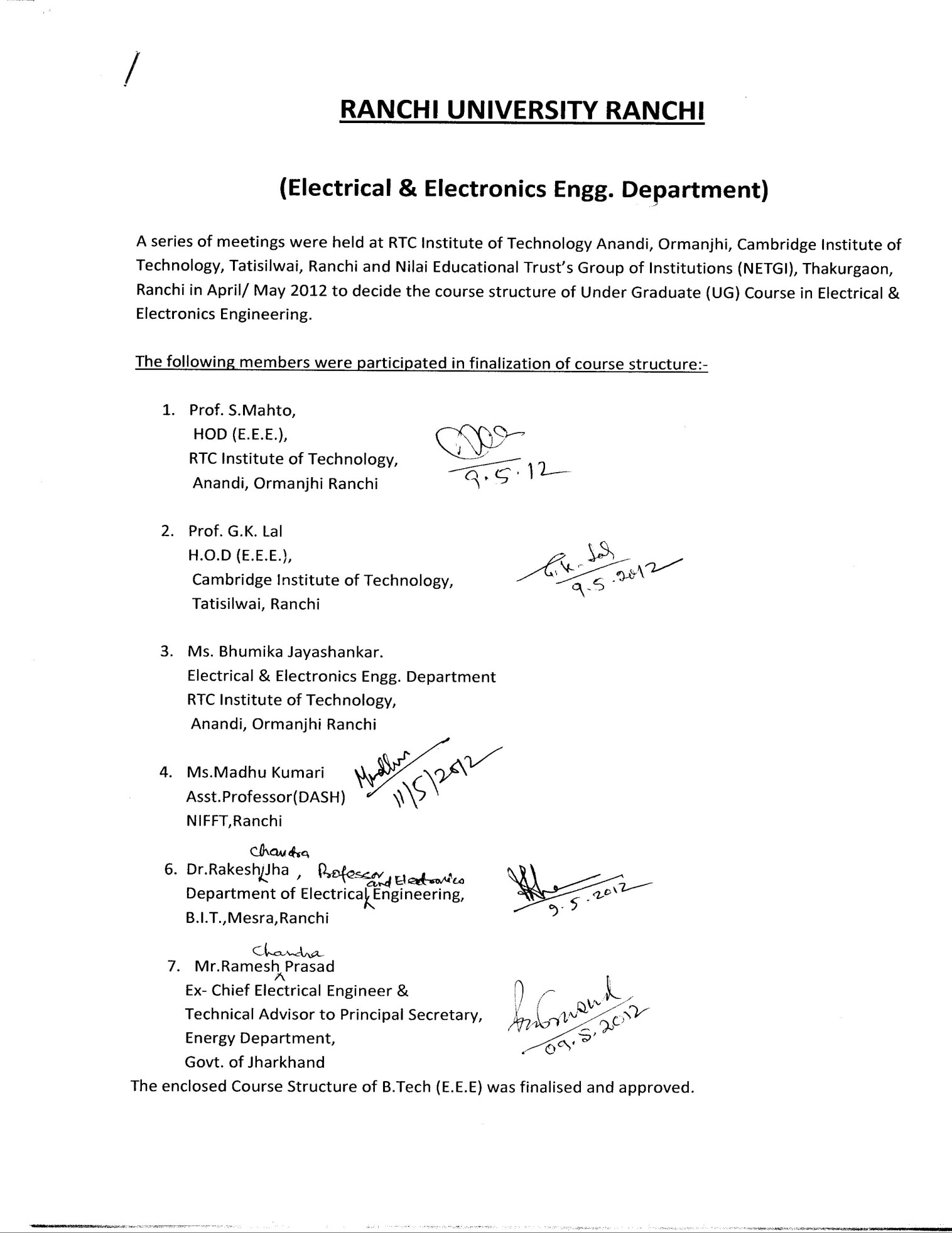
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**REGULATION**

**FOR**

**B.TECH. COURSE**

**RANCHI UNIVERSITY**

**REGULATION**

**FOR  
B.TECH. COURSE OF RANCHI UNIVERSITY**

**Leading to Bachelor of Technology Degree**

1. **Introduction :**
   1. The Ranchi University, Ranchi, constituted the Board of studies, vides Notification, No. RU/R/8086/12 dated 12.03.2012 , to formulate the Curricula of B. Tech.Courses as well as regulations of the university. Several meetings of the committee were held chairmanship of the Dean, Faculty of Engineering of Ranchi University, Ranchi. The Board of studies considered the guidelines provided by AICTE, while formulating the regulation and syllabus of B.Tech Courses.
   2. All B.Tech Courses of 4-year duration shall consist of eight semesters. However, a student may be allowed to complete the course in maximum of six years.
   3. The regulation and curriculum of B.Tech Courses will come into force from the Academic Year 2012 for the students admitted in the session 2012-13 and onwards.
   4. The provision of this regulation shall also be applicable to any discipline that is introduced from time to time in the Engineering Colleges affiliated to Ranchi University.
   5. The University Senate on the recommendation of the Academic Council may change any or all parts of this Regulation at any time considered appropriate.
2. **Academic Calendar**

2.1 The Academic Session shall be divided into two semesters each of approximately 17 weeks duration (90 working days including examination period).The odd semesters shall start from July and end in December, whereas even semesters will begin in January and end in May every academic year.

2.2 A Co-ordination Committee shall be constituted consisting of Dean, Faculty of Engineering (Chairman), Controller of Examination of R.U (Member-Secretary) and Principals of all affiliated engineering colleges under Ranchi University (members).

The committee shall prepare the Examination Calendar at the beginning of each Academic Year for both odd as well as even semesters.

**3. Admission**

3.1 Admission to all B. Tech. Courses will be made in the first semester of each academic year, at the first year level through the JECECE, AIEEE, and others as per the guidelines of AICTE/Government of Jharkhand. Lateral entry in IIIrd Semester will be permitted as per the guidelines of AICTE/ Government of Jharkhand.

3.2 All students admitted to any of the B.Tech. courses shall deposit the requisite fees as prescribed by the institutes at the time of joining in each academic year.

**4. Residence**

4.1 The Residential requirement shall be as per rules of AICTE. There should be  
 accommodation facility at least 25% for Boys & 50% for Girls Students.

**5. Attendance**

5.1 Minimum 70 % attendance is essential for any student to appear in the end semester examination. The balance 30% shall include absence for all other reasons including medical.

**6. Conduct & Discipline**

Following rules shall be in force to govern the conduct and discipline of students:

6.1 Students shall show due respect to the teachers of the Institute, the wardens of Hostels, the sports officers and the officers of the National Cadet Corps; proper courtesy and consideration should also be extended to the employees of the institute and hostel. They shall also pay due attention and courtesy to visitors.

6.2 Students are required to develop a friendly relationship with fellow students. In particular, they are expected to show kindness and consideration to the new students admitted to the institute every year. Law bans ragging in any form to anybody. Any act of physical or mental pressurization of junior students, individually or in a group, will be considered as an act of ragging. Ragging also includes forcing junior students to meet seniors outside institute premises, or in places where student has no valid reason to be present, asking irrelevant questions or using abusive language. Ragging will be considered as gross indiscipline and will be severely dealt with, which may include expulsion from institute.

If junior student yields to any form of ragging by senior students and does not inform the institute or hostel authorities, or willfully withholds the information in an enquiry of ragging incident, the matter will be treated as indiscipline on part of junior student and will invite punishment comparable to those against whom ragging charge are framed. Willful withholding of complain by a junior student does not automatically exempt a senior from punishment.

6.3 The following acts of omission and /or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures:

* Furnishing a false statement of any kind in the form of application for admission or for award of scholarship or prizes etc.
* Furnishing false statement to the Disciplinary Committee, or willfully withholding information relevant to an enquiry.
* Organising or participating in an activity that has potential for hurting fellow students along lines of religion, caste, home state, and batch of admission, hostel or any other unhealthy criterion.
* Physical or mental harassment of freshers through physical contact or oral abuse.
* Getting involved in a brawl or fight with persons outside the Institute, either alone or in a group, irrespective of who has initiated the conflict.
* Willfully damaging or stealthily removing any property that belonging to the institute, hostel or fellow students.
* Adoption of unfair means in the examinations.
* Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.
* Organising or participating in any group activity except purely academic and scientific programms in the company with others in or outside the campus without prior permission of Dean of Student’s affairs /Principal of Institute.
* Mutilation or unauthorized possession of library books.
* Displaying lack of courtesy and decorum by resorting to indecent behavior anywhere within or outside campus.
* Resorting to noisy and unseemly behavior, disturbing studies of fellow students.
* Not intimating his/her absence to the warden before leaving the campus.

6.4 Commensurate with the gravity of offence, the punishment may be

1. Reprimand.
2. Additional work in the institute.
3. Debarment from student activities and elections and captaincy of sport teams.
4. Debarment from medals and prizes.
5. Partial ( 1 month or one semester ) or complete debarment from campus placement.
6. Reduction in grade in one or more subjects.
7. Expulsion from hostel.
8. Rustication for a specified period.
9. Outright expulsion from the Institute.

Punishment under items v-ix will constitute major punishment and will debar a student from all academic medals & prizes as well important non academic awards.

* 1. For all such major acts of indiscipline, which may have serious repercussion on students in general and/or which may warrant a uniform and more formalized nature of investigation, the Institute will form Disciplinary Committee to examine available evidences and award punishment through Principal of the college.
  2. Cases of unfair means in the sessional examination may be dealt with Examination Disciplinary committee of the Institute
  3. In case any student is found using unfair means in any subject/paper for the End Semester for which the examination are in progress, the concerned student will be expelled from the course for which he was admitted. However, this would not preclude from his being readmitted to the next course in the series and such student may be readmitted to the next course from the beginning of concerned semester during which he was expelled from the course. As an example, if a student was found using unfair means during examination for second semester of the course, he may be readmitted from the beginning of second semester of next course in the series.

**7. Change of Branch**

7.1 Only those Students will be eligible for a change of Branch after the Second Semester, who has   
 (a) Completed all the Credits prescribed in the First Two Semesters of their Studies in their

first attempt.

(b) Obtained a CGPA, at the end of the Second Semester, not lower than 8.25.

7.2 Students may *enlist their* *choice* of Branch, in order of preference, to which they wish to change over. It will not be permissible to alter the *choice* after the application has been submitted.

* 1. Change of Branch shall be made strictly on the basis of Merit of the applicants. For this purpose, the CGPA obtained at the end of second semester shall be considered.
  2. *All Change of Branch made in accordance with the above Rules will be effective from the 3rd   
      Semester of the applicants concerned.*
  3. *No changes of Branch shall be permitted here after.*
  4. Maximum branch change will be limited to 10% of branch intake, subject to condition that (a) strength of branch will not go below 90 % of sanctioned strength and (b) there is vacancy in the branch.
  5. The Institute will forward *the* recommendation for branch change to Dean, Faculty of Engineering, followed by approval *of* Vice-Chancellor *and the decision is* to be communicated to Controller of Examination, Ranchi University and the Institute concerned.

**8. Course Structure**

8.1 Total credit point for B.Tech course should be between 200-212.

8.2 The Curricula for the different Degree Programs as proposed by the respective   
Departments *and* recommended by the Academic Committee of the Institute shall be approved by the Academic Council of the University and subsequently ratified by Ranchi University Senate.

**9. Registration**

9.1 Every Student of the B. Tech. Course is required to register, in person, at the   
 commencement of each semester, on the day fixed for and notified in the Academic   
 Calendar.

9.2 Registration of students for all semesters will be centrally organized by the Academic   
 section of the Institute.

9.3 A student who failed to register on the day announced for the purpose may be   
 permitted for late registration within next three working days on payment of additional late fee as prescribed by the Institute. Normally no Late Registration shall be permitted after the Third Working Day from the scheduled date of registration.

9.4 Only those students will be permitted to register who have:

(a) Cleared all dues of the previous semesters.

(b) Paid all prescribed fee for the current semester.

(c) Not been debarred from registering for a specified period on disciplinary or any  
 other ground.

**10. Performance Evaluation**

10.1 Students’ performance will be measured on a 10 point Scale Grading System using Letter Grades.

10.2 Grading System: A grade will be awarded to student in a subject based on his performance in end semester examination, practical examination and internal assessment through class tests, home assignments. Grades will be assigned and associated point values will be as follows:

|  |  |  |
| --- | --- | --- |
| Range of Marks  (percentage) | Grade | Point of Value |
| 90-100 | Ex | 10 |
| 80-89 | A | 9 |
| 70-79 | B | 8 |
| 60-69 | C | 7 |
| 50-59 | D | 6 |
| 35-49 | P for theory courses | 5 |
| 40-49 | P for Laboratory Courses(Practical) | 5 |
| Less than 35 | F for theory courses | 0 |
| Less than 40 | F for Laboratory Courses(Practical) | 0 |

The student must secure 35% marks in end semester examination (ESE) **and** 35% marks in sessional separately.

The Examination Section of Ranchi University will centrally conduct the End Semester Examinations in respect of the Theory component of the subjects. Each subject/paper will carry 100 marks. The sessional and practical will be assessed on 50 marks each.

The distribution of sessional marks will be as follows:

Attendance: 10

Class Test/Home assignment: 30

Performance/Behavior: 10

The distribution of practical marks will be as follows:

Attendance: 10

Timely submission of lab report: 05

Lab oratory report: 15

Viva-voce: 20

10.3 Students who have failed in maximum of three theory subjects, but pass in all practical and sessional examination, will be promoted to next higher semester & they will be permitted to appear in those subjects, when semester examination of this subject takes place. The marks obtained by the students in practical/sessional examination in the relevant semester will be counted for publication of result.

10.4 For registration in III rd Semester a student must have

(a) Completed at least 35 Credits out of 57 Credits with minimum P grades in each Practical Examination.

(b) Obtain a Cumulative Grade Point Average(35) (CGPA(35)) of not lower than 4.5 calculated on the basis of the best Grades obtained by him/her to attain in 35 Credits.

10.5 Students who have failed in more than three subjects in a semester must register for all subjects including sessional /practical courses offered in the corresponding semester of the next year.

10.6 No supplementary examination will be conducted for B. Tech I, II, III, IV and V semesters.

10.7 There will a supplementary examination for promoted candidates only each for VI and VII semesters to enable candidates to clear backlog papers of these semester, if any. However, if the candidate fails to clear any of the subject/paper in supplementary examination, he/she will not be promoted to the next semester. Such candidate will have to repeat that particular semester again.

10.8 However, if the student is successful in obtaining at least pass marks or more in the subjects, he/she has appeared then, only pass grade will be entered for publication of result.

10.9 Only those candidates, who have cleared all the subjects of all previous semesters including those in VIIth semester, will be promoted to VIII semester.

10.10 Only one supplementary examination will be conducted for VIII semester for those candidates only, who could not clear or could not appear ( due to compelling reasons like serious illness of himself/herself), subject to following conditions:

a. If the candidate appears in all the papers and obtains at least pass marks or more in all the subjects he/ she has appeared, then marks obtained in all the papers along with the sessional and practical marks already secured, will be considered afresh for publication of result.

b. If the candidate appears in failed papers & obtains at least pass marks or more, only pass grade will be entered for publication of result.

10.11 Semester Grade Point average (SGPA) will be computed for each semester. The SGP will be calculated as follows:

Where ‘n’ is the number of subjects registered for the semester, ‘ci’ is the number of Credit allotted to particular subject, & ‘gi’ is the grade point carried by the Letter Grade corresponding to the subject. SGPA will be rounded off to the second place of decimal   
 and recorded as such. The SGPA would indicate the performance of the student in the   
 semester to which it refers.

10.12 Starting from second Semester at the end of each semester , a cumulative Grade Point Average (CGPA) will be computed for every student as follows:

Where ‘m’ is the total number of subjects the student has registered from the First Semester onwards up to & including the semester, ‘ci’ is the Number of Credits   
allotted to a particular subject and ‘gi’ is the Grade –Point carried by the Letter Grade corresponding to the Grade awarded to the student for the subject . CGPA will be rounded off to the second place of Decimal & recorded as such.

The CGPA would indicate the cumulative Performance of the student from the First semester up to the end of the semester to which it refers.

The CGPA, SGPA & the Grades obtained in all the subjects in a semester will be communicated to every student at the end of every semester.

For determining the Inter se Merit Ranking of a group of students, only the rounded off values of the CGPAs will be used.

10.13 When a student gets the grade ‘F’ in any subject during a semester, the SGPA and the CGPA from that semester onwards will be tentatively calculated, taking only ‘Zero Point’ for each such ‘F’ Grade. After the ‘F’ Grade(s) has/have been substituted by Letter Grade during a subsequent/examination, the SGPA and the CGPA of all the semester, starting from the earliest Semester in which ‘F’ Grade has been updated, will be recomputed and recorded to take this Change of Grade into account.

10.14 The six week Industrial training undergone by the students in summer vacation will be assessed within five weeks after commencement of the seventh semester. The students are required to submit a written report on training received & give a seminar. This will be evaluated along with project work of VII semester.

10.15 Assessment of Project Work: Performance in the various activities involved in the Project would be assessed individually at the end of each semester in which it is being carried out as per the curriculum.

