joint distribution and its properties, joint density function and its properties, conditional distribution, and density – Point conditioning, conditional distribution and density - Interval conditioning, statistical independence.

Operations on Multiple Random Variables: Expected value of a function of random variables, joint moments about origin, joint central moments, joint characteristic functions, jointly Gaussian random variables, transformations of multiple random variables, linear transformations of Gaussian random variables, Law of large numbers (statement), distribution and density of sum of random variables, Central limit theorem (statement)-equal distributions, unequal distributions, problems on central limit theorem.

UNIT 4 : (≅08 lectures)

Stochastic Processes – Temporal Characteristics: The stochastic process concept, stationarity and independence – distribution and density functions, statistical independence, first-order stationary processes, second-order and wide-sense stationarity, Nth order and strict-sense stationarity, time averages and ergodicity – mean-ergodic

processes (Proof not expected), correlation-ergodic processes (Proof not expected), correlation functions, Gaussian random processes, Poisson random process, random signal response of linear system.

UNIT 5 : (≅07 lectures)

Stochastic Processes – Spectral Characteristics: Power density spectrum and its properties, relationship between power spectrum and autocorrelation function, cross-power density spectrum and its properties, relationship between cross-power density spectrum and cross-correlation function, spectral characteristics of system response.

Text Books:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2010.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes" 4th Edition, TMH, 2011.

Reference Books:

1. Mallikarjuna Reddy, "Probability Theory and Stochastic Processes", 4th Edition, Cengage Learning, 2013.
2. "Schaum's outline of Theory and Problems of Analog and Digital Communications" - Schaum's Outline Series, 2nd Edition, McGraw-Hill, 2004.
3. Henry Stark and John W. Woods, "Probability and Random Processes with Application to Signal Processing", 4th Edition, Pearson Education, 2012.

Online Resources:

1. http://nptel.ac.in/courses/117105085/ (Probability and Random Processes- by Prof Mrityunjoy Chakraborty, IIT Kharagpur)
2. https://nptel.ac.in/courses/111102111(Introduction to Probability Theory and Stochastic Processes- by Dr.S.Dharamraja, IIT Delhi)

Course Outcomes (COs)

After completion of the course, students will be able to

1. Define probability through axioms and relative frequency, random variables, and random processes.
2. Identify probabilistic models and functions of random variables using single and multiple random variables, and describe the significance of various inequalities and bounds.
3. Calculate moments, and characteristic functions for single and multi- random variables.
4. Analyse the temporal and spectral characteristics of random processes.
5. Evaluate the characteristics of response of LTI system with respect to the input applied to the system.

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II Year B.Tech.ECE II-Semester **L T P C**
CourseCode:PC124BJ **3 0 0 3**

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

Prerequisites: -Nil-

Course Objectives:

This is a structured foundation course, dealing with concepts, formulations and applications of Electromagnetic Theory and Transmission Lines, and is the basic primer for all electronic communication engineering subjects. The main objectives of the course are

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields, and apply them to solve physics and engineering problems.
2. To distinguish between static and time-varying fields, and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
3. To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
4. To conceptually understand the phenomena of reflection and refraction at different boundary surfaces.
5. To determine the basic Transmission Line Equations and telephone line parameters and estimate the distortions present.
6. To understand the concepts of RF Lines and their characteristics, Smith Chart and its applications, acquire knowledge to configure circuit elements, QWTs and HWTs, and to apply the same for practical problems.

UNIT 1: (~12 lecture hours)

Electrostatics: Review of Co-ordinate systems & Vector Algebra, Coulomb's Law, Electric Field Intensity - Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance -Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT 2: (~10 lecture hours)

Magnetostatics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Illustrative Problems, Introduction to Ampere's Force Law.

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface : Dielectric- Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

UNIT 3: (~10 lecture hours)

EM Wave Characteristics-I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves-Definition, All Relations Between E &H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics-Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

EM Wave Characteristics-II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem – Applications, Illustrative Problems.