10.16 The Chairman, Academic Affairs/Head of the Department of Institute will constitute   
a committee for conducting the comprehensive Vive-Voce Examination, evaluation of project etc. as per the requirement of the Curriculum.

10.17 A Student will be issued an Admit Card for appearing in the End Semester Examination, only if he/she has

(a) requisite attendance.

(b) paid all Institute & Hostel dues for the semester.

(c) no disciplinary action is pending against him.

(d) paid the requisite examination fee

**11. Graduation Requirement**

11.1. In order to qualify for a B.Tech. Degree of Ranchi University covered under this regulation a student must:

(a) Complete all the Credit requirements for the degree as laid down in the prescribed   
 Curriculum of the Course with a minimum of Grade ‘P’ scored in every subject.

(b) Obtain a minimum CGPA of 4.50 at the end of the semester in which he/she completes all the requirements for the degree.

(c) In the final degree certificate CGPA obtained by the candidate will be mentioned.

***16.05.2012 (DRAFT)***

**B. TECH COURSE STRUCTURE**

**ELECTRICAL & ELCTRONICS ENGINEERING**

**RANCHI UNIVERSITY, RANCHI**

**COMMON TO ALL B.TECH BRANCHES YEAR : I SEMESTER : I**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl No.** | | **Course No.** | **Subject** | **Periods** | | |  |
| **THEORY** | | | | **L** | **T** | **P** | **Credit**  **Point** |
|
| 1. | | HS 1101 | ENGLISH FOR PROFESSIONAL COMMUNICATION | 2 | - | - | 2 |
| 2. | | CH 1101 | ENGINEERING CHEMISTRY | 2 | - | - | 2 |
| 3. | | PH 1101 | ENGINEERING PHYSICS I | 3 | - | - | 3 |
| 4. | | MH 1101 | MATHEMATICS I | 3 | 1 | - | 4 |
| 5. | | ME 1101 | ENGINEERING MECHANICS | 3 | 1 | - | 4 |
| 6. | | EE 1101 | BASIC ELECTRICAL ENGINEERING | 3 | 1 | - | 4 |
| **PRACTICAL/DRAWING/DESIGN** | | | | | | | | |
| 7. | CH1102-P  PH1102-P | | CHEMISTRY/ PHYSICS LAB (TO BE TAKEN IN ALTERNATE WEEKS) | - | - | 3 | 2 |
| 8. | ME1102-P EE 1102-P | | ENGINEERING MECHANICS / ELECTRICAL LABORATORY  (TO BE TAKEN IN ALTERNATE WEEKS) | - | - | 3 | 2 |
| 9. | ED1101-P | | ENGINEERING GRAPHICS I | - | - | 3 | 2 |
| 10. | WP1101-P | | WORKSHOP PRACTICE I | - | - | 3 | 2 |
| 11. | HS1102-P | | GENERAL PROFICIENCY I | - | - | - | 2 |
| **TOTAL** | | | | **16** | **3** | **12** | **29** |

**COMMON TO ALL B. TECH BRANCHES YEAR : I SEMESTER : II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl No.** | | **Course No.** | **Subject** | **Periods** | | |  |
| **THEORY** | | | | **L** | **T** | **P** | **Credit**  **Point** |
|
| 1. | | CS 1201 | INTRODUCTION TO  COMPUTING | 2 | - | - | 2 |
| 2. | | CH 1201 | ENVIRONMENT & ECOLOGY | 2 | - | - | 2 |
| 3. | | PH 1201 | ENGINEERING PHYSICS II | 3 | - | - | 3 |
| 4. | | MH 1201 | MATHEMATICS II | 3 | 1 | - | 4 |
| 5. | | ME 1201 | ENGINEERING THERMODYNAMICS | 3 | 1 | - | 4 |
| 6. | | EC 1201 | BASIC ELECTRONICS | 3 | - | - | 3 |
| **PRACTICAL/DRAWING/DESIGN** | | | | | | | |
| 7. | EC1202-P | | BASIC ELECTRONICS LAB | - | - | 3 | 2 |
| 8. | CS1202-P | | COMPUTER PROGRAMMING LAB | - | - | 3 | 2 |
| 9. | ED1202-P | | ENGINEERING GRAPHICS II  (M/C DRAWING) | - | - | 3 | 2 |
| 10. | WP1202-P | | WORKSHOP PRACTICE II | - | - | 3 | 2 |
| 11. | HS1202-P | | GENERAL PROFICIENCY II | - | - | - | 2 |
| **TOTAL** | | | | **16** | **2** | **12** | **28** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ELECTRICAL & ELECTRONICS ENGINEERING YEAR : II SEMESTER: - III** | | | | | | | | | | | | |
| **SL. No.** | | **Course No.** | **Subject** | | **Periods** | | | | | | **Credit** | |
| **THEORY** | | | | | **L** | | **T** | | **P** | |
|
| 1 | | CS1301 | Numerical Analysis & Computer Programming | | 2 | | - | | - | | 2 | |
| 2 | | ME1312 | Material Science | | 2 | | - | | - | | 2 | |
| 3 | | ME1303 | Strength of Materials | | 3 | | 1 | | - | | 4 | |
| 4 | | ME1313 | Fluid Mechanics & Fluid Machinery | | 3 | | - | | - | | 3 | |
| 5 | | MH1301 | Mathematics III | | 3 | | 1 | | - | | 4 | |
| 6 | | EE1301 | Electrical Measurements & Instrumentation | | 3 | | - | | - | | 3 | |
| **Practical/Drawing/Design** | | | | | | | | | | | | |
| 7 | CS1302-P | | Numerical Analysis & Computer Programming Lab | | - | | - | | 3 | | 2 | |
| 8 | ME1307-P ME1308-P | | Material Sc./ Strength of Materials Lab (To be taken in alternate weeks) | | - | | - | | 3 | | 2 | |
| 9 | ME1309-P | | Fluid Mechanics & Fluid Machinery Lab | | - | | - | | 3 | | 2 | |
| 10 | EE1302-P | | Electrical Measurements & Instrumentation Lab | | - | | - | | 3 | | 2 | |
| 11 | HS1303-P | | General Proficiency III | | - | | - | | - | | 2 | |
| **Total** | | | | | **16** | | **2** | | **12** | | **28** | |
| **ELECTRICAL & ELECTRONICS ENGINEERING YEAR : II SEMESTER: - IV** | | | | | | | | | | | |
| **SL. No.** | | **Course No.** | **Subject** | **Periods** | | | | | | **Credit** | |
| **THEORY** | | | | L | | T | | P | |
|
| 1 | | EC1404 | Solid State Devices | 2 | | - | | - | | 2 | |
| 2 | | EE1402 | Circuit Theory | 2 | | - | | - | | 2 | |
| 3 | | EE1403 | Electromagnetic Theory | 3 | | - | | - | | 3 | |
| 4 | | EE1404 | Electrical Machine - I | 3 | | 1 | | - | | 4 | |
| 5 | | EC1407 | Digital Electronics | 3 | | - | | - | | 3 | |
| 6 | | EE1406 | Power System I | 3 | | - | | - | | 3 | |
| **Practical/Drawing/Design** | | | | | | | | | | | |
| 7 | | EC1409-P | Solid State Devices Lab | - | | - | | 3 | | 2 | |
| 8 | | EE1407-P | Circuit Theory Lab | - | | - | | 3 | | 2 | |
| 9 | | EE1408-P | Electrical Machines Lab I | - | | - | | 3 | | 2 | |
| 10 | | EC1411-P | Digital Electronics Lab | - | | - | | 3 | | 2 | |
| 11 | | HS1404-P | General Proficiency IV | - | | - | | - | | 2 | |
| **Total** | | | | **16** | | **1** | | **12** | | **27** | |

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| **ELECTRICAL & ELECTRONICS ENGINEERING YEAR : III SEMESTER: - V** | | | | | | |
| **SL. No.** | **Course No.** | **Subject** | **Periods** | | | **Credit** |
| **THEORY** | | | **L** | **T** | **P** |
|
| 1 | HS1502 | Management Science | 2 | - | - | 2 |
| 2 | EC1505 | Analog Electronics | 2 | - | - | 2 |
| 3 | EE1502 | Control Engineering | 3 | - | - | 3 |
| 4 | EE1503 | Electrical Machines - II | 3 | - | - | 3 |
| 5 | EE1504 | Power System - II | 3 | - | - | 3 |
| 6 | EC1506 | Digital Electronics & Logic Design | 3 | - | - | 3 |
| **Practical/Drawing/Design** | | | | | | |
| 7 | EC1509-P | Analog Electronics Lab | - | - | 3 | 2 |
| 8 | EE1507-P | Electrical Machines Lab II | - | - | 3 | 2 |
| 9 | EE1508-P | Power System Lab | - | - | 3 | 2 |
| 10 | EC1510-P | Digital, Electronics & Logic Design | - | - | 3 | 2 |
| 11 | HS1505 | General Proficiency V | - | - | - | 2 |
| **Total** | | | **16** | **-** | **12** | **26** |

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| **ELECTRICAL & ELECTRONICS ENGINEERING YEAR : III SEMESTER: - VI** | | | | | | |
| **SL. No.** | **Course No.** | **Subject** | **Periods** | | | **Credit** |
| **THEORY** | | | **L** | **T** | **P** |
|
| 1 | EC1612 | Signals & Systems | 2 | - | - | 2 |
| 2 | EC1607 | Microprocessors & Microcontrollers | 2 | - | - | 2 |
| 3 | EC1608 | Communication Engineering | 3 | - | - | 3 |
| 4 | EE1603 | Power Electronics | 3 | - | - | 3 |
| 5 | EE1604 | Power System - Stability | 3 | - | - | 3 |
| 6 | EE1605 | Design of Control System | 3 | - | - | 3 |
| **Practical/Drawing/Design** | | | | | | |
| 7 | EC1611-P | Microprocessors & Microcontrollers Lab | - | - | 3 | 2 |
| 8 | EE1606-P | Power Electronics Lab | - | - | 3 | 2 |
| 9 | EE1607-P | Power System Stability Lab | - | - | 3 | 2 |
| 10 | EE1608-P | Control Systems Lab | - | - | 3 | 2 |
| 11 | HS1606-P | General Proficiency VI | - | - | - | 2 |
| **Total** | | | **16** | **-** | **12** | **26** |

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| **ELECTRICAL & ELECTRONICS ENGINEERING YEAR : IV SEMESTER: - VII** | | | | | | |
| **SL. No.** | **Course No.** | **Subject** | **Periods** | | | **Credit** |
| **THEORY** | | | **L** | **T** | **P** |
|
| 1 | EE1701 | Computer Aided Power System | 3 | - | - | 3 |
| 2 | EE1702 | Network Synthesis | 3 | - | - | 3 |
| 3 | EE1703 | Power System Protection & Switch-gears | 3 | - | - | 3 |
| 4 | - | Open Electives - I | 3 | - | - | 3 |
| 5 | - | Professional Electives - I | 3 | - | - | 3 |
| **Practical/Drawing/Design** | | |  | | | |
| 6 | EE1704-P | Colloquium | - | - | 3 | 2 |
| 7 | EE1705-P | Computer Aided Power System Lab | - | - | 3 | 2 |
| 8 | EE1706-P | Switch-gears & Protection Lab | - | - | 3 | 2 |
| 9 | EE1707-P | Project I | - | - | 3 | 2 |
| 10 | HS1707-P | General Proficiency VII | - | - | - | 2 |
| **Total** | | | **15** | **-** | **12** | **25** |

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|  | **Elective** | **Sl No.** | **Code** | **Subject** |
|  | Open Elective I | 1 | HS-2721 | Enterprise Resource Management |
|  | 2 | CS-2721 | e-commerce strategy |
|  | 3 | HS-2722 | Technology Management |
|  | 4 | CS-2722 | Software Technology |
|  | 5 | HS-2724 | Knowledge Management |
|  | Professional Elective I | 1 | EE 2721 | Electric Drives |
|  | 2 | EE 2722 | Special Electrical Machines |
|  | 3 | EE 2723 | High Voltage DC Transmission |
|  | 4 | EE 2724 | Power System Operation & Control |
|  | 5 | EE 2725 | Non Conventional Energy Sources |

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| **ELECTRICAL & ELECTRONICS ENGINEERING YEAR : IV SEMESTER: - VIII** | | | | | | | | |
| **SL. No.** | | **Course No.** | **Subject** | | **Periods** | | | **Credit** |
| **THEORY** | | | | | **L** | **T** | **P** |
|
| 1 | - | | Open Elective II | | 3 | - | - | 3 |
| 2 | - | | Professional Elective II | | 3 | - | - | 3 |
| 3 | - | | Professional Elective III | | 3 | - | - | 3 |
| 4 | EE 1801 | | High Voltage Engineering | | 3 | - | - | 3 |
| 5 | EC 1802 | | Digital Signal Processing | | 3 | - | - | 3 |
| **Practical/Drawing/Design** | | | | |  | | | |
| 6 | | - | | Project II | - | - | 12 | 6 |
| 7 | | HS 1808-P | | General Proficiency VIII | - | - | - | 2 |
| **Total** | | | | | **15** | **-** | **12** | **23** |

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| --- | --- | --- | --- |
| **Elective** | **Sl No.** | **Code** | **Subject** |
| Open Elective II | 1 | CS-2821 | I.T in Marketing Management |
| 2 | HS-2821 | Human Values |
| 3 | HS-2822 | Science Technology and Society |
| 4 | CS-2822 | I.T in HR Management |
| 5 | CS-2823 | I.T in Financial Management |
| Professional Elective II | 1 | EE 2821 | Industrial Automation & Control |
| 2 | EE 2822 | Neural Network & Fuzzy System |
| 3 | EE 2823 | Utilization Of Elec. Power |
| 4 | EE 2824 | Adv. Control Systems |
| 5 | CS 2828 | Comp. Network & Data Communication |
| Professional Elective III | 1 | EC 2824 | Biomedical Instrumentation |
| 2 | EE 2825 | Optoelectronics Devices& Instrumentation |
| 3 | EE 2826 | Mechatronics |
| 4 | EC 2827 | VLSI Design |
| 5 | EE 2828 | Modern Power Station Practice |

**B. TECH COURSE STRUCTURE**

**COMMON TO ENGINEERING**

**BRANCHES**

**1ST SEMESTER**

**RANCHI UNIVERSITY, RANCHI**

**HS 1101 ENGLISH FOR PROFESSIONAL COMMUNICATION**

**UNITS NO. OF LECTURES**

**COMMUNICATION (5 LECTS)**

Role & Objectives Of Communication, Process of Communication, Element & Essentials of Communication, Flow of Communication, Barriers /Factors Inhibiting Communication, Verbal/Non-Verbal Communication, Kinesics/Body Languages, Style In Technical Communication, Communication Skills-Reading, Writing, Speaking, Listening& Talking.

**PROFESSIONAL WRITING (3 LECTS)**

Business Letters/Official Letters, Letter Writing Skills, Letter Writing Process, Letter Formats, Essentials of Letter Writing, Types Of Professional Letters, D.O Letter, Job Application and resume.

**GRAPHICS (1 LECT)**

Introduction, Planning of Graphics, Placing of Graphics, Construction of Graphics, Types of Graphics.

**PHONETICS & PHONOLOGY (8 LECTS)**

Organs of Speech/ Speech Mechanism, Phonetic Symbols, Consonant/Vowels/ Diphthongs-Classification, Stress Pattern/Intonation, Pronunciation Guidelines, Syllable/Syllable Division, Tones.

**REPORT WRITING (5 LECTS)**

Introduction & Important Features of Report, Types of Report, Structure &Layout Format, Language Style, Project Report, Laboratory Report, Industry Report, Socio Culture Report, Technical Report, Proposals –Nature,Significance Types,Structures.

**DISCUSSION SKILLS (3LECTS)**

Introduction, importance of group discussion, Process of group discussion Group discussion strategies, Interaction strategies, Individual, Contribution, Leadership skills, Team management, Creating a friendly co operative atmosphere.

**PRESENTATION SKILLS**

Nature And Importance of Presentation, Introduction And Meaning of Presentation, Planning Presentation, Objective With Central Idea, Main Ideas, Role of Supporting, Material –Steps, Handling Stages Fright

**STUDY SKILLS (2LECTS)**

Note making, Mechanics of note making, Note writing techniques, Reduction device, Organizing techniques, Methods of sequencing, Summarizing & paragraph, Mechanics of summarizing, Summarizing techniques, Outlining & paraphrasing

**REFERENCING (2LECTS)**

Referencing Skills, Method of Referencing, Using Footnotes, Scanning Skills, Skimming Skills, Locating Books in the Library, Required Information/Meaning/Pronunciation.