UNIT4: (~7 lecture hours)

Transmission Lines-I: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness /Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Illustrative Problems.

UNIT 5: (~7 lecture hours)

Transmission Lines-II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; λ/4, λ/2, λ/8 Lines-Impedance Transformations, Significance of Zmin and Zmax, Smith Chart-Configuration and Applications, Single Stub Matching, Illustrative Problems.

Text Books:

1. Matthew N.O. Sadiku and, S.V. Kulkarni-Principles of Electromagnetics, Oxford University Press, 6th Edition, Aisan Edition, 2015.
2. E.C. Jordan and K.G. Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, PHI, 2000.

Reference Books:

1. William H. Hayt Jr. and John A. Buck -Engineering Electromagnetics, 7th Edition, McGraw Hill Education, 2006.
2. Nathan Ida, Engineering Electromagnetics, 2nd Edition, Springer (India) Pvt. Ltd., New Delhi, 2005.

Online Resources:

1. https://nptel.ac.in/courses/117101056
   (Course Title : Transmission Lines and EM Waves, by Prof. R.K.Shevgaonkar (IITB))
2. https://onlinecourses.nptel.ac.in/noc16_ph03
   (Course Title : Introduction to Electromagnetic Theory by Dr. Manoj Kumar Harbola (IITK))
3. https://onlinecourses.nptel.ac.in/noc21_ee83
   (Course Title : Electromagnetic Theory by Prof. Pradeep Kumar (IITK))
4. https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-ee82/
   (Course Title : Applied Eletromagnetics for Engineers by Prof. Pradeep Kumar (IITK))

Course Outcomes (COs)

After completion of the course, students will be able to

1. Student will be able to Define and narrate the basic concepts of electrostatic fields and relate the corresponding Maxwell's equations.
2. Students will be able to Explain Maxwell's two equations for magnetostatic fields and outline magnetic vector potential concepts.
3. Students will be able to Develop the Maxwell's equations for time varying fields, and apply them to build the boundary conditions.
4. Students will be able to Define a Uniform Plane Wave (UPW), derive the wave equations and establish the wave propagation characteristics in different media, categorizing the phenomena of reflection and refraction at different boundaries.
5. Students will be able to Deduce the transmission line equations, evaluate the line parameters and assess losslessness and distortionlessness.
6. Students will be able to Compile the transmission characteristics for RF lines, configuring the impedance transformations using QWT design and single stub matching with and without Smith charts.

II Year B.Tech.ECEII-Semester **L T P C**
CourseCode: PC124AZ **3 0 0 3**

ANALOG CIRCUITS

(Common to ECE, ETE)

Prerequisite: 1. Electronic Devices and Circuits 2. Network Theory

Course Objectives:

1. To familiarize with different types of Power Amplifiers, Wave shaping circuits and Multivibrators.
2. To understand the working of Op-amp and its applications.
3. To know the functionality of ADC and DAC circuits
4. To distinguish between various modes of 555 Timer.

UNIT 1: (~10 Lecture Hours)

Multistage Amplifiers: Different coupling schemes used in amplifiers, Analysis of two stage RC Coupled Amplifier, Darlington pair and Bootstrap Darlington pair. **Power amplifiers:** Classification of Amplifiers – Distortion in amplifiers, Various classes of operation (Class A, B), Class A Power Amplifier, Maximum Efficiency of Class A Amplifier, Transformer Coupled Class A Amplifier, Push- Pull and Complimentary Symmetry Class B, Concept of Tuned Amplifier and its applications.

UNIT 2:(~10 Lecture Hours)

Linear Wave Shaping: High pass and low pass RC circuits and their response for Sinusoidal, Step, Pulse, Square, & Ramp inputs, High pass RC network as Differentiator, Low pass RC circuit as an Integrator.

Non-Linear Wave Shaping: Diode clippers, Clipping at two independent levels, Positive and Negative Clampers, Clamping circuit theorem.

UNIT 3:(~8 Lecture Hours)

Multivibrators: Analysis and Design of Bistable Multivibrator, Commutating Capacitors, Types of Triggering, Collector coupled Monostable and Astable Multivibrators, Schmitt trigger using Transistors.

UNIT 4: (~8 Lecture Hours)

Operational Amplifier:

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Applications of Op-Amp - Differential Amplifier, Logarithmic amplifier, Differentiator and Integrator, Summing Amplifier, Precision Rectifier.

UNIT 5: (~9 Lecture Hours)

IC 555Timer: Functional Diagram, Monostable and Astable Operations, Applications, **IC565 PLL**- Block Schematic & Applications, **Digital-to-Analog converters (DAC)-**Weighted Resistor, R-2R ladder, **Analog-to-Digital converters (ADC)-**Dual slope, Successive approximation, Flash.

Text Books :

1. J. Millman, H. Taub and Mothiki S. Prakash Rao, "Pulse, Digital and Switching Waveforms", 2nd Edition, McGraw Hill, 2008.
2. J.Millman and Christos C Halkias , "Integrated Electronics", TMH 2010.
3. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 2003.

References:

1. D. Roy Chowdhury, "Linear Integrated Circuits", 2nd Edition, New Age International (p) Ltd, 2003.
2. J. Millman and A. Grabel, "Microelectronics", 2nd edition, McGraw Hill, 1988.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_ee45/preview ('Analog Electronic Circuits' by Prof. Pradip Mandal, IIT, Kharagpur.)
2. https://nptel.ac.in/courses/108101094 (Lectures on 'Analog Circuits' by Prof. Jayanta Mukherjee, IIT Bombay.)

Course Outcomes(COs):

After completion of the course the student should be able to

1. After completion of the course, students will be able to Identify the need for Multistage Amplifiers, different coupling schemes and estimate the amplifier parameters.
2. Compare the performance characteristics of Class A/B/C Power Amplifiers and outline their applications.
3. Construct linear and nonlinear wave shaping circuits and interpret their responses.
4. Analyze and Design different types of Multivibrators and Schmitt Trigger using transistors.
5. Illustrate the Op-amp characteristics and its linear/nonlinear applications.
6. Explain the functional schematic of IC 555, IC 565 and their applications, study the performance characteristics of different ADCs and DACs.

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II Year B.Tech.ECEII-Semester **L T P C**
Course Code: PC124BE **3 0 0 3**

DIGITAL ELECTRONICS AND LOGIC DESIGN

(Common to ECE, ETE)

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 impart student the concepts for analyzing digital systems in terms of state machines.

UNIT1: (~ 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: (~11 Lecture Hours)

Minimization of Combinational Circuits: Introduction, The Karnaugh Map Method-Up to Five 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, BCD to Seven Segment Decoder, PLD's: PROM, PLA, PAL, Realization of circuits using PLD's.

UNIT 3: (~11 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: (~7 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: (~9 Lecture Hours)

Finite State Machines: State Diagrams, Mealy and Moore Models, Finite State Machines – Capabilities, Limitations, Minimization of Completely and Incompletely Specified FSMs.

Logic Families: Introduction, Characteristics of Digital ICs, Transistor Transistor Logic, Emitter Coupled Logic, MOS Logic, CMOS Logic.

Text Books:

1. Morris Mano, "Digital Design", Pearson, 5th Edition, 2012.
2. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 4th Edition, 2009.
3. Zvi Kohavi & Niraj K. Jha, "Switching and Finite Automata Theory", Cambridge University Press, 3rd Edition, 2009.

Reference Books:

1. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill, 2nd Edition, 2012.
2. W. H. Gothmann, "Digital Electronics- An Introduction to Theory and Practice", PHI, 2nd Edition, 2006.
3. A. Anand Kumar, "Switching Theory and Logic Design", PHI, 3rd Edition, 2013.