**SENTENCES (2LECTS)**

Requisites of Good Sentence Writing, Effective Sentence Structure, Sentence Building, Sentence Coherence, Use of Connectives, Sentence Emphasis/Sentence Theme, Development of Paragraph

**PARAGRAPH WRITING (2LECTS)**

Paragraph Structure, Principles of Paragraph Writing, Paragraph length/ Coherence/ Division, Use of Modals/Connectives/Modifies, Punctuations & Spelling, Concord

**TELEPHONIC CONVERSATION** (**2LECTS)**

Introduction, Listening/speaking, Telephonic skills required Problems of telephonic conversations, Intensive listening

**LISTENING COMPHREHSION (2LECTS)**

To comprehend spoken materials in standard Indian, English/British English & American English, Current situation in India regarding English American English/British English

**INTERVIEW** (**2LECTS)**

The Interview process, Pre interview preparation techniques, projecting a positive image, Answering strategies.

**GENERAL PROFICIENCY**

G.P. classes are conducted for personality development of students. It includes Group Discussion, Presentation, Seminar, Quiz, C V Writing, Technical Report Writing and also inculcates Human Values and Professional Ethics. There will be assignments and class tests also.

**SYLLABUS OF ENGINEERING CHEMISTRY CH1101**

Adv. Atomic structure / Atoms

1. Basic ideas about de-Broglie’s ware equation, Heisenberg uncertainty principle, schrodinger wave equation (Derivation). Particle in a box illustrating energy quantization radial and angular part of H-atom. Wave functions/orbitals, probability and charge distribution.  **(4 period)**
2. Chemical bonding/chemical valency/ molecules.

Ionic bond, covalent bond, co-ordinate bond, vanderwalls forces & hydrogen bonding shape and geometry of species (Helfrich rule, VSEPERT & Hybridisation) and nature of species (VBT & MOT) of diatomic molecular.  **(4 period)**

1. Chemical kinetics / Reaction dynamics

Rate laws, molecularity & order of reaction, kinetic derivation of first and 2nd order of reaction with their half life period. Arrhenius equation for single and double temperature. Collision and transition state theory. **(3 period)**

1. Laser in chemistry

Explain laser in chemistry with their types **(2 period)**

1. Electrochemistry:

Nernst equation for electrode potential (Derivation), Application of electrode potentials to predicet redox reactions in solution with special reference in lattimer and frost diagrams. **(3 Period)**

1. Transition metal chemistry/Co-ordination chemistry

Nomenclature and isomerism of complex compounds. Theories of bonding in co-ordination compounds, Viz crystal field theory, Valence bond theory. Chelation. Application in organic synthesis. **(4 Period)**

1. Organometallic chemistry:

Introduction, structure and bonding in organometallic complexes. The eighteen and sixteen electron rules. **(3 period)**

1. Catalysis:

Introduction, types and characteristics of catalysis (Homogeneous, Heterogeneous, acid-base, auto and enzyme catalysis). The role of metals in catalysis cycles turning some chemical reaction (e. g. Hydrofirngalation, Hydrogenetion ) **(3Period)**

1. Role of metals in biology:

Oxygen carrier, electron transfer biologigical role of iron and copper.

**(2 Period)**

1. Structure and reactivity of organic molecules/organic chemistry:

Electron displacement effects (Inductive effect, Mesomeric effect or resonance hyper conjugation, electromeric effect, inductomeric effect)

Intermediate organic species based on carbon (free radicals, carbocations, carbanions, carbenes)

Types of organic reactions addition reaction, elimination reaction (E1 & E2 ) substitution reactions ( SN1 SN2, SNi)

Stereochemistry (introduction, Chirality, isomerism conformational analysis E-Z & R-S nomenclature) **(6 Period)**

1. Polymerisation;

Basic concepts, classification and industrial application **(2 Period)**

1. Photochemistry:

Introduction, fluorescence, phosphorescence, norrish type –I and II reaction, application of photosynthesis, photosynthem ( Z- diopram) chemistry of vision. Laws of phtochemistry. **(4 Period)**

**Reference Books:-**

1. Advance physical chemistry, Gurdeep Raj, Goel publishing house Meerut
2. Essentials of Physical Chemistry B. S. Bahal, S. chand and Company
3. Organic Chemistry Morrison Boyd
4. Advanced Inorganic Chemistry Gurdeep Raj
5. Engg. Chemistry Shashi Chawla, Dhanpat Rai and Com.
6. Engg. Chemistry Jain & Jain, Dhanpat Rai and Com.
7. Industrial Chemistry, B. K. Sharma, Goel publishing house Meerut

**PH 1101 ENGINEERING PHYSICS-I (3-1-0)**

**Module 1. Theory of Relativity**

Inertial frame of reference, Noninertial frames and fictitious forces, Outline of relativity, Michelson-Morley experiment, Lorentz transformation of space and time, Length contraction, variation of mass with velocity, Equivalence of mass and energy. **[6]**

**Module 2. Cardinal Points of Optical System**

Combination of thin lenses, Cardinal points of coaxial system of thin lenses, Thick lenses, Location and properties of cardinal points, Graphical construction of images. **[4]**

**Module 3. Interference of Light**

Analytical treatment of interference, Intensity distribution of fringes system, Coherent and Non-coherent sources, Fundamental conditions of interference, Fresnel’s biprism, Displacement of fringes, Wedge shaped films, Newton’s rings. **[5]**

**Module 4. Diffraction of Light**

Single slit and double slit diffraction, Diffraction grating, Limit of resolution, Resolving power of grating and image forming systems. **[4]**

**Module 5. Polarization of Light**

Brewster’s law, Double refraction, Geometry of calcite crystal, Optic axis, nicol prism, Circularly and elliptically polarized light, Retardation plates, Production and analysis of plane, circularly and elliptically polarized light, Polarimeter. **[5]**

**Module 6. Thermal Physics**

Kinetic theory of gases, Maxwellian distribution, Mean free path , Transport phenomena in gases, Imperfect gases and Vander waal’s equation of state. **[4]**

**Module 7. Accoustics**

Production and applications of Ultrasonics, Accousitcs of buildings. **[2]**

**Module 8. Dynamics of fluids**

Continuity equation, Bernoulli’s theorem and its applications, Torcelli’s theorem, Viscosity-flow of Liquid through a capillary tube , Capillaries in series and parallel, Stoke’s formula, Rotation viscometer. **[5]**

**Books Recommended**:

1. Optics, Ajoy Ghatak, Tata Mc: Graw- HILL Publising Company Co. , New Delhi.
2. Relativistic Mechanics, Satya Prakash , Pragati Prakasan , Meerut.
3. Heat and thermodynamics, P. K. Chakrawarty, Hindustan Publishing Concern.

MH 1101 **Mathematics-I**

**Unit-1**

Differentiation of functions of one variable:- Successive differentiation, Leibnitz Theorem( without proof), Rolle’s Theorem ,Lagrange’s Mean Value Theorem, Taylor’s Theorem and Expansions of functions into Taylor’s and Maclaurin’s Series. **(05 Classes)**

**Unit-2**

Calculus of function of several variables:-Partial Derivatives, Chain Rule, Differentiation of implicit function, Total Differentials, Euler’s Theorem. **(05 Classes)**

**Unit-3**

Maxima and Minima:-Maxima and Minima of function of two Variables, Method of Lagrange’s Multiplier’s. **(02 Classes)**

**Unit-4**

Integral Calculus:-Elementary Reduction formula for Integral, Integration as a Limit of Sum, Problems on Length, Area, Volume and surface area of revolutions. **(08 Classes)**

**Unit-5**

Multiple Integral:-Double and Triple Integral, Change of Order of Integration, Jacobian, Applications to Areas and Volume. **(05 Classes)**

**Unit-6**

Differentiation of Vector:- Scalar and Vector point Function, Gradient Divergence and Curl. **(03 Classes)**

**Unit-7**

Integration of Vectors:-Line Integral and surface Integral, Greens Theorem, Gauss Divergence Theorem and Stoke’s Theorem (without proof) and their simple applications. **(05 Classes)**

**Unit-8:**

Infinite Series:- Convergence and Divergence of Series, Comparison Test, Ratio Test, Cauchy’s root test, Leibnitz Rule, Absolute and Conditionally convergence. **(06 Classes)**

**Reference Books**:-

1. Advanced Mathematics for Engineers, by “Erwin Kreyszig”(Wiley Eastern Publication)

2. Higher Engineering Mathematics, by “B.S.Grewal” ( Khanna Publication)

3. Engineering Mathematics, by “ S.S.Shastri” (PHI Publication)

4.Advance Mathematics for Engineer,by’Gorakh Prasad”(Torrent Publication).

**1st Semester**

**ME 1101 ENGINEERING MECHANICS (3-1-0)**

**Fundamentals of Mechanics – Basic concepts (5 Lectures)**

**Force Systems and Equilibrium**Force,Moment and couple, Principle of Transmissibility, Varignon’s theorem, Resultant of force system- Concurrent and non- concurrent coplanar forces, Free body diagram, Equilibrium equations and their uses in solving elementary engineering problems. **(5 Lectures)**

**Plane Trusses (5 Lectures)**The structural model, simple trusses, analysis of simple trusses: method of joints, method of sections, graphical method.

**Friction (5 Lectures)**Introduction, laws of coulomb friction, simple contact friction problems, belt friction, the square screw thread, rolling resistance.

**Properties of Surfaces (5 Lectures)**First moment of an area and centroid, Second moment and product of area of a plane area, transfer theorems, relation between second moment and product of area, polar moment of inertia, principal axes, mass moment of inertia.

**Virtual work (5 Lectures)**Work of a force, Principle of Virtual work and its application.

**Kinematic of Rigid bodies (5 Lectures)**Plane motion, Absolute motion, Relative motion, Translating axes and rotating axes.

**Kinetics of Rigid bodies (5 Lectures)**Plane motion, Work energy, Impulse and momentum.

**Suggested Text Books & References:-**

* Mechanics for Engineering ,Beer F.P. and Johnson F.R. , Mc Graw Hill
* Engineering Mechanics, Timoshenko ,Young & Rao , TMH
* “Engineering Mechanics,Dr. R.K. Bansal ,Laxmi Publications
* “Engineering mechanics, R.S. Khurmi ,
* “Engineering Mechanics,Dr. V.M. Domkundwar , Dhanpat Rai Publications
* Engineering mechanics”, I.H Shames & Rao , Prentice Hall of India
* Engineering mechanics, Dr. D. S. Kumar , Kataria & sons

**Semester I**

**EE 1101 - BASIC ELECTRICAL ENGINEERING (3-1-0)**

**DC Networks**

Kirchoff’s laws, node voltage and mesh current methods; Delta-star and star-delta conversion; Classification of Network Elements, Superposition principle, Thevenin’s and Norton’s theorems. **4Hrs**

**Single Phase AC Circuits**

Single phase EMF generation, average and effective values of sinusoids; Solution of R,L,C series circuits, the j operator, complex representation of impedances; Phasor diagram, power factor, power in complex notation; Solution of series, parallel and series- parallel circuits. **6Hrs**

**Three Phase AC Circuits**

Three phase EMF generation, delta and Y- connection, line and phase quantities; Solution of three phase circuits balanced supply voltage and balanced load; Phasor diagram, measurement of power in three phase circuits; three phase four wire circuits.

**6Hrs**

**Magnetic Circuits**

Ampere’s circuital law, B-H curve, solution of magnetic circuits, Hysteresis and eddy current losses. **4Hrs** **Transformers**

Construction, EMF equation, ratings; Phasor diagram on no load and full load; Equivalent circuit, regulation and efficiency calculations; Open and short circuit test,

Three phase transformers. **4Hrs**

**Induction Motors**

The revolving magnetic field, principle of operation, ratings; Equivalent circuit; Torque-speed characteristics; **4Hrs**

**DC Machines**

Construction, EMF and Torque equations; Characteristics of DC generators and motors; Speed control of DC motors and DC motor stators; Armature reaction and communication. **4Hrs**

**Electrical Measuring Instruments**

DC PMMC instruments, shunts and multipliers, multi-meters, Moving iron ammeters and voltmeters, Extension of instrument ranges. **4Hrs**

**Power Supply Systems (Introductory)**

General structure of electrical power systems; power transmission and distribution via overhead lines and underground cables, steam, hydro, gas and nuclear power generation. **4Hrs**

**Suggested text books & references**

1 ”Basic Electrical” Mittal & Mittal, Tata McGraw Hill

2 “Theory and Practice of Basic Electrical Engg.” Kothari & Nagraaj ,Prentice Hall of India

3 “Basic Electrical Engg.” G.K. Lal, 3-D Publication

4 ”Fundamental of Electrical Engg.” Ashfaq Hussain, Dhanpat Rai Publication.

**SYLLABUS OF ENGINEERING CHEMISTRY OF PRACTICAL PAPERS**

**CH1102-P**

1. Acide – base titration (estimation of commercial caustic soda).
2. Redox titration (estimation of iron using permanganometry)
3. Perparation and analysis of a metal complex (for example thiourea/copper sulfate or nickel chloride/ammonia complexes.
4. Chemical kinetics (determination of relative rates of reaction of iodide with H2O2 at room temperature (clock reaction)
5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water.
6. Photochemical oxidation-reduction(study of Photochemical reduction of ferric salt)
7. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
8. Synthesis of aspirin
9. Synthesis of P-nitro aniline from acetanilide.
10. Detection of functional groups in organic compounds.
11. Radical polymerization of vinyl monomers such as styrene, acrylonitrile etc.
12. Conductometric titration (determination of the strength of a given HCL solution by titration against a standard NaOH solution.

**Reference Books:-**

1. Essentials of experimental Engg. Chemistry by Shashi Chawla & Dhanpat Rai & Company.

**PH1102-P ENGINEERING PHYSICS-1**

**List of Experiment**

* To determine the coefficient of viscosity of water by capillary flow.
* To determine the thermal conductivity of a bad and good conductor by Lee’s method and Searl’s methods respectively.
* To determine the wave length of light by Newton’s ring method.
* To determine the wave length of light by Fresnel’s biprism.
* To determine the dispersive power of the given material of the prism.
* To determine the focal length of light combination of two thin lenses by nodal slide assembly and its verification.
* Determination of c/m by J. J. Thomson’s method.
* Measurement of thermo emf between different types of thermocouples as a function of temperature difference between the junction, measurement of an unknown temperature.
* Use of Carry Foster Bridge.
* Study of electromagnetic Induction.
* Study of electromagnetic damping and determination of terminal velocity reached by magnet falling in a metallic tube.
* Study of electromagnetic damping and determination of terminal velocity reached by magnet falling in a metallic tube.
* Study of L.C.R circuits with AC circuits.
* Determination of Plancks’s constant using photocells.

**ME 1102-P ENGINEERING MECHANICS (0-0-3/2)**

**List of Experiments**

To determine the Newton’s second law of motion by Fletcher’s trolley apparatus.  
To determine the moment of inertia of a flywheel about its axis of rotation.  
To verify: (a) The condition of equilibrium of forces by parallel force apparatus.  
 (b) The principal of moments by crank lever.  
To determine the dry friction between inclined plane and slide boxes of different materials.  
To determine the coefficient of friction between the belt and rope and the fixed pulley.  
To determine the velocity ratio of a simple screw jack and to plot graph between   
 (a) Effort- Load   
 (b) Friction-Load   
 (c) Efficiency- Load.  
To measure the area of a figure with the help of a Polar Planimeter.

**Semester I**

**EE 1102-P – Basic Electrical Engineering (0-0-3/2)**

**List of Experiments**

* To measure the armature and field resistance of a DC machine.
* To calibrate a test (moving iron) ammeter and a (dynamometer) wattmeter with respect to standard (DCPMMC) ammeter and voltmeters.
* Verification of circuit theorems, Thevenin’s and Superposition theorems (with DC Sources only).
* Voltage-current characteristics of incandescent lamps and fusing time-current characteristics of   
  fuse wire.
* Measurement of current, voltages and power in R-L-C series circuit excited by (single phase) AC  
  supply.
* Open circuit and short circuit tests on a single – phase transformer.
* Connection and starting of a three – phase induction motor using direct online (DOL) or star – delta starter.
* Connection & measurement of power consumption of a fluorescent lamp.
* Determination of open circuit characteristics (OCC) of a DC machine.
* Starting and speed control of a DC shunt motor.
* Connection andtesting of a single - phase energy meter (unity power factor load only).
* Two – wattmeter method of measuring power in three – phase circuit (resistive load only).

**1st semester**

**ED 1101-P ENGINEERING GRAPHICS – I (0-0-3)**

**General**

Importance, Significance & scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, B.I.S. Specifications. **(5 Lectures)**

**Projections of Points & Lines**

Introduction of planes of projection, Reference and auxiliary planes, projections of points and lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on auxiliary planes,  
shortest distance, intersecting and non- intersecting lines. **(5 Lectures)**

**Planes Other than the Reference Planes**

Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points and lines lying in the planes, conversion of oblique plane into auxiliary plane and solutions of related problems. **(5 Lectures)**

**Projections of Plane Figures**

Different cases of plane figures (of different shapes), making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes, Obtaining true shape of the plane figure by projection. **(5 Lectures)**

**Projection of Solids**

Simple cases when solid are placed in different positions, Axis faces and lines lying in the faces of the solid making given angles. **(5 Lectures)**

**Development of Surface (5 Lectures)**

Development of simple objects with & without sectioning.