Online Resources:

1. https://www.youtube.com/watch?v=CeD2L6KbtVM&list=PL803563859BF7ED8C - Digital Circuits & Systems by Prof. S. Srinivasan, Department of Electrical Engineering, IIT Madras
2. https://onlinecourses.nptel.ac.in/noc20_cs67/preview - Switching Circuits and Logic Design by Prof Indranil Sengupta, Department of Computer Science and Engineering, IIT Kharagpur

Course Outcomes (COs)

After completion of the course the student will be able to

1. Recall fundamental concepts and techniques involved in the design of digital circuits.
2. Comprehend the concepts required to design basic combinational and sequential circuits.
3. Demonstrate building of various designs using basic digital blocks.
4. Design complex digital systems using simpler digital subsystems.
5. Verify the digital designs for required functionality.
6. Provide solutions for various requirement specifications in the form of digital designs.

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II YEAR B.TECH. ECE II -SEMESTER **L T P C**
COURSE CODE: PC124BC **3 0 0 3**

CONTROL SYSTEMS ENGINEERING

(Common to ECE, ETE)

Prerequisites: Ordinary Differential Equations & Laplace Transform, Linear Algebra, Mathematics I

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 performance of linear control systems using time domain analysis and methods for improving it.
3. To assess the performance of linear control systems using frequency domain analysis and techniques for improving the performance.
4. To design various compensators to improve system performance.

UNIT 1: (~10 Lecture hours)

Introduction: Introduction, time variant, time invariant open loop and closed loop Control System. Development of Block diagrams and Transfer Function of physical/Mechanical and Electrical systems. Feedback elements of closed loop Control Systems: DC and AC Servo motors,

Synchro's, Tachometer. Block diagram reduction, signal flow graphs, Mason's gain formula, numerical problems.

UNIT 2: (~8 Lecture hours)

Time Domain Analysis: Unit step, ramp and impulse signals, Steady state error using error constants, step and ramp response of first order and second order systems, time domain specifications, derivations, problems, P, PD, PI, PID controllers with derivations.

UNIT 3: (~9 Lecture hours)

Stability Analysis: Concept of stability, Absolute stability, Conditional stability, Relative stability, Limited stability, Routh Hurwitz criterion, Problems.

Root Locus: Construction of Root locus, Effect of addition of poles and zeros in transfer function on stability.

UNIT 4: (~10 Lecture hours)

Nyquist, Bode plots and compensators: Frequency domain specifications, Bode plot, finding frequency domain specifications from plot, Effect of gain K, frequency domain specifications with the help of Bode plot. Nyquist plot of different systems including systems with dead time, Performance specifications like ùc, ùg Gain margin, Phase margin.

Compensators: Lead, Lag compensators, Lead-Lag compensators. Design of system using compensators.

UNIT 5: (~8 Lecture hours)

State Variable Analysis: Concept of state, State Equations, State Transition matrix, State Transition Equation, Transfer Function from differential equations and state equations, State equations from differential equations, State models, Controllability, Observability.

Digital Control Systems Digital control, advantages and disadvantages, and digital control system architecture. The discrete transfer function.

Text Books:

1. B.C. Kuo, Automatic Control Systems, 10th edition, John Wiley and sons, 2017.
2. I.J. Nagrath and M. Gopal, Control Systems Engineering, 6th edition, New Age International (P) Limited, Publishers, 2018.

Reference Books:

1. Katsuhiko Ogata, Modern Control Engineering, 5th edition, Prentice Hall of India Pvt.Ltd., 2010.
2. M. Gopal, Control Systems Principles and Design, 4th edition, Tata McGraw-Hill,2012.
3. A.Nagoorkani, Control Systems, 3rd Edition, RBA Publications, 2017.
4. A K. Jairath, Solutions and Problems of Control Systems, 7th edition, CBS publications and distributors,2021.
5. Gopal, Madan, "Digital Control Engineering," 1/e, New Age Publishers, 2008

Online Resources:

1. Control Engineering, Dr. Rama Krishna Pasumarthy, Associate Professor, IIT Madras. https://nptel.ac.in/courses/108106098/
2. Control Engineering, Prof.S.D.Agashe, Professor, IIT Bombay. https://www.digimat.in/nptel/courses/video/108101037/L01.html