**Isometric Projection (5 Lectures)**

Nomography

Basic concepts and uses

**1st and 2nd semester**

**WP 1101 – P WORKSHOP PRACTICE I & II (0-0-3)**

**Carpentry:** Definition, engineering applications, seasoning and preservation, plywood and plyboards.  
**Foundry:**  Moulding sands, constituents and characteristics, Pattern, definition, materials, types, core prints Role of gate, runner, riser, core and chaplets, Causes and remedies of some common casting defects like blow holes, cavities, inclusions.  
**Metal Joining:** Definition of welding, brazing & soldering processes and their applications, Oxy – acetylene gas welding process, equipment and techniques, types of flames and their applications, Manual metal are welding techniques and equipments, AC & DC welding, electrodes, constituents and functions of electrode coating, Welding positions, Type of weld joint, common welding defects such as cracks, undercutting, slag inclusions, porosity.  
**Metal Cutting:** Introduction to machining and common machining operations. Cutting tool materials, Definition of machine tools, specification and block diagram of lathe, Shaper, drilling machine & grinder, Common  
Lathe operations such as turning, chamfering and facing, Quick return mechanism of shaper, Difference between drilling and boring, Files – material and classification.  
**Forging:** Forging principle, materials, operations like drawing, upsetting, bending and forge welding, use of forged parts.  
**List of Jobs to be made in the workshop  
Group A**1. T – Lap joint and Bridle joint (Carpentry shop)  
2. Mould of any pattern (Foundry shop)  
3. Casting of any simple pattern (Foundry shop)  
**Group B**1. (a) Gas welding practice by student on mild steel flat  
 (b) Lap joint by Gas Welding  
2. (a) MMA Welding practice by students  
 (b) Square butt joint by MMA Welding  
3. (a) Lap joint by MMA Welding  
 (b) Demonstration of brazing  
4. Tin smithy for making mechanical joint and soldering of joints.  
**Group C**   
1. Job on lathe with one step turning and chamfering operations  
2. Job on shaper for finishing two sides of a job  
3. (a) Drilling two holes of size 5 & 12 mm diameter on job used/to be used for shaping  
 (b) Grinding a corner of above job on bench grinder  
4. Finishing of two sides of a square piece by filling

**(CS 1201) INTRODUCTION TO COMPUTING**

**Module I [5 Hrs]**

Fundamentals of Computer:

History of Computer, Generation of Computer, Classification of Computers

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices

**Module II [6 Hrs]**

Number systems representation of signed and unsigned numbers, BCD, ASCII, Binary, Arithmetic & logic gates.

Assembly language, high level language, compiler and assembler (basic concepts)

**Module III [4 Hrs]**

Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX.

Introduction to typesetting software such as Microsoft office, Introduction to emails, FTP, R-login, Network Services, Internet.

**Module IV [20 Hrs]**

Concepts of Algorithm & flow chart, notion of programs, programmability and programming languages.

Structure of programs, object codes.

Introduction to Programming Languages - BASIC, FORTRAN and PASCAL.

**Text Books:**

Kerninghan, B.W. The Elements of Programming Style

Gottfried Programming with Pascal, Shaum Series, TMH

Rajaraman V. Fundamental of Computers

**Reference Books:**

Kerninghan B.W. & Ritchie D.M. The C Programming Language

Balaguruswamy Programming in C

M.M.Oka Computer Fundamentals, EPH

Leon Introduction to Computers, Vikas

Leon Fundamental of Information Technology, Vikas

**B.TECH COURSE STRUCTURE**

**ELECTRICAL & ELCTRONICS ENGINEERING**

**2ND SEMESTER**

**RANCHI UNIVERSITY, RANCHI**

**(CS 1201) INTRODUCTION TO COMPUTING**

**Module I [5 Hrs]**

Fundamentals of Computer:

History of Computer, Generation of Computer, Classification of Computers

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices

**Module II [6 Hrs]**

Number systems representation of signed and unsigned numbers, BCD, ASCII, Binary, Arithmetic & logic gates.

Assembly language, high level language, compiler and assembler (basic concepts)

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**Reference Books:**

Kerninghan B.W. & Ritchie D.M. The C Programming Language

Balaguruswamy Programming in C

M.M.Oka Computer Fundamentals, EPH

Leon Introduction to Computers, Vikas

Leon Fundamental of Information Technology, Vikas

*ENVIRONMENT & ECOLOGY* (CH1201)

***Unit – I*** **4 Lecture**

1. Environment:

Definition Components of Environment importance of study, Environmental degradation and human activity.

***Unit – II***

1. Ecology: **5 Lecture**

Definition elements of Ecology, Scope/object of Ecology, Different kind of Ecosystem (structure & function), Principles of Environmental impacts assessment.

***Unit – III*** **5 Lecture**

1. Air Pollution:

Atmospheric composition, energy balance, climate, weather, dispersion, soures and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures.

1. Water pollution:

Hydrosphere, natural water , pollutants their origin and effects river/lake/ground water pollution standards and control

***Unit – IV*** **4 Lecture**

1. Land pollution:

Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid waste) their origin and effects, collection and disposal of solid waste, recovery and conversion methods.

1. Noise Pollution

Sources, effects standards and control

***Unit – V*** **5 Lecture**

1. Energy:

Definition different kind of sources of energy (conventional & nonconventional) and its impact on environment. Solar, Biomass, Bio-gas, hydrogen as an alternative Future source of energy.

***Unit – VI*** **6 Lecture**

Current environmental issues of importance population growth, climate change and/or Global warming – definition and its effect, Acid Rain, ozone layer Depletion

***Unit – VII*** **3 Lecture**

Environmental protection – Role of Government and Civilians. Environmental education.

***Unit – VIII*** **3 Lecture**

Solid Waste Management – Definition and methodology.

Reference:-

1. Environmental Chemistry B. K. Sharma
2. Environmental Studies by Ritu Bir, Vayu education of India.
3. Environmental Studies by S. Deswal, A. Deswal, Dhanpat Rai & company.

**PH 1201 ENGINEERING PHYSICS-II (3-0-0)**

**Module 1. Vector analysis**

Scalar and vector fields, Gradient of a scalar field, Divergence and curl of vector fields, Line integral of a vector field, Gauss-divergence theorem, Stoke’s theorem. **[5]**

**Module 2. Electrostatics**

Quantization & conservation of charge, Coulomb’s law (vectorial form) and superposition principle, Concept of electric field lines, flux of electric field, Gauss’s law, Electric Potential and potential energy, Conductors, Capacitors and dielectric materials. **[5]**

**Module 3. Electromagnetism**

Magnetic field, Force on a moving charge in a magnetic field, Force on a current element, Torque on current loop, Biot-Savart law, Ampere’s circuital law, Electromagnetic induction and Faraday’s law, Magnetism in materials, Maxwell’s equations, Electromagnetic Waves. **[7]**

**Module 4. Thermoelectricity**

Seebeck effect, Law of successive temperatures, Law of intermediate metals, Peltier effect, Thomson effect, Thermoelectric power, Application of thermodynamics on thermocouple. **[6]**

**Module 5. Matter waves**

Elements of wave properties of particles**,** Elements of particle properties of waves, Nuclear Energy. **[3]**

**Module 6. Laser**

Spontaneous and Stimulated emission of radiation, Einstein coefficient, Parts of laser, Types of laser and their application. **[3]**

**Module 7. Energy Bands and charge carrier in semiconductors**

Energy band diagram, Covalent bonds, Bound and free electrons, Holes, Electron and hole mobilities, Intrinsic and extrinsic semiconductors, Fermi and impurity levels. **[3]**

**Module 8. Conductivity in semiconductors**

Impurity compensation, Charge neutrality equation and semiconductors conductivity, Einstein relation, Drift and diffusion current, Photo conductivity and Hall effect. **[3]**

Books Recommended:

1. Mathew N.O. Sadiku ( SAD), Elements of Electromagnetics, Oxford University Press(2001).
2. Arthur Beiser (AB), Concept of Modern Physics, 6th edition 2009, Tata McGraw- Hill.
3. Halliday, Resnick, Walker , Fundamentals of Physics 6/e, John Wiley & Sons 2004.
4. Streetman and Banerjee, Solid State Electronic Devices, PHI Publication india.

MH 1201 **Mathematics-II**

**Unit-1**

Matrices and Determinant:-Review and operation on Determinant and Matrices, Rank of a Matrix, Elementary Transformations, Reduction to Normal form, Solution of simultaneous Equations, Gauss Jordan Method. Cayley Hamilton’s Theorem, Eigen Values and Eigen Vectors. **(05 Classes)**

**Unit-2**

Vector Space:- Definition, Linear dependence and linear independence of vectors. **(03 Classes)**

**Unit-3**

First Order Ordinary Linear differential Equation:- Method of solution of first order differential equations (Types: Variable Separable, Homogeneous and non Homogeneous differential equations, linear differential equations, Bernoulli’s differential equations and Exact differential equations. **(06Classes)**

**Unit-4**

Higher Order Linear differential equation:- Solution of Higher Order linear differential equations with constant coefficient, Method of Variation of Parameters, Cauchy’s Homogeneous and Legendre differential equations. **(06 Classes)**

**Unit-5**

Laplace Transformations:-Definition, Existence of Laplace Transform, Laplace Transform of Basic and Periodic function, Shifting Theorems, Properties of Laplace Transformations **(05 Classes)**

**Unit-6**

Laplace Inverse Transformation:- Laplace Inverse Transformation of basic functions, Convolution theorem, Laplace Transform of Unit Step function and Unit Impulse function, Application of Laplace Transformation to differential equations. **(05 Classes)**

**Unit-7**

Numerical Analysis:-Operators (,*Е*) and relation between operators, Factorial Polynomial. **(03 Classes)**

**Unit-8:**

Interpolation and Extrapolation:- Newton’s Forward and Backward Formula, Lagrange’s Interpolation formula and Newton’s divided difference formula for unequal intervals, Numerical Differentiation and Numerical Integration (Newton’s cote’s Method, Trapezoidal rule, Simpson’s rule and rule). **(06 Classes)**

**Reference Books**:-

1. Advanced Mathematics for Engineers, by “Erwin Kreyszig”(Wiley Eastern Publication)

2. Higher Engineering Mathematics, by “B.S.Grewal”( Khanna Publication)

3. Introductory Method of Numerical Analysis, by “ S.S.Shastri” (PHI Publication)

4. Advance Mathematics for Engineer,by’Gorakh Prasad”(Torrent Publication).

**Semester II**

**ME1201 ENGINEERING THERMODYNAMICS (3-1-0)**

**Fundamentals and definition (5 Lectures)**System, properties, state, state change, diagram, Dimension and units

**Work mechanism and thermodynamics (6 Lectures)**Definitions, Displacement work at part of a system boundary, Engine indicator, Displacement work in various quasi static processes, Shaft work, electrical work, Heat, temperature, thermal equilibrium, Zeroth law of thermodynamics, sign convention for heat transfer.

**First law of thermodynamic (5 Lectures)**Statement, application to non cyclic and cyclic process, Energy, mode of energy, pure substances, specific heats, and first law applied to flow processes.

**Second law of thermodynamics (5 Lectures)**Direct and reversed heat engine, Kelvin – Plancks and clausius statement of second law and their equality, reversible and irreversible process, Carnot cycle, carnot Theorem, thermodynamic temperature scale.

**Entropy (5 Lectures)**Definition, calculation through T – ds relation, T – S diagrams, entropy as a measure of irreversibility, Clausius inequality

**Properties of pure substances including steam tables and Mollier diagram   
 (5 Lectures)  
  
Psychometrics: (5 Lectures)**Properties of ideal gas and ideal gas mixture with a condensable vapour.

Second law analysis of engineering processes, Avaibility and irreversibility and their application in thermal engineering. **(4 Lectures)**

**Suggested Text Books & References:-**

* Engineering Thermodynamics - R.K.Rajput ,Laxmi Publications
* Engineering Thermodynamics - P.K.Nag ,TMH
* Thermal Science & Engineering - Dr. D.S. Kumar , Kataria & sons
* Thermal Engineering-D r. P. L. Ballaney , Khanna Publication

**EC 1201**

**Semester - II**

**Basic Electronics**

**(3 – 0 – 0)**

**Module – I [10 Hrs]**

Introduction Ideal diode, Introduction to P – N Junction diodes, Characteristics of semiconductor diode, analysis of simple diode circuits, DC and AC load lines, Zener diodes its characteristics and application.

**Module – II [6 Hrs]**

Application of Rectifier diode, Half wave & Full wave Rectifier, L, C, L – C & π Filter clipper and clamper Circuits, Voltage multiplier Circuit

**Module – III [7 Hrs]**

Introduction to BJT, Transistor operation Common Base, Common Collector, Common Emitter configuration, Transistor dc load line, JFETs & MOSFETs, Depletion type MOSFET & Enhancement type MOSFET

**Module – IV [4 Hrs]**

OP – AMP: Introduction, Differential &Common mode operation, virtual ground, inverting & non inverting amplifier, Adder, Subtractor, integrator, differentiator, buffer

**Module - V [4 Hrs]**

Semiconductor Devices: Introduction to SCR, DIAC, TRIAC, GTO, UJT

**Module – VI [2 Hrs]**

CRO: Introduction, Cathode Ray tube – theory and construction

**Suggested Text Books and References Books:**

* Millman and Halkias, “ Integrated and Electronics”, Tata Mc Graw Hill
* Nashelesky & Boylstead, “ Electronic Devices & Circuit Theory”, Prentice Hall of India
* D. Chattopadhay & P.C. Rakshit, “ Electronics Fundamentals and Applications”, New Age International

**EC 1202 - P**

**Basic Electronics Lab**

**(0-0-3)**

**List of Experiments:**

* Characteristics curve for Common Base, Common Emitter & Common Collector Transistors.
* Characteristics of Field Effect Transistor.
* Verification of properties of Operational Amplifiers (Inverting, Non Inverting, Differential, Adder, Integrator, Differentiator).
* Study of CRO. (Measurement of Frequency & Amplitude of Sinusoidal, Triangular & Square Wave Signals).
* Study of working of Data Acquisition system.

**(CS 1202 – P) LAB ASSIGNMENT**

1. DOS System commands and Editors

2. UNIX system commands and vi

3. Simple Programs: simple and compound interest. To check whether a given number is a palindrome or not, evaluate summation series, factorial of a number , generate Pascal’s triangle, find roots of a quadratic equation

4. Programs to demonstrate control structure: text processing, use of break and continue, etc.

5. Programs involving functions and recursion

6. Programs involving the use of arrays with subscripts and pointers

7. Programs using structures and files

**ED1202-P ENGINEERING GRAPHICS – II ( M/c Drawings) (0-0-3)**

**Shape Description (External)**

Multiplanar representation in first and third angle systems of projections, glass box concept, sketching of orthographic views from pictorial views, precedence of lines

Sketching of pictorial (isometric and oblique) views from Multiplanar orthographic views, Reading exercise, Missing line and missing view exercises.

**Shape Description (Internal)**

Importance of sectioning, principles of sectioning, types of sections, cutting plane representation, section lines, conventional practices.

**Size Description**

Dimensioning, tools of dimensioning, Size and location dimensions, Principles and conventions of dimensioning, dimensioning exercises.

**Computer Aided Drafting**

Basic concepts and use.

**Screw Threads**

Different type of threads , Assembly drawing of nut and bolt.

**Joints and couplings**

Cotter joints and Knuckle joint , Flanged coplings

**B. TECH COURSE STRUCTURE**

**ELECTRICAL & ELCTRONICS ENGINEERING**

**3RD SEMESTER**

**RANCHI UNIVERSITY, RANCHI**

(**CS1301) NUMERICAL ANALYSIS & COMPUTER PROGRAMMING**

**Numerical Analysis:-**

**Module 1 [5 Hrs]**

Approximation and round of error, Truncation errors.

Taylor Series, Bisection Method, Determination of root of polynomials and transcendental equation by Newton-Raphson, Secant and Bairstow method.

**Module 2 [5 Hrs]**

Solutions of linear simultaneous linear Algebraic equations by Gauss Elimination and Gauss Siedel Iteration Methods. Backward, Forward and Central difference relations and their uses in Numerical Differentiation and integration .

**Module 3 [5 Hrs]**

Application of difference Relations in the solution of Partial Differential Equations. Numerical Solutions of Ordinary Differential Equations by Eular, Modified Eular, Runge-Kutta and Predictor-Corrector method. Curve fitting-Linear and Non Linear Regression analysis, Trapezoidal rule, Simpson’s rule.

**Computer Programming:-**

**Module 4 [3 Hrs]**

Introduction to Computer Programming in C Languages. Arithmetic Expressions . Simple Programs. The Emphasis should be more on Programming Techniques rather than the Language itself.

**Module 5 [3 Hrs]**

C Data Types, int , char, float etc. C Expressions, Arithmetic Operations , Relational and Logic Operations. C Assignment Statements, Extension of Assignments to the operations. C Primitive input output using getchar() and putchar(), Exposure of the scanf() and printf() Functions.