Course Outcomes (COs):

After completion of the course the student will be able

1. To narrate the basic features of Open Loop and Closed Loop control systems, illustrate the physical and electrical systems and formulate their transfer function
2. To categorize first order and second order systems and examine their time domain responses for different inputs and analyze the transfer function of proportional(P), proportional plus derivative(PD), proportional plus integral(PI),proportional plus derivative plus integral controllers(PID)
3. To define the concept of stability and analyze the system stability using RH criteria and Root Locus technique
4. To assess the stability in frequency domain using Bode, Nyquist plots and develop compensators to meet given frequency domain specifications.
5. To define the basic concepts of state variable analysis, derive state equations and establish transfer functions for a given system and discuss their controllability and observability. To define the basics of Digital control system and its Transfer function.

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II Year B.Tech.ECEII-Semester **L T P C**
CourseCode:PC12418 **0 0 3 1.5**

ANALOG CIRCUITS LAB

(Common to ECE, ETE)

Prerequisites: -Nil-

Course Objectives:

1. To design, simulate various non-linear wave shaping circuits, multivibrators.
2. To verify practically different applications of Op-Amp.
3. To familiarize with the operation of DACs.
4. To know the functionality of 555 timer in different modes.

Minimum Twelve experiments to be conducted

List of Experiments:

1. Design, develop and Testing of a Two Stage RC Coupled Amplifier.
2. Design, develop and Testing of a Non-linear wave shaping circuits
   a) Clippers b) Clampers
3. Design, develop and Testing of a Bi-stable Multivibrator.
4. Design, develop and Testing of a Monostable Multivibrator.
5. Design, develop and Testing of a Astable Multivibrator.
6. Design, develop and Testing of a Schmitt Trigger.
7. Design an Adder, Subtractor using Op-amp 741.
8. Design an Integrator and Differentiator using Op-amp 741.
9. Design an Inverting Amplifier and Non-Inverting Amplifier using Op-amp 741.
10. Design an R-2R ladder DAC.
11. Design a Weighted Resistor DAC.
12. Design a Monostable Multivibrator using 555 Timer.
13. Design an Astable Multivibrator using 555 Timer.

Note:

1. Any 3 Experiments from 1 to 6 Experiments to be implemented using Simulation (Multisim or equivalent) and 1 to 6 Experiments to be implemented using Hardware realization.
2. Experiments 7 to 13 to be implemented using Design and Hardware realization.
3. Minimum 12 out of 13 to be carried out.

Online Resources:

https://onlinecourses.nptel.ac.in/noc18_ee11/preview

Course Outcomes (COs)

After completion of the course the student should be able to

1. Demonstrate the frequency response characteristic of a two stage RC coupled amplifier.
2. Build different non-linear wave shaping circuits and outline their responses.
3. Design, develop and test Multivibrators using transistors and IC 555 timer in Monostable, Astable modes.
4. Construct, develop and demonstrate linear/non-linear applications of IC741 Op-amp.
5. Develop different types of DAC circuits and illustrate their functionality.
6. Design and analyze analog circuits that uses IC741/IC555 for different electronic applications.

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B.Tech. IIYear,ISem **L T P C**
CourseCode:PC12419 **0 0 3 1.5**

DIGITAL ELECTRONICS AND LOGIC DESIGN LAB

(Common to ECE, ETE)

Prerequisites: -Nil-

Course Objectives:

1. To realize and design combinational circuits.
2. To build sequential circuits.
3. To analyze the functionality of digital systems.