**Module 6 [5 Hrs]**

C statements , Conditional Execution using if-else. Optionally Switch and Break statements may be Mentioned. Concepts of Loops, Example of Loops in C using for, while and do-while optionally continue may be mentioned

**Module 7 [4 Hrs]**

One Dimensional Arrays and example of iterative programs using Array. 2-D Arrays. Use on Matrix Computations. Concept of Sub-Programming, Functions, Examples of Functions, Argument passing of simple Variables. Pointers relationship between arrays and Pointers, Argument passing using pointers, Array of Pointers, Passing array as arguments . String and C string library.

**Module 8 [5 Hrs]**

Structure and Union Defining C . Structures passing structures as arguments-program examples

Files I/O Use fopen and fprintf routines.

**Text Books :**

* Grewal, B.S. “*Numerical Methods*” Khanna Publication
* Gottfried, B. S. “*Programming with C*”, Tata McGraw Hill Publication
* Ritchie & Kernighan “C Programming Language” Prentice Hall

**References Books :**

* Kamthane, A. “Programming in C” Pearson
* Theraja, Reema. “Programming in C” Oxford University Press
* Balaguruswamy, E. “*Programming in C*” Tata McGraw Hill
* Venugopal, K.R “*Programming in C*” Tata McGraw Hill

**ME 1312**

**MATERIAL SCIENCE (2-0-0)**

**Module – I [5 Hrs]**

History of materials: Source of engineering materials, categorization of engineering materials [2 or 3 material, their properties and their application just to make an illustrative point] Periodic table approach to engineering materials, Atomic bonding vis-à-vis properties of materials: Crystal structure and no crystalline structure, Miller indices

**Module – II [3 Hrs]**

X-ray diffraction,

Defects, their origin, Frenkel Schottky defects, Oder-disorder transformations, association of defects, non-stoichiometric solids, role of defects in defining electronic properties of materials – Si, GaAs, Dislocations 3 hours

Diffusion in solid, atom mobilities, temperature and impurity dependence of diffusion, various diffusion processes

**Module - III [5 Hrs]**

Binary phase diagrams (Pb-Sr, AI- Si, Ge-Si & Au-Si etc), microstructure and its effect on properties. 2 hours Materials for use in electronic devices: Polymers, ceramics. Semiconductors and matals – their structure and properties, insulators, superconductors, dielectric, ferroelectric, memory and magnetic materials. Case studies, 7 hours Quantum mechanical approach to structure of materials: Energy band in solid, electrical conductivity Extrinsic and intrinsic semiconductors, carrier concentration, work function

**Module – IV [3 Hrs]**

Carrier transport mechanism: Scattering and drift of electrons and holes, diffusion and drift of carriers, Hall effect

**Module – V [5 Hrs]**

Technology of fabrication of semiconductor devices, Unit operations: Thin film deposition, oxidation, diffusion, implantation lithography, etching metallization, bonding, encapsulation and packaging, Description of a discrete device fabrication, IC fabrication technology

**Module – VI [4 Hrs]**

Sensors and actuators: classification and terminology, acoustic sensor, mechanical sensors, magnetic sensors, radiation sensors, thermal sensors, biosensors, chemical sensors and mechanical sensors Examples of integrated sensors 4 hours

**Module – VII [4 Hrs]**

Opto-electronic materials and devices: Modulation of light: birefringence, Kerr effect, magneto- optic effects, acousto – optic effects. Display devices’ CRTs. LEOs, LCDs, photoconductors, IR detectors, Photon devices, Lasers, Optical switching devices

**Module – VIII [6 Hrs]**

Structural, chemical characterization of material – introduction to X-ray Analysis, optical microscopy, ESCA

SEM-EDAX, STM, AFM, case studies of Si, GaAs, ferrites, lithium niobate

Environmental assessment of semiconductor device production retrospect and prospect

**Suggested text Books and References:**

* Ian P. Jones, “ Material Science for Electrical and Electronic Engineers”., Oxford Publication, Indian Edition
* Collister, Jr. Willium D, John Willey, “ Materials Science and Engineering – An Introduction” Singapore
* Naurula, “ Material Science”., Tata McGraw Hill Publication
* O.P. Khanna, “Material Science”., Dhanpat Rai Publication

**III Semester**

**ME 1303 STRENGTH OF MATERIALS (3-1-0)  
  
Stress:**  Axial load-safety concept, general concepts; stress analysis of axially loaded bars, member strength of design criteria. (4 Lectures)

**Strain:** Axial strain and deformation; strains and deformation in axially loaded bars, stress-strain relationship, poison’s ratio, thermal strain and deformation, strain concentration.   
 (4 Lectures)

Generalized Hook’s law, Pressure vessels, constitutive relationship-generalized concepts, relationship between elastic constants, thin wall pressure vessel. (6 Lectures)

**Torsion:** Torsion stress and deformation in circular members, design of circular members in torsion, closed coil helical spring. (5 Lectures)

**SFD & BMD:** Axial force, shear and bending moment diagram, introduction-direct approach for axial force, shear and bending, bending of beams with symmetrical cross-section. (4 Lectures)

**Stresses in Beams:** Shear stress in beams; introduction-shear flow-shear stress in beams.   
 (4 Lectures)

**Combined stresses:** Transformation of stress and strain; analysis of combined loading, transformation   
of stress and strain-Mohr’s rule for stress information. (6 Lectures)

**Deflection of beams:** Introduction-deflection by integration-deflection by moment-area method.  
 (6 Lectures)

**Stability of column:** introduction-Euler’s buckling load formula, Rankin’s formula-introduction to beam  
column. (2 Lectures)

**Suggested Text Books & References:-**

* Strength Of Materials , R S Khurmi , S. Chand
* Strength Of Materials, R K Rajput , S. Chand
* Strength Of Materials , Dr Sadhu Singh , Khanna Publications
* Strength Of Materials , Young & Timoshenko
* Strength Of Materials , Singer, Happer & Row Publisher

**ME 1313 Fluid Mechanics and fluid machinery (3-1-0)**

**Introduction**

Definition and fluid properties, Units and Dimensions, Classification of fluids, Normal and Shear messes in fluids. (6 Hours)

**Statics of Fluids**

Types of forces on fluid system, Mechanics of fluids at rest and in rigid body translation, Manometry, forces on fully and partially submerged bodies. (5 Hours)

**Kinematics of Fluid Motion**

Types of motion, Streamlines, Pathlines and streaklines, Velocity and rotation, stream function, Acceleration of a fluid particle , voracity and circulation, Irrational flow, Potential function, Differential equation of conversion of mass. (5 Hours)

**Dynamics of Ideal Fluid Flow**

Euler’s equation of motion, Bernoulli’s equation and application to flow measurement, pumping, fluid machines, (4 Hours)

**Integral Analysis of Flow**

System and control volume approaches, The transport theorem, Conversion of mass, linear momentum equation, energy equation, Application to rotodynamic machines. (4 Hours)

**Mechanics of viscous Flow**

Navier- Stokes equation; Exact solution, Flow between parallel plates, Laminar Flow through ~ circular pipe, Transition from laminar to turbulent flows, Turbulent flow in a circular pipe, concept of the Boundary Layer and drag on the bodies, Phenomenon of separation   
 (6 Hours)

**Dimensional Analysis and Similarity in Motion**

Buckingham’s P-theorem, Geometric, Kinematic and dynamic similarity, Application   
 (3 Hours)

**Fluid Energy Conservation systems**

Mechanics, Types of Pumps and hydro-turbines, Classification, working principle, Characteristic and Application, Wind energy and wind turbines. (3 Hours)

**Suggested Text Books & Reference**

1. Fox, R.W and Mc Donald, A.T “Introduction to Fluid Mechanics”, 4th Edition, John Wile and Sons Ins, 1995
2. Kumar, K.L, “Engineering Fluid Mechanics” Eurasia Publishing House (P) Ltd, 1976, Gupta, Vijay and Gupta S.K. “Fluid Mechanics and Application”, Tata Mc Graw Hill C. 1985.
3. Modi, P.N and Seth, S.M “Hydraulic and Fluid Mechanics”, Standard Book House, 1968.

**MH 1301 Mathematics – III**

**(E.E.E. Branch)**

**Unit – I**

**Introduction to Partial Differential Equations: -**Linear and Non – Linear partial Differential equations if first order, four standard form, Classification of second order linear partial differential equations, solution by separation of variable of heat conduction and wave equations, Laplace equations. **(06Clasess)**

**Unit – II**

**Numerical Methods: -**Error in competition. Nonlinear Equation f(x) = 0 in one variable, Regula-Falsi, Secant and Newton-Raphson Methods, convergence of these methods, linear algebraic system of equations, Gauss elimination methods, Jacobi methods and Guss-Seidal iterative methods, convergence of these methods. **(06Clasess)**

**Unit – III**

**Interpolation: -**Newton Forward and Backward difference formula Lagrange and Newton divided difference formula. **(04Clasess)**

**Unit – IV**

**Differentiation and Integration By Numerical Methods: -**Differentiation by using interpolation formulas, Integration by Trapezoidal and Simpson rules, Newton cote formula. (**04 Classes)**

**Unit – V**

**Ordinary Differential Equations: -**Solution of ordinary differential equations by Taylor, Euler and Runge-Kutta second order and fourth order formulas. **(04 Classes)**

**Unit – VI**

**Partial Differential Equations: -**Solution of one- dimensional heat, wave equations and Laplace Equation by Finite difference scheme. **(05 Classes)**

**Unit – VII**

**Curve Fitting: -**Least Square Methods, Linear and Non-Linear equation. **(03 Classes)**

**Unit – VIII**

**Fourier Transform**: - Fourier Integral Transform, Fourier Transform, Convolution theorem and Inversion formula of Fourier transform **(06 Classes)**

**Reference Book: -**

1. “Numerical Methods for Scientific and Engineering Computation” by Jain, M.K., Iyengar, S.R.K. and Jain, R.K., New Age International Publication.
2. “Introduction to Numerical Analysis” by Froberg, C.E, Addition Wesley, 1995.
3. “Advanced Mathematics for Engineers”, by Erwin Kreysizig, Wiley Eastern Publication.
4. “Computational Methods for Partial Differential Equations” by Jain, M.K., Iyengar, S.R.K. and Jain, R.K., New Age International Publication.

**EE 1301 ELECTRICAL MEASUREMENT & INSTRUMENTATION**

**Electrical measurement:** Characteristics of Measuring Instruments, Accuracy and Precision, Significant figures, Standards of Measurements & Errors, Types of errors, Gross errors, Systematic errors and random errors, Probability of errors, Normal distribution of errors Limiting errors, Review of indicating and integrating instruments: Voltmeter, Ammeter, Wattmeter, Multi-meter and Energy meter. 4 Hrs

**Measurement of resistance:** Measurement of low resistance, Kelvon Double Bridge, Measurement of medium resistance – Wheatstone bridge method, Measurement of high resistances, Insulation resistance measurement, Megger 4Hrs

**Magnetic measurement:** Measurement of magnetic flux, magnetic measurement using Hall Effect, Measurement of self-inductance, mutual inductance and Measurement of capacitance. 4Hrs

**Measurement of voltage:** Potentiometers –principle of the potentiometer, study of unbalanced condition, potentiometer use for the measurement of resistance, current and voltage, AC potentiometer, AC Bridge method, AC bridges under unbalanced conditions. Current measurement, AC bridges for Inductance and capacitance measurement **6Hrs**

**Instruments:** Moving coil and Moving Iron meters, Dynamometer and Induction instruments, wattmeter and energy meter, Electronic voltmeter, Multi-meter, Instrument Transformer: Current and Voltage transformers, Frequency, Phase and power Factor meters, Electronic multi-meters, Digital voltmeter, Analog and Digital oscilloscopes, Time, frequency and phase-angle measurement using CRO, Spectrum & wave analyzer, Storage Oscilloscope, Signal and Function generators, Digital Counters **4Hrs**

**Instrumentation:** Transducers- Classification & selection of transducers, Strain Gauges, Inductive & Capacitive transducers, Piezo-electric and Hall-effect transducers, Thermisters, Thermocouples, Photo diodes and Photo-transistors, Encoder type Digital transducers, Signal conditioning and telemetry, Basic concepts of smart sensors and their applications, Data Acquisition Systems **6Hrs**

**Text Books/ References Books :**

1.“Instrumentation, Measurement & Feedback”,B.E Jones,Tata McGraw

2.”Modern Electronic Instrumentation & Measurements”, Helfrick and Cooper, Prentice Hall of India

3.”Electronic Instrumentation & Measurements”, Bell, Prentice Hall of India

**(CS 1302-P)**

**LAB ASSIGNMENT**

1. Write a Program to print “ HELLO WORLD”

2. Write a Program to add two numbers.

3. Write a program to find the area of a circle.

4. Write a program to check whether the given number is palindrome or not.

5. Write a program to check whather the given number is prime or not.

6. Write a program to find the largest among three numbers using if-else statement.

7. Write a program to swap two numbers using function.

8. Write a program to store 100 elements within array and find largest and smallest element.

9. Write a program to add two matrices and display the resultant matrix.

10. Write a program to multiply two matrices and display the resultant matrix.

11. Write a program to display the output.

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12. Write a program to display the output.

1

0 1

1 0 1

0 1 0 1

**. . . . .**

**. . . . . .**

`13. Write a program to display the output.

1

1 2 1

1 2 3 2 1

1 2 3 4 3 2 1

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14. To find the roots of non-linear equation using Bisection method/Muller’s method.

15. To find the roots of non-linear equation using Newton’s method/Miller’s method.

16. Curve fitting by least-squares approximations.

17. To solve the system of linear equations using Gauss-Elimination method.

18. To solve the system of linear equations using Gauss-Seidal iteration method.

19. To solve integral equation numerically using Trapezoidal rule.

20. To solve integral equation numerically using Simpson’s rule.

21. To find numerical solution of ordinary differential equations by Euler’s method.

22. To find numerical solution of ordinary differential equations by Runga-Kutta method.

23. To find numerical solution of partial differential equation/laplace equation/wave  
equation/heat equation.

24. To find numerical solution of ordinary differential equations by Milne’s method.

25. To solve a given problem using Newton’s forward interpolation formula.

26. To solve a given problem using Lagrange’s forward interpolation formula.

**ME 1307-P MATERIALS SCIENCE LAB (0-0 -3)**

**List of Experiments**1. To study the lattice structure of various types of unit cells, observe the miller indices for various   
 planes & directions in unit cells.  
2. To study the microstructure of cast iron, mild steel, brass, solder underancaled, cold work, forged  
 rolled condition.  
3. To verify Hall effect.  
4. To verify the fracture, characteristics of ductile & brittle material.  
5. To determine the chemical composition of a few common alloys.  
6. To determine the percentage of carbon & contents in a alloy with Fe as main.

**ME 1308-P STRENGTH OF MATERIALS LAB (0-0-3)**

**List of Experiments**

1. Tensile Test: -To prepare the tensile test upon the given specimen (Mild Steel).   
2. Compression Test: -To determine the compressive strength of the given specimen.   
3. Torsion Test: - To perform the Torsion test on given specimen.  
4. Impact Test: - To determine the impact toughness of the given material.  
5. Brinell Hardness Test: - To determine the hardness of the given specimen.   
6. Vicker’s Hardness Test: - To determine he hardness of the given specimen.  
7. Rockwell Hardness Test: - To determine he hardness of the given specimen.

**ME 1309-P FLUID MECHANICS LAB** (0-0-3)

**List of Experiments**  
1. Verification of Bernoulli’s theorem.  
2. Determination of co-efficient of discharge for a venturimeter.   
3. Determination of loss of head of water flowing in a pipe; through different climaters.  
4. Determination of loss of head due to friction.   
5. Determination of co-efficient of discharge for Orificemeter.  
6. Determination of met accenteric height of a boat model.  
7. Verification of Reynolds Law.  
8.Viscosity determination of a liquid by Capillary tube method.

**PRACTICAL:**

**EE 1302-P PELECTRICAL MEASUREMENTS & INSTRUMENTATION (0-0-3)**

**List of Experiments: (Min six experiments to be conducted)**

* Study of Kelvin’s Double Bridge and its application for measurement of Low resistances.
* Schering Bridge for measurement of Capacitance.
* Anderson’s Bridge for measurement of Capacitance.
* Study and use of LVDT or Displacement Transformer.
* Study and use of Time Division Multiplexing (TDM).
* Study and use of Frequency Division Multiplexing (FDM).

**B.TECH COURSE STRUCTURE**

**ELECTRICAL & ELCTRONICS ENGINEERING**

**4th SEMESTER**

**RANCHI UNIVERSITY, RANCHI**

**EC1404**

**SOLID STATE DEVICES**

**(3-0-0)**

**Module-I [6 Hrs]**

Carrier Concentration: Energy band diagram, intrinsic and extrinsic Semiconductor, mobility of free electron and hole. Fermi level, Electron and Hole Concentration of equilibrium. Direct and Indirect recombination of electrons and holes, Hall Effect

**Module-II [4 Hrs]**

Transport phenomena: Drift and Diffusion of carriers, Continuity and Diffusion equations, Hynes Shockley experiment.

**Module-III [5 Hrs]**

PN junctions: Barrier potential, space charge at a junction, steady state condition. I-V Characteristics, effect of temperature on diode current Break down mechanism- avalanche and Zener P.N junction capacitance

**Module-IV [6 Hrs]**

Semiconductor diodes: Zener diode, LED, Tunnel Diode, photo diode, photo detector, photo diode materials, solar cell, Metal Semiconductor Junction .

**Module-V [7 Hrs]**

Bipolar junction transistor: Basic structure and principle of operation of BJT. Current components and amplifying property of characteristics, current gain and active, saturation and cut- off region of output characteristic

**Module-VI [6 Hrs]**

Field effect transistor: Basic structure, principle of operation and I-V characteristic of JFET, MESFET, MOSFET. FET parameters

**Suggested Test and Reference Books:**

* “Solid state Device’’, B.G. Streetman, PHI.
* “Electronic Devices and circuits’’, Milliman, J. and Halkias, C.C.,TMH.
* “Physics of semiconductor Devices’’ – S.M. Sze.
* “Semicoductor Device’’, Tusprit singh, John Wiley Eastern.

**EE 1402 CIRCUIT THEORY (2-0-0)**

**Review of circuit concepts:**

L, C, Mutual Inductance, Controlled sources, Transformers, Dot convention for coupled circuits, Nodal & Loop analysis**. [Six Lectures]**

**Network theorems (with proof):**

Thevenin’s, Norton’s, Tellegen’s, Reciprocity theorems, Maximum Power Transfer Theorem, Compensation theorem. **[Six Lectures]**

Time and Frequency Domain analysis of circuit for step, ramp, exponential and damped exponential inputs, Wave form synthesis, Laplace transform method and complex frequency approach. **[Six Lectures]**

**Network functions:**

Driving point and Transfer function, Calculation of network function, Poles and Zeros and their significance. Concept of stability of active networks, Frequency response (frequency & phase plots). **[Seven Lectures]**

**Coupled circuit and Two-Port Networks:**

Analysis of mutually coupled circuits, two port parameters, relations among different parameters, scattering parameters. **[Six Lectures]**

**Elements of Filter Design:**

Low-Pass, High- Pass and Band-Pass filters, Butter worth and Chebyshev approximations, Design of first order and second order low-pass filters, Elementary synthesis techniques.

**[Seven Lectures]**

**Text Books/ References Books :**

1. ”Network Analysis”, F.F. Kuo, Jhon Willison.
2. ”Circuit Theory-Analysis & Synthesis”, A Chakrabarti, Dhanpat Rai Publication.
3. ”Basic Circuit Theory “, Heelsman, Prentice Hall Of India.
4. ”Network Theory- Analysis & synthesis”, Ghosh, Prentice Hall of India.
5. ”Network Analysis”, Valkenburg Van, Prentice Hall of India

**EE 1403 ELECTRTOMAGNETIC THEORY (3-0-0)**

**General Principles:** Concept of gradient, divergence and curl, Ampere’s Laws, Magnetic vector and scalar potentials, Eddy current Loss and Skin Effect, The field concept, Source of Electromagnetic fields, Classification, Boundary conditions. **[Five Lectures]**

**Boundary value Problems in Electrostatics:** Laplace andPoisson’s equations, product solution method of solving Laplace’s equation, Rectangular, Spherical and Cylindrical coordinates, method of Images, Field plotting methods. **[Six Lectures]**

**Magneto-static Field:** integral theorems, Coulomb’s Law, Gauss’s equipotential surface, Divergence theorem, Poisson’s evaluation of capacitance, Electrostatic energy, Electrostatic uniqueness theorem. **[Five Lectures]**

Faraday’s Law of Magneto-static energy, Ampere’s Laws, Magnetic vector and scalar potentials, Eddy current Loss and Skin effect, Boundary value problems in Magneto-static, Current sheet and flux sheet. **[Six Lectures]**

**Electromagnetic fields:** Propagation of Electromagnetic waves in dielectrics and conductors, space sheet, transmission lines, Polarization, Reflection and Refraction of plane waves, Brewster angle, Surface impedance, Poynting theorem, Power loss in plane conductor. **[Six Lectures]**

Transmission line equations, Standing waves, Impedance matching Transmission charts, Smith charts, guided wave, Rectangular wave guides wave impedance, and characteristic impedances, Retarded potentials, Radiation from elementary dipole and half wave dipole, Radiation pattern.  **[Six Lectures]**

**Radiation And Antenna:** Retarded potential, Hertzian dipole, Antenna pattern, directivity and gain, Application of field effect theory to electrical devices. **[Six Lectures]**

**Text Books/ References Books :**

1. “Elements of Engineering Electromagnetics”, Rao, N.N., Prentice Hall, India.
2. “Elements of Electromagnetics”, Mathew, N., Sadiku, O., Sauders College Publishing.
3. “Fields and Waves in Communication Electronics “,Ramo, S.,Whinnery, S. and Van Duzer, T., John Wiley and Sons.
4. Kraus, J. D., “ Electromagnetics”, 3rd Edition, McGraw Hill, 1989. Jordan, E.C. and Balmain, K. G., “Electromagnetic Waves and Radiating Systems”.

**EE – 1404 ELECTRICAL MECHINE – I (3-1-0)**

**A). Transformer**

**Module 1:**

**Autotransformer:**

Equivalent circuits and equations for step – up and step – down operations, Comparison with two winding transformer on the basis of copper losses and volume of copper. 4 Hrs

**Module 2:**

**Three – phase Transformer:**

Special constructional features – cruciform mitering, alternative winding arrangement, cooling methodology, conservators, breathers, Buchholz relay, Transformer connection , vector phase groups, Phase conversions – 3 to 1, 3 to 2, 3 to 6 and 3 to 12. 6 Hrs

**Module 3:**

**Parallel Operation:**

Parallel operation of single and three- phase transformers and load sharing, testing of three phase transformers, Special Purpose Transformers: Pulse Isolation, Welding, Rectifier, High frequency. 6 Hrs

1. **Synchronous Machine:**

**Module 4:**

**Constructional Features:**

Constructional Features, Poly – phase Distributed AC Windings: Types, Coil span and winding factors; Excitation systems, e.m.f. equation and harmonic elimination; Interaction between excitation flux and armature m.m.f.

**Module 5**

**Equivalent Circuit:**

Equivalent circuit model and phasor diagram and circle diagram. Power angle equation and characteristics. Voltage Regulation and effect of AVR.

**Module 6**

**Synchronizing:**

Synchronizing methods, Parallel operation and load sharing, actice and reactive control, operation on infinite bus-bar.

Management information system:

Role of information in decision making, information system planning, Design and Implementation, Evaluation and Effectiveness of Information System 4 Hrs

Statistical Quality Control, TQM and ISO Certification

Social and Ethical issue in Management,

Ethics in management, Social Factors, Unfair and restrictive Trade Practices.

Strategic and Technology Management: 6 Hrs

Need, Nature, Scope and Strategic, SWOT analysis, value and concept.

**EC 1407 DIGITAL ELECTRONICS (3 – 1 - 0)**

Review of Binary numbers, Boolean functions, Karnaugh Maps, and minimum realization of combinational circuits;

Half and Full adder, Comparator, Schmitt Triggers, monostable, bistable and astable multivibrators Multiplexer, Demultiplexers, Decoders and encoders, counters,

Transistor (BJT & MOS) as switching element;

Logic Gates: TTL, ECL and CMOS gates;

Memories: RAM,ROM, EPROM, EEPROM, R-S, J-K, T and D flip-flops;

State transition diagram, Asynchronous and synchronous design, counters, registers;

Shift registers, A/D and D/A Converters;

Arithmetic Circuits, State Machine Design, Memory Cells, Introduction to Digital Circuit Testing, Introduction to Hardware Description Language, Introduction to Field Programmable Devices.

**Suggested Books &References:**

* Taub and Schilling, “Digital Integrated Electronics”, McGraw Hill, 1976.

**18.Digital Electronics**

1. “Digital Integrated Electronic”,McGraw Hill

**PRACTICAL : EC 1411 DIGITAL ELECTRONICS LAB (0-0-3)**

**List of Experiments:**

* To study the switching characteristics of a diode
* To study the switching characteristics of a Bipolar Junction Transistor.
* Implementation of logic functions using gates, Multiplexes and D- Multiplexes.
* To set up an Rs., a clocked RS, J-K, Edge triggered J-K Master Slave K-J flip- flops using NAND Gates.
* Design & Implementation of sequential memory using shift register to design and text counters and sequence detectors using J-K flop-flops.

**EE 1406 POWER SYSTEM – I (3-0- 0)**

**Generation of Electric Power:**

Brief description of Thermal, Hydro, Nuclear and Gas Power Plants and other non- conventional Power Plants. **[Four Lectures]**

**Distribution Systems:**

DC 2-Wire and 3- wire systems, AC single phase, three phase and 4-wire systems, and comparison of copper efficiency. **[Four Lectures]**

Distribution system: Primary and Secondary distribution systems, concentrated and uniformly distributed loads on distributers fed at one and both ends, ring distribution, sub-mains and tapered mains, voltage drop and power loss calculations, voltage regulators. **[Four Lectures]**

**Overhead Transmission Lines:**

Types of conductors, Line parameters: Calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with stranded and bundle conductors, Generalized ABCD constants and equivalent circuits of short, medium and long transmission lines, shunt compensation; Introduction to FACTS; per unit representation of system quantities, steady state performance of transmission network, Elements of load flow analysis, Nature of faults in electrical systems, Fault calculations in power networks, Elements of economic operation. **[Six Lectures]**

**Overhead Line insulator**

Type, String efficiency, voltage distribution in string of suspended insulators, grading ring, preventive maintenance. **[Three Lectures]**

**Mechanical design of Transmission lines:**

Different types of towers, Sag-tension calculations, Sag- template, String charts, Vibrations and Damping, Corona – corona losses, radio and audio noise; transmission line – communication line interference. **[Four Lectures]**

**Cables:**

Calculation of capacity of cables, Charging current, Stress, Grading, Heating of cables, Construction and Characteristics of HV and EHV CABLE. **[Six Lectures]**

**Tariffs and Load Curves:**

Definition and different tariffs for domestic, commercial, industrial application;

Different types of Loads and Load duration curves; Curves and their significance. **[Three Lectures]**

**Introduction to EHV/ HVDC Transmission:**

Brief description of both the systems with working and constructional details; **[Three Lectures]**

**Text Books/ References Books :**

* Grainger John, J. and Steverson, Jr. W. D., “Power system analysis”, McGraw Hill, 1994.
* **“**Power System Analysis”, W.D. Stevenson, McGraw Hill
* “Electrical Power System”, C.L. Wadhwa, Wiley Eastern Ltd.
* “Power System Engg.”, I.G.Nagrath & Kothari, Tata McGraw Hill

“Electric Power Generation, Transmission & Distribution”, Singh, Prentice Hall of India

**EC 1405 - P**

**SOLID STATE DEVICES LAB**

**(0-0-3)**

**List of Experiments:**

* Rectifying and Breakdown Characteristics of P-N Junction and point contact diodes.
* Input and Output characteristics of Bipolar Transistor in Common Base and Common Emitter Configurations.
* Drain Current (ID) – Drain to source voltage (VDS), Characteristics of Junction Field Effect Transistor (JFET).
* Study of SCR Characteristics.
* Measurement of h – Parameters of Bipolar Junction Transistor.
* Study of Basic properties of Operational Amplifier.
* Measurement of Energy Band Gap and Resistivity of Semiconductor sample.
* Measurement of Carrier Concentration in a Semiconductor by Hall Measurements.
* Measurement of Junction Capacitance and Ideality factor of Semiconductor diode.
* Study of effect of Temperature on Leakage Current and Breakdown voltage of P – N Junction.
* Study of UJT and Relaxation Oscillator.
* Study of Frequency response of R – C Coupled Amplifier.

**EE 1408-P ELECTRICAL MACHINES LAB I (0-0-3)**

**List of Experiments: (Min six experiments to be conducted)**

* Characteristics of DC Machines- motors and generators with different excitation.
* Hopkinsin’s test and Field test – loss calculation and prediction of performance characteristics.
* Speed control of DC motors – conventional and electronics.
* Determination efficiency of single- phase transformer by using back-to-back test.
* Determination efficiency of single -phase transformer by R-L & R-C loads.
* Determination of equivalent circuit parameters of a three- phase slip-ring induction motor.
* Determination of equivalent circuit parameters of a three- phase squirrel cage induction motor by blocked rotor test and to draw circle diagram.
* Phase conversion using Scott connection and perform load test.
* No-load short-circuit and Zero Power Factor (ZPF) test on a synchronous machine.
* Determination of voltage regulation at specified load by (i) EMF, (ii) MMF, (iii) Pottier method, (iv) ASA methods and comparison of results, Load angle characteristic and comparison with theoretically predicted results.
* V- Curves and inverted V- curves of synchronous machines, Comparison with predicted characteristics.
* Slip-test, short circuit and lagging current tests on a salient pole machine and determination of armature parameters, Estimation of voltage regulation at specific loads using Blondel’s method, Comparison with results from load test.
* Sudden short circuit test and determination of Xc, Xd’, Xd’’ and machine time constants. Determination of X1, X2,X0 by fault simulation methods.
* Study of Automatic Voltage Regulators (AVR) and from grid to stand alone mode.

**B.TECH COURSE STRUCTURE**

**ELECTRICAL & ELCTRONICS ENGINEERING**

**5th SEMESTER**

**RANCHI UNIVERSITY, RANCHI**

**HS 1501**

**MANAGEMENT SCIENCE**

**(2-0-0)**

**MODULE - I [5 Hrs]**

Definition and concept of management, Evolution of management thought, systems approach and decision, Theory approach to management, process of decision-making.

**MODULE - II [12 Hrs]**

Function of management planning, Types and plans , Major steps in managerial planning, Strategies MBO Organization, nature and purpose, process of organization, Basic departmentation, Co-ordinating supervision, communication and direction, Leadership, Motivation, Controlling, Nature and purpose control techniques and information technology, International Management, Japanese Management vs. U.S. Management managerial functions in international business.

**MODULE –** **III [5 Hrs]**

Organization Theory, Group dynamics, Defining and classifying groups process, Group task.

**MODULE – IV [6 Hrs]**

Group cohesiveness, Conflict Management, Discovery of conflicts, Processing of grievances, conflicts resolution, conflict and intergroup relations.

**MODULE - V [5 Hrs]**

Stress Management, nature of stress, potential sources of stress, consequences strategies.

**Suggested Books and references:**

* Koontz, H. and Weihrich, H., “Essential of Management”.
* Mathur, S.S, “Principles of Management”.
* Agarwal , R. D. , “Organization and Management”.
* Robbin , S.P., “Organizational Behavior”.
* Hicks and Gullet, “Organizations: Theory and Behavior”.
* Allen , “Management and Organization”.

ANALOG ELECTRONICS

**EE 1502 CONTROL ENGINEERING (3-0-0)**

**Introduction to Control Problem**

Scope of control, Parts of Control System, Mathematical modeling of physical systems – Mechanical, Electrical, Thermal and Hydraulic systems, Differential Equation; Systems with dead-time, System response; Control hardware and their models: Potentiometers, Synchros, LVDDT, DC ad AC Servomotors, Techo- generators, Electro- hydraulic valves, Hydraulic servomotors, Electro-pneumatic actuators; Closed- loop systems; Block diagram and Signal Flow Graph analysis, Transfer function.

**Basic Characteristics of Feedback Control Systems**

Stability, Steady-state accuracy, Transient accuracy, Disturbance rejection, Sensitivity and Robustness; Basic modes of feedback control: Proportional, Integral and Derivative; Feed-forward and multi-loop Control Configurations; Stability concept, Relative stability, Routh Stability criterion;

Time response of second order systems, steady- state errors, and error constants; Performance in time- domain; Root locus method of design; Lead and Lag compensation.

**Frequency Response analysis**

Relationship between time and frequency response, Polar plots, Bode’s plot, stability in frequency domain, Nyquist plots, Nyquist stability criterion; Performance specifications in frequency- domain; Frequency- domain methods of design, Compensation and their realization in time and frequency domain; Lead and Lag compensation.

Op-amp based and digital implementation of compensators; Tuning processes controller; State variable formulation and solution.

**State Variable Analysis**

Concept of state, State variable, State model, State models for linear continuous time functions, Diagonalization of transfer function, solution of state equations, Concept of controllability and observability;

**Introduction to Optimal Control and Non- Linear Control**

Optimal Control problems, Regulator Problem, Output Regulator, Trekking problem; Non-linear system- Basic Concept and analysis;

**Text Books/ References Books :**

1**. “**Control System- Principle & Design”, M.Gopal, Tata McGraw Hill

2. “Automatic Control System”, B.C. Kuo, Prentice Hall of India

3. “Control System Engg.”, I.G.Nagrath & M.Gopal, New Age Publication

4. “Elements of Control System”, Gupta, Prentice Hall of India

**EE1503 ELECTRICAL MACHINE-II (3-0-0)**

**3-Phase Induction Motor:**

Review of constructional details, Poly-phase distributed AC windings, production of EMF, Coupled circuit equations, Steady state analysis- Equivalent circuit, phasor diagram, power flow diagram and torque-slip characteristics; Starting and speed control; Effect of rotor resistance, deep and double cage rotor; speed control schemes including solid state and vector control; breaking.