List of Experiments:

1. Design a 450 KHz clock using NAND / NOR gates.
2. Realize and design a 16 x 4 priority encoder using two 8 x 3 priority encoder.
3. Realize and design a 16-bit comparator using 4-bit comparators.
4. Realize and design a 16 x 1 multiplexer using 8 x 1 multiplexer.
5. Realize and design a 16-bit adder / subtractor using 4-bit adder / subtractor IC's
6. Realize and design 4 bit gray to binary and binary to gray code converters.
7. Plot the transfer characteristics of 74H, LS, HS series IC's.
8. Realize and design a modulo-53 counter using two decade counters.
9. Realize and design a 4-bit pseudo random sequence generator using 4-bit ring counter.
10. Realize and design a two digit 7-segment display unit. Display a Mod-53 counter output on the 7-segment display.
11. Realize and design an 8-bit parallel load and serial out shift register using two 4-bit shift register.
12. Realize and design an 8-bit serial in and serial out shift register using two 4-bit shift register.
13. Realize and design a ring counter and twisted ring counter using a 4-bit shift register
14. Realize and design a 4-digit hex counter using synchronous one digit hex counters.
15. Realize and design a 4-digit hex counter using asynchronous one digit hex counters.
16. Hobby Project

Note: Minimum of 12 experiments to be conducted.

Text Books:

1. Morris Mano, "Digital Design", Pearson, 5th Edition, 2012.
2. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 4th Edition, 2009.

Reference Books:

1. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill, 2nd Edition, 2012.
2. W. H. Gothmann, "Digital Electronics- An Introduction to Theory and Practice", PHI, 2nd Edition, 2006.
3. A. Anand Kumar, "Switching Theory and Logic Design", PHI, 3rd Edition, 2013.

Online Resources:

1. https://www.youtube.com/watch?v=CeD2L6KbtVM&list=PL803563859BF7ED8C - Digital Circuits & Systems by Prof. S. Srinivasan, Department of Electrical Engineering, IIT Madras
2. https://onlinecourses.nptel.ac.in/noc20_cs67/preview - Switching Circuits and Logic Design by Prof Indranil Sengupta, Department of Computer Science and Engineering, IIT Kharagpur

Course Outcomes (COs)

After completion of the course the student should be able to

1. Recall the concepts involved in combinational and sequential circuits.
2. Demonstrate the ability to build simple digital systems.
3. Interpret the outputs of the digital blocks with the help of timing diagrams.
4. Design complex digital systems using modular approach.
6. Discuss the approach used to build and verify the circuits.

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II Year B.Tech. II-Semester **L T P C**
Course Code: MC12422 **2 0 0 0**

HUMAN VALUES AND PROFESSIONAL ETHICS

(Mandatory Course)

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 enable the 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 (COs):

After completion of the course the student should be able to

1. Understand the importance of imbibing and inhering Ethics and values as an individual and professional
2. Relate the need for establishing harmony at various levels.
3. Evaluate the relevance of ethical values in their academic and professional environment.
4. Develop right understanding about oneself and the rest of reality through self-exploration.
5. Identify the basis for universal human values based on right understanding providing the vision for the holistic way of living.
6. 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 impart the knowledge of basic sciences , mathematics and programming skills in solving various Engineering problems pertaining to the field of Electronics and Communications
PEO2:	To train the students in analyzing , designing and imparting research based knowledge and acquainting them with modern scientific tools
PEO3:	To create professional , ethical environment and to inculcate effective communication skills .
PEO4:	To encourage team work and interdisciplinary ideas benefiting the society
PEO5:	To motivate students to be independent with a desire for life long learning and adapt to the changing professional needs

Program Outcomes (POs) – B.Tech. (ECE)

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, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3:	Design & Development 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:	Investigation 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 modelling to complex engineering activities with an understanding of the limitations.
PO6:	Engineering & Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7:	Environment & 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 & 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 & 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 – B.Tech. (ECE)

PSO1:	Research Activities:Develop abilities to successfully analyze, execute and synthesize hardware and software oriented mini-and technical major-projects in identified specializations and areas of interest, and enrich industry compatibility
PSO2:	Professional Outlook: Establish a good knowledge sharing network and peer connectivity through Professional Society Memberships, Conduct of seminars, Technical Events and Conference Paper Presentations, and earn prominence.

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.