Effect of space/time harmonics and analysis; Testing Losses and Efficiency;

Induction generators- Grid connected and self excited mode; Applications;

Single Phase Motor:

Induction Type double field revolving theory, equivalent circuit, characteristics,

Starting of single-phase motor, shaded pole machines.

Synchronous type Hysteresis motor, Reluctance motor, Stepper motor. Variable

Reluctance and permanent magnet type, Permanent Magnet Synchronous motor, brushless

Motor.

Special Electrical Motors

Switched reluctance motor, linear machines- Power energy and Levitation types;

Permanent Magnet DC motors.

Machines for control Systems

Disc motors, Printed circuit Motors, Servo motors-AC and DC, Tachogenerators, Synchros,

Disk Machines

**Text Books/ References Books :**

1. **“**Alternating Current Machine”, M.G.Say, ELBS Publication.
2. “Electrical Machinery and Transformer”, I.L. Kosow, Prentice Hall of India.
3. “The Performance & Design of A.C. Commutator Motors”, Obenshaw Taylor, A.H.Wheeler & Co.(P ) Ltd.

“Electrical Machines”, G.K.Lal, 3-D Publication

**EE1504 POWER SYSTEM-II (3-0-0)**

**System Representation:**

**S**ingle line representation, Per Unit systems, Modeling of Transformers, Load, Synchronous machines.

**Formation of Network Matrices**

Bus admittance and impedance matrices, Algorithms for formation of Z-Bus and Y-Bus matrices, Modification of bus impedance matrix, Sparsity oriented inversions for Y-Bus;

**Short Circuit Studies**

Symmetrical components, Sequence network diagram,Short circuit studies for balanced and unbalanced three-phase network for various type of shunt faults using sequence networks, Short circuit studies using Z-Bus matrix.

**Load Flow Studies**

Power system equations, solution techniques, Gauss-Seidel iterative method, Newton-Raphson method, Fast-coupled method, Comparison of methods, Acceleration of convergence, Voltage controlled buses, Digital computer studies of load flow, Information from load flow;

**Stability Studies**

Stability problem, Swing equation , Power angle equation, Equal area criterion of stability, Elements of steady state and dynamic stability studies, Methods of simulation for transient stability, Representation of network, load and generators, System security concepts;

**Power System Monitoring and Control**

Economic operation and load dispatch, Elementary ideas of voltage – VAR and load-frequency controls, Load-frequency control elements, Voltage control elements, Block diagram representation of hydro and steam turbine governors, Tie-line bias control;

**Text Books/ References Books :**

1. **“**Power System Analysis”, W.D.Stevenson, McGraw Hill.
2. “Electric Power System”, C.L. Wadhwa, Wiley Eastern Ltd.
3. “ Power System Analysis-Operation & Control”, Chakrabarti & Halder, Prentice Hall of India
4. “Advance Power Systems Analysis and Dynamics”, L.P. Singh, New Age International.
5. “Power System Analysis & Design”, B. R. Gupta, S.Chand

**EC1506 DIGITAL ELECTRONICS AND LOGIC DESIGN (3-0-0)**

**Number System and codes** Decimal Odometer, Binary Odometer, Number Codes, Why Binary numbers are used, Binary –to- Decimal Conversion, Decimal-to-Binary Conversion , Hexadecimal Numbers, Hexadecimal-Binary Conversion, Hexadecimal-to-Decimal conversion, Decimal-to-Hexadecimal conversion, BCD Numbers, The ASCII code.

**Gates** Inverter, OR, AND, NOT, and NAND Gates, Boolean algebra, De Morgan’s Second Theorem, Exclusive-NOR Gate, Controlled Inverter;

**TTL Circuits** Digital Integrated Circuits, 7400 Devices, TTL Characteristics, TTL Overview, and OR-Invert Gates, Open-Collector Gates, Multiplexers;

**Boolean Algebra and Karnaugh Maps** Boolean Relations, Sum-of-Products method, Algebraic Simplification, Karnaugh maps, Pars, Wads, and Octets, Karnaugh Simplifications, Don’t-Care Conditions;

**Arithmetic-logic Units** Binary Addition, Binary Subtraction, Half Adders, Binary Address, Signed Binary Numbers, 2’s Complement, 2’s Complement Adder-Subtractor;

**Flip Flops** RS Latches, Level Clocking, D-Latches, Edge-Triggered D-Flip-Flops, Edge triggered 7K Master-Slave Flip-Flop;

**Registers and Counters** Buffer Registers, Shift Registers, Controlled Shift Registers, Ripple Counter, Synchronous Counters, Ring Counters, other Counters, Three-State Register, Bus-Organize computers;

**Memories** RAMs ROMs, PROMs, EPROMs, TTL Memory, Hexadecimal Addresses

**EE 1507-P ELECTRICAL MACHINES LAB II (0-0-3)**

**List of Experiments: (Min six experiments to be conducted)**

* Parallel operation of two identical three-phase transformers.
* No-Load short- circuit and zero power factor test on synchronous machine.
* Determination of torque-speed characteristics of a 3-phase induction machine in braking, motoring and generating region and its calibration.
* Study of the effect of rotor resistance on the load characteristics of wound rotor Induction motor.
* Speed control of Induction motor- conventional and electronic control. Solid state speed control using (i) V constant, (ii) V/f constant, (iii) Slip-energy injection.
* Determination of equivalent circuit and parameters of single- phase Induction Motor. Predictions of torque- speed characteristics and verification of load test.
* Load characteristics of Universal Motor, operating on DC and AC supply. Comparison of performance with the two results.
* Starting of slip-ring Induction Motor by using (a) thee-phase variac, (ii) Star connection rheostat, (iii) Oil-immersed rotor resistance starter.
* Determination of equivalent circuit parameters of 3-phase Induction Motor by (i) No-load test, (ii) Blocked rotor test; and to draw the circuit diagram of 3-phase Induction Motor.
* Determination of Torque and slip rate characteristics of Stepper Motor and determination of operating range.
* Load characteristics of hysteresis motor and shaded pole motor.
* Characteristics of Permanent Magnet Motor.
* Characteristics of Switched Reluctance Motor.

**EE 1508-P POWER SYSTEM LAB (0-0-3)**

**List of Experiments: (Min six experiments to be conducted)**

* Power Factor control of a system excited by single-phase supply.
* To determine phase-sequence of three-phase circuit using (i) RC method, (ii) two lamp method.
* Measurement of Earth-resistance by Earth Tester.
* Study of different types of insulators.
* Simulation of DC distribution by network analyzer.
* To determine positive, negative and zero sequence impedance of three-phase transformer/three-phase induction motor.
* To determine generalized constants A, B, C, and D of a given system.
* To determine dielectric strength of insulating oil.

**Practical**

**EC 1510 –P DIGITAL ELECTRONICS AND LOGIC DESIGN (0-0-3)**

**List of Experiment**

* Verification of Logic Gates
* Verification and realization of different Flop \_Flops
* Study of 4 – Bit Register
* Study of Synchronous Counter
* Study of BCD Counter
* Study of Ripple Counter
* Design of MOD 6 Counter
* Design of Up and Down Counter.

**B.TECH COURSE STRUCTURE**

**ELECTRICAL & ELCTRONICS ENGINEERING**

**6th SEMESTER**

**RANCHI UNIVERSITY, RANCHI**

**SEMESTER-V**

**EC 1505 ANALOG ELECTRONICS**

**Review of construction, operation and characteristics of Diodes and BJTs :**

**Mod -1** : Region of operation; Biasing, Bias stability; Current mirror biasing; Transistor and an amplifier; Load line analysis; Design for maximum symmetrical swing, thermal stabilization; **5 hours**

**Mod - II** : FET, JFET and MOSFET devices : Device structure, characteristics and equations; FET as an amplifier; Common Source, Common Drain and Common Gate configurations; **5 hours**

**Mod - III**: Small Signal Analysis :

Mid - frequency response of BJT and FET circuits; Hybrid parameter models and analysis; Low frequency response including the effects of emitter bypass and coupling capacitors; High frequency response;  **5 hours**

**Mod - IV** : Multistage Transistor Circuits :

Differential amplifier, Cascade amplifier; internal details of Op-amps; some linear and non-linear applications of Op-amps; Schmitt trigger using Op-amp; **5 hours**

**Mod - V** : Power Amplifiers :

Class A, Class B, and Class C operations; Push Pull Amplifier; Complementary symmetry configuration; **5 hours**

**Mod -VI** : Feedback in Amplifiers :

Different types of feedback; Stability and oscillation; Wien bridge, Phase Shift; Colpitts and Hartley Oscillators; **5 hours**

**Mod - VII** : Operational Amplifiers (741) - use and its applications 5 hours Introduction to and use of Circuit Simulation Software (SPICE) with an Op - amp :

Suggested Books & References :

• Sedra Adel, S. and Smith Kenneth C, "Microelectronics Circuits Engineering", June 1997.

• Sedra, K. C, "1995 Problems Supplement to Microelectronics Circuits", Oxford University Pres, 1995.

• Roberts, G. W. and Sedra, A. S., "SPICE (The Oxford Series in Electrical and Computer Engineering)", Second Edition, 1996.

• Millman & Taub, "Pulse Digital Switching Waveforms" McGraw Hill.

**PRACTICAL EC 1509 - P ANALOG ELECTRONICS LAB (0-0-3)**

**List of Experiments** :

• To design and test of a multistate RC - coupled amplifier with given specifications.

• To design and test a current mirror using BJTs

(a) Set up an RC oscillator using a BJT to give sinusoidal output at 2KHz.

(b) Set up a Wien Bridge oscillator using a BJT to give sinusoidal output at 2KHz

• To design and test a series voltage regulator with short circuit protection.

• To design and test a complementary symmetry power amplifier and observe the performance.

• To implement a summer and integrator by using op - amps.

# EC 1612 SIGNALNS & SYSTEMS (2-0-0)

# Dynamic Representation of System

System Attributes, Causality Linearity ,Stability Time invariance; Special Signals, Complex exponentials, Singularity function-Impulse and step function; Linear Time-invariant system :Differential equation representation, Convolution integral ,discrete form of special function, discrete convolution and its properties, Realization of LTI-Differential and Difference.

# Fourier analysis of Continuous time Signals and Systems

Fourier series, Fourier Transform and properties, Parsifal’s theorem, Frequency response of LTI system; Sampling theorem;

# Fourier analysis of Continuous Time Signal and Systems

Discrete Time Fourier Transform and properties, Frequency response of discrete time LTI system;

# Laplace Transformer

Laplace Transformer and it inverse: Definition, existence condition, Region of Convergence and properties, Application of Laplace transformer for the analysis of continuous time LTI system; Significance of Poles and Zeros.

Z-Transformer

Z-Transformer and its inverse; Definition, existence condition, Region of Convergence and properties, Application of Z-Transformer for the analysis of discrete time LTI system; Significance of Poles and Zeros.

# Random signals

Introduction of probability ;Bayes theorem,Concept of Random variable, Probability density and distribution functions, Function of random variable; Moments, Independence of a random variable; Introduction to random process; Auto and cross correlation; Power spectral density, White noise, Random signal analysis;

# Suggested Books & References:

(1)Operation Alan, V., wIllsky Alan’s., and Nawab, H. “Signal and System”, Prentice Hall, 1997.

(2)Haykin Symon,”Communication System”, 3rd Edition, John Wiley, 1995.

# 21. Signals & System

1. “ Signals & System”, Oppenheim Alan, V. Willsky alan S,& Nawab, Prentice Hall of India

2. “Communication Systems”, Haykin yan, John Wiley

**EC 1607 MICROPROCESSORS AND MICROCONTROLLERS (2-0-0)**

**Architecture of 8085 Microprocessor**

Functions Block Diagram – Registers, ALU, Bus system, Timing & control signals, Machine cycles & timing diagrams.

**Programming of 8085A**

Instruction formats, Addressing models, Instruction set, Need for Assembly language –Development of assembly programs.

**Memory Interfacing**

Interface requirements – Address space partitioning – Buffering of buses – timing constraints, Memory control signals, Read & cycles, Interdacing SRAM, EPROM & DRAM section.

**I/O Interfacing**

Memory mapped I/O scheme, I/O mapped I/O scheme , Input cycles, Simple I/O ports, Programmable Peripheral Interface (8285), Data Transfer Scheme: Programmable Data Transfer, DMA data transfer, Synchronous, Asynchronous & interrupt driven Data Transfer Scheme, Interfacing, Simple Keywords & LED displays.

**Interrupts & DMA**

Interrupt feature, Need for interrupts, Characteristics of Interrupts, Types of Interrupts, Interrupts structure, Methods of servicing interrupts, Developments of Interrupt service subroutines; Multiple interrupt request & their handling, Need for Direct Memory access, Device for handling DMA, Programmable DMA controller 8237.

**Application**

Interfacing of A/D converters (ADC 0800/ADC 0808/ADC 0809); Interfacing of D/A converters (DAC 0800), Waveform generators; Multiplexed Seven Segment LED display system; Measurement of frequency, Phase angle, & power factor; Traffic Light Controller, Stepper Motor, Stepper motor control.

**Intel 8051 Microcontroller**

Architecture of 8051; Memory Organization, Addressing Modes; Instruction set; Boolean processing; Simple Programs.

**8051 Peripheral Function**

8051 interrupt structures; Timer & serial functions; Parallel port features; Modes of operation; Power control; Interfacing of 8051; Typical applications, MCS family features 8031/8051/8751.

**Text Books/ References Books :**

1. “Microprocessor Architecture Programming & Application with 8085/8080A”, Gaonkar, R.S,Penram International Publishing House.
2. “Microprocessor Systems, Microcontrollers and their Applications”, Singh, I.P., IMPACT Learning Material Series.
3. “Microprocessor & Interfacing Programming and Hardware”, Douglas, V. Hal, McGraw Hill.
4. “Microprocessors Programming & Interfacing”, Srinath, Prentice Hall of India

**EC 1611 - P MICROPROCESSOR & MICROCONTROLLER LAB (0-0-3)**

**List of Experiments :**

• Programming to add (i) two 8 - bit numbers, (ii) two 16 -bit numbers

• Programming to find the smallest number in a data entry.

• To find larger of two numbers

• To find largest number from a series of numbers

• To arrange a series of number in descending order

• To find 1's complement of a 16—bit/8—bit numbers.

• To find 2's complement of a 16—bit/8—bit numbers.

• Programming to find multiplication f two 8 - bit numbers

• Programming to find a square root of a number.

• Programming and verification of speed control of stepper motor

• Programming and verification of Seven-segment display.

**EC 1608 COMMUNICATION EINGINEERIG**

**Mod - I** : **Review**

Review of frequency Band, Fourier transform and Fourier series.

**Amplitude Modulation Systems** :

Need for modulation, normal AM, Generation and demodulation - envelop and synchronous detection; Modulation index; DSBSC. Generation and demodulation, Effect of phase and frequency offset on demodulation: SSB : Generation using filter and phasing method, detection: Frequency division multiplexing systems using SSB. 7 hours

**Mod - II : Angle Modulation Systems**

Concept of frequency and phase modulation, frequency deviation ad modulation index, FM spectra, Carson's Rule, Narrowband FM, Generation of Wideband, FM -Armstrong method, Direct FM generation; Demodulation of FM - discriminator; PLL. 5 hours

**Mod - III : Sampling and Discrete time Modulations**.

Sampling Theorem - Low Pass and Band Pass; Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM) - their generation and detection, Phase time division multiplying. 5 hours

**Mod - IV : Digital Communication**

PCM, Quantization noise, Bandwidth, Advantages over analog communication, PCM system, Differential PCM, Delta Modulation, Digital Modulation - ASK, FSK, PSK, DPSK, Digital multiplexing. 5 hours

**Mod - V : Power Line Carrier**

Interfacing with power line, Description of a typical system. 3 hours

**Mod - VI : Microwave Communication**

Transmit and Receive Antennas, Ling Budget, Line of Sight Systems, Satellite Ling - GT ratio of earth station, VSATS and GPSS, TDMA, CDMA. 5 hours

**Mod -VII : Optical Communication Systems**

Types of optical fibers - step index and graded index, multimode and single mode; Attenuation and Dispersion in fibers; Optical transmitters - LEDs and Laser Diode; Optical Receivers - PIN and APDs, Fiber optic links. 5 hours

**Suggested Books & References** :

• Haykins Simon "Communication Systems", 3rd Edition, John Wiley, Singapore, 1984.

• Couch Leon, W. "Modern Communication Systems", Prentice Hall, India, 1998.

• Keiser Gerd, "Optical Fiber Communications", 2nd Edition, McGraw Hill, 1991.

• Lathi, "Modern Digital and Analog Communication System", Oxford University Press.

**EE 1603 POWER ELECTRONICS (3-0-0)**

**Power Semiconductor Devices:**

History of development of Power Electronic devices, Constructional features, Characteristics, rating and specification, gate/base drive circuits, Protection including cooling and application of diodes; SCR’s, GTO’s, BJT’s, MCT, MOSFET and IGBT, Electromagnetic interference.

**AC to DC Converters:**

Operation and analysis of single phase and multi-phase uncontrolled and controlled rectifiers with R, R-L, and Back EMF load, effect of source inductance, Freewheeling effect, Power Factor Improvement method for Phase-Controllers rectifiers, Filters.

**Ac to AC Voltage Converter:**

Operation and analysis of single-phase integral cycle and phase controlled converters, Configuration of three-phase controllers.

**DC to DC Converters:**

Single-phase and three-phase bridge inverters, VSI and CSI, Voltage control-PWM and Square wave operation, Harmonics and their reduction techniques.

**Cyclo-Converters:**

Single-phase and three-phase configurations and operating Principle.

**Text Books/ References Books :**

1. **“**Power Electronics”, Rashid Muhammad, Prentice Hall of India.
2. “Power Semiconductor Circuits”, S.B. Dewan, John Wiley & Sons.
3. “Power Semiconductor Circuits”, G.K. Dubey, Wiley Eastern.
4. “Power System Engg.”, I.J. Nagrath & Kothari, McGraw Hill

**EE 1604 POWER SYSTEM STABILITY (3-0-0)**

**Introduction**

System modeling and dynamics of synchronous generator

**Small signal stability analysis (low frequency oscillations)**

* Analysis of signal machine system.
* Application of P.S stabilizers.
* Analysis of multi-machine system.

**Small signal stability Analysis (Synchronous frequency oscillations)**

* Transient stability Analysis.
* Dynamic stability Analysis.
* Dynamic Equivalence.
* Voltage Stability Analysis.
* Static VAR control and loads.
* Direct stability evaluation- Lypnor and Popor’s criteria.

**Text Books/ References Books :**

1. “Power System Engg.”, Nagrath I.G. & Kothari, D.P., Tata McGraw Hill.

“Power System Dynamics: Stability & Control”, Podiyar, K.R., Sntelina

**EE1605 DESIGN OF CONTROL SYSTEMS (3-0-0)**

Rewiew of frequency response, Frequency domain specification; Design of controllers for single loop systems in the frequency domain – Lag,lead,Lag-Lead networks as compensators; Design of P, PDT, PI and PID controllers for first, second and third order systems; control loop with auxiliary feedback, feed forward control, Multivariable control.

Ziegler and Nichol’s methods, Oppelt’s method; state variable representation of control systems; Design using state variable feedback;

AC carrier control systems

**Modern control Theory**

Formulation of equation of a system- Linearization, input-output relations, state space methods; state transition matrix, stability, controllability, obserbality and transfer function.

Lyapunov’s direct method, sensitivity, optimal control formulation, calculus of variations, performance indices, Pontryagin,s maximum principle, Time optimal control, principle of optimally, Dynamic programming.

Pole placement, Quadratic performance index, index, linear regulator problem;

**Text Books/ References Books :**

1. **“**Control System – Principle & Design”, M. Gopal, Tata McGraw Hill.

“Digital Control System”, B.C. Kuo, Saunders College Publishing

MICROPROCESSORS LAB

**EE 1606-P POWER ELECTRONICS LAB (0-0-3)**

**List of Experiments:**

* Study of V-I characteristics of SCR, Triac and Diac.
* Study of BJT and IGBT, GTO and MOSFET.
* Study of a UJT firing circuit for the control of SCRs.
* To generate and study the PWM control signal for single-phase DC to DC inverter.
* To study and use of the single-phase half controlled and fully controlled AC to DC Converter and effect of firing angle control on load voltage and waveforms.
* To Study and use of back- to-back connected SCR / Triac controlled AC Voltage controller and its wave forms with Variation of firing angle.

**EE 1607-P POWER SYSTAM STABILITY LAB (0-0-3)**

**List of Experiments:**

* Study of Synchronous Generator.
* Study and analysis of Transient stability of a Single and Multi- Machine System.
* Study and analysis of Dynamic stability of a Multi-Single Machine System.
* Analysis of voltage stability.
* To control Static VAR.

**EE 1608-P CONTROL SYSTAM LAB (0-0-3)**

**List of Experiments: (Minimum six experiments to be conducted)**

* Identification of transfer function of a system using Bode plots from experimentally obtained frequency response.
* Experimental study of characteristics of Synchro device & AC and DC servo motor.
* Position control of DC servo system with Lead / Lag compensator in the loop.
* Experimental study of a hydraulic servomechanism.
* Experimental study of pneumatic system.
* PID tuning on process control simulator.
* Stepper motor control using 8-bit Microprocessor.
* PID control of thermal and / or liquid level system.
* Study of Proportional, Integral and Derivative Control.
* Study of stability of a control mechanism.

**B.TECH COURSE STRUCTURE**

**ELECTRICAL & ELCTRONICS ENGINEERING**

**7th SEMESTER**

**RANCHI UNIVERSITY, RANCHI**

**EE 1701 COMPUTER AIDED POWER SYSTEMS (3-0-0)**

**Representation of power system components**

-Modeling, Y-Bus formation

-GS,NR,FDLF methods

**Ootimal power system Operation**

1. -Unit commitment
2. –Reliability
3. –Economic Dispatch
4. –Emission Dispatch
5. –Optimal Load flow
6. –Optimal Hydro-thermal scheduling

Power system security

State estimation

Load forecasting

Fault analysis-balanced and unbalanced

Automatic generation control

Computer Aided Power System Protection

SCADA,SLC &SLCC

**Text Books/ References Books :**

1. “Power System Engineering”, I.J. Nagrath & Kothari, Tata McGraw Hill.
2. “Computer Aided Power System Analysis and Control”, Mahalanbteis, A.K. Kothari, D.P. and Ahson, TMH New Delhi.
3. “Performance, Operation and Control of EHV Transmission System”, A.Chakrabarti, A.K.Kothari,D.P.and Mukhopadhyay, Wheeler Pubkication, New Delhi.
4. “Computer Aided Power System Analysis”, Kusic, Prentice Hall of India

**EE 1705-P COMPUTER AIDED POWER SYSTEM LAB (0-0-3)**

**List of Experiments:**

* Study of Security of Power System.
* Study of Faults in Power System.
* Study of methods of Fault Detection in Power System for balanced and unbalanced loadings.
* Computer Aided Design of Control Automatic Power Generation.
* Computer Aided Design of Power System Protection.
* Experiments based on the problems discussed in the class such as Y-Bus formation, optimal load flow analysis, Load forecasting etc.

**EE 1702 NETWORK SYNTHESIS (3-0-0)**

**Introduction to synthesis Problems**

Formulation of State synthesis Problems

Basic Impedance Synthesis Problems, LC and RC impedances

Reciprocal and Synthesis

Transfer Function and ladder networks

Properties of second –order systems

Second-order Low Pass Networks

Second-order Band Pass Networks

Second-order High Pass Networks

Approximations, LP, HP, BP

Band-stop functions and realizations

Reciprocal transfer functions synthesis

Non-reciprocal transfer function s synthesis

T.F. Synthesis with prescribed loading

Scattering matrix synthesis

**Text Books/ References Books :**

1. ”Network Analysis and synthesis: A Modern systems Theory Approach:, Enderson et al, B.D.O., Prentice Hall, Inc. Englewood cliffs, New Jersey.
2. “Passive and active Network Analysis and synthesis”, Budak Aram, Houghtnn Miffin Co., Boston.
3. “Network Analysis & Synthesis – A Modern System Theory Approach”, Anderson et al, B.D.O, Prentice Hall of India.

**EE 1706-P SWITCHGEAR & PROTECTION LAB (0-0-3)**

**List of Experiments:**

* Study of protective relays and their working.
* To study the function of Buchholz relay.
* To draw the characteristics curves of percentage biased differential relay for various current setting and bias setting.
* To study the characteristic feature of inverse time over-current relay.
* Study of digital distance relay.
* Study of various types of switchgears.
* Study of different types of faults occurring in Transmission Network.
* Study of various types of Protection Systems of Power System.
* Study of different types of ELECTROMECHNICAL AND Static Relays.
* Study of different types of Circuit Breakers.
* Testing and application of Circuit Breakers.
* Study of different types of faults occurring in Circuit Breakers.
* Fault classification using MATLAB.

**EE1703 POWER SYSTEM PROTECTION & SWITCHGEAR (3-0-0)**

**Protection**

Importance of protective relaying in Power System, Fundamental requirements of a good protection Scheme; primary and Back-up Relaying;

**Classification of Relays**

Constructional- Electromechanical and Static Relays, Over-current, Directional, Differential, Distance Relays, etc. and their principles and applications.

Current Trend in Protective Relaying

## Microprocessor and PC based Relaying

**Switchgear**

Classification of Switchgear, Fault Analysis, Symmetrical Faults on a Synchronous machine, Fault clearing process , Arcing phenomena and principle of arc interruption, AC and DC circuit breakers, Different types of Circuit Breakers and their constructional features, Testing and Selection of Circuit Breakers.

**Breakdown in gases**

Mechanism of breakdown in gases, various related ionization processes, Townsend’s

And steamer theories, pastern’s law, Breakdown in Non-uniform fields; Effect of wave

Shape of impressed voltage on the breakdown strength, breakdown of sphere gape and rod

Gap;

## Breakdown in liquid and solids

Mechanisms of breakdown in liquid, suspended particle, suspended water

Cavitations and bubble and electronic breakdown theories; mechanisms of breakdown in

Solids; Intrinsic electro-mechanical, erosion, surface, thermal and streamer; relation between

Electric strength of solids and time, intrinsic breakdown strength;

## Impulse Generator

Specification of an impulse voltage wave, standard impulse, reasons for adopting the

Particular shape, Analysis and control of simple circuit of impulse generator; multi-stage

Impulse generator (Marks circuit) circuit working

Earthling and tripping; Techniques to observe wave front on C. R. O

## Generation of High Voltage

Methods of generation of power frequency, high voltage cascade transformers and

Resonance methods, generation of high voltage DC, voltage stabilization, Tesla coil.

## Measurement of high voltage

Potential dividers-resistive, capacitive and mixed dividers for high voltage, sphere

Gap, construction, mounting, effect of nearby earthed objects, humidity and atmospheric

Conditions, effect of irradiation and polarity; Electrostatic volt meter-principles and

Classification, constructional details of an absolute electrostatic voltmeter; oscilloscopes and

Their applications in high voltage measurement.

## High voltage testing

Measurement of insulation resistance of cables; wet and dry flashover test of insulators, testing of Simulated polluted conditions; testing of transformers and rotating machines; measurement of breakdown strength of oil; basic techniques of non- destructive testing of insulators; measurement of loss angle, high voltage schering bridge and discharge measurement techniques.

**Text Books/ References Books :**

1. “Fundamentals of Power System Protection”, Paithankar, Y.G., Prentice Hall of India.
2. “Power System Protection & Switchgear”, B.Rajendranath & M. Chanda, New Age International

**B.TECH COURSE STRUCTURE**

**ELECTRICAL & ELCTRONICS ENGINEERING**

**8th SEMESTER**

**RANCHI UNIVERSITY, RANCHI**

**EE 1801 HIGH VOLTAGE ENGINEERING (3-0-0) (3-0-0)**

Breakdown in gases

Mechanism of breakdown in gases, various related ionization processes, Townsend’s

And steamer theories, pastern’s law, Breakdown in Non-uniform fields; Effect of wave

Shape of impressed voltage on the breakdown strength, breakdown of sphere gap and rod

Gap;

## Breakdown in liquids and solids

Mechanisms of breakdown in liquid, suspended particle, suspended water

Cavitations and bubbles and electronic breakdown theories; mechanisms of breakdown in

Solids; Intrinsic electro-mechanical, erosion, surface, thermal and streamer; relation between

Electric strength of solids and time, intrinsic breakdown strength;

## Impulse Generator

Specification of an impulse voltage wave, standard impulse, reasons for adopting the

Particular shape, Analysis and control of simple circuit of impulse generator; multi-stage

Impulse generator (Marks circuit) circuit working

Earthling and tripping; Techniques to observe wave front on C. R. O

## Generation of High Voltage

Methods of generation of power frequency, high voltage cascade transformers and

Resonance methods, generation of high voltage DC, voltage stabilization, Tesla coil.

## Measurement of high voltage

Potential dividers-resistive, capacitive and mixed dividers for high voltage, sphere

Gap, construction, mounting, effect of nearby earthed objects, humidity and atmospheric

conditions, effect of irradiation and polarity; Electrostatic volt meter-principles and

classification, constructional details of an absolute electrostatic voltmeter; oscilloscopes and

their applications in high voltage measurement.

## High voltage testing

Measurement of insulation resistance of cables; wet and dry flashover test of insulators, testing of insulators in simulated polluted conditions; testing of transformers and rotating machines; measurement of breakdown strength of oil; basic techniques of non- destructive testing of insulators; measurement of loss angle, high voltage schering bridge and discharge measurement techniques.

**EC 1802 DIGITAL SIGNAL PROCESSING** (3-0-0)

Sampling and data reconstruction process, Z-transforms;

Discrete linear systems; Frequency domain design of digital filters;

Quantization effects in digital filters;

Discrete fourier transform and FFT algorithms.

High speed convolution and its applications to digital filtering; Multi-rate filtering;

**Text Books/ References Books :**

* Rabiner,L. R. & Gold.,”theory and application of Digital Signal Processing”,

Prentice Hall, 1989.

* Openheim & Schafer, “Digital Signal Processing”, Prentice Hall, 1995
* “Theory and Application of Digital Signal Processing”, Rabiner, L.R. & Gold B, Prentice Hall
* “Digital Signal Processing”, Openheim & Schafer, Prentice Hall

**OPEN ELECTIVE - I**

**7th SEMESTER**

**HS 2721 ENTERPRISE RESOURSE MANAGEMENT**

**Module I**

**Manufacturing Industry – Management Characteristics and Information Requirements**

Industry classification, Product/Market/Process Characteristics, Manufacturing planning and control techniques, ERP Concept & Evaluation History: MRP-I, MRP – II, ERP. Information Technology Advancement: Client server technology, RDBMS.

**Module II**

**Sales, Purchase & Inventory Control, Concepts**

Classification/coding of material & finished goods, sales enquiry, quotation, order, invoicing, delivery, finished good valuation, purchase requisition, enquiry, supplier quotation, purchase order, Material receipt, Material issues, methods of issue valuation (FIFO/LIFO/Weighted Average Cost/Std. Cost), Returns from operations, Returns to supplies, Stock Adjustment, Physical Stock verification, ABC analysis. Lot and Location control, Replenishment order control (safety stocks, report point, economic order quantity).

**Module III**

**Manufacturing**

Product configuration, Bill of material, Master Production Scheduling, Material Requirement planning, Capacity Requirement Planning, Loading and Scheduling. An overview of man power planning and customer manufacturing planning.

**Module IV**

**Financial & Cost Accounting**

Basic accounting principles, Day book-Cash, Bank, Journal, Purchase and Sales. Ledgers-general, Supplier, Customer, Advances etc. Bank Reconciliation, Trial Balance, Profit & Loss/Income & Expenditure account and Balance Sheet. Fixed assets and depreciation. Budgeting – Revenue, Capital Cash, Cost Elements-Direct material, Direct Labour, Direct Expenses and Overheads, Margin at costing and Break even analysis, Standard Costing, Activity Based Costing.

**Module V**

**Introduction to A Typical Software**

Overview of ERT modules and tools of a software.

**Module VI**

**Distribution Module**

Module architecture - an overview, Item data, Purchase ordering/control, Sales ordering/control, Replenishment order control, Electronic Data Interchange.

**Module VII**

**Manufacturing Module**

Module architecture – an overview, Capacity Requirement, Planning, Engineering change control, Engineering data Management, Master Production Scheduling, Materials Requirement Planning, Product Classification/configuration, Production planning/control, Repetitive Manufacturing.

**Module VIII**

**Finance Module**

Module architecture – an overview, Accounts payable, Account receivable, General ledger, Cost allocation, Cash Management, Activity based costing, fixed assets, Financial budgeting system.

**Text Books/Reference Books**

* “Material Requirement Planning, the new Way in Production and Inventory Management”. McGraw Hill book company, New Delhi, 1975.
* BaaN Student Manuals, BaaN Education Centre, Hyderabad, 1996.

**CS 2721 E-COMMERCE, STRATEGIC IT**

**Module I**

**Element of E-commerce**: Doing business on the internet. The scope of internet and the web, to reach customers. Benefits of E-commerce market.

**Module II**

**E-business Models and Markets:** E-business Models, E-business markets. Traditional build approach and vendors, online sales channels, Advantages of outsourcing an infrastructure to an ECIP.

**Module III**

**E-commerce website development:** Web site server, Developing a commerce site, Building the site, implementation.

**Module IV**

**Building Shopping Cart Application**: A shopping cart scenario, A customer Servlet, A Real World Application Model, Loose component coupling.

**Module V**

**Mobile E-commerce:** Wireless industry standards, wireless communication platforms for LANs, wireless WANs, Faculties for wireless Environment, Concerns for Mobile Enterprise.

**Module VI**

**Security Issue:** Security Solution: Symmetric and Asymmetric Cryptosystems, RSA, DES and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronics cash over internet, Internet Security.

**Module VII**

**Electronics Payments Technology:** Issue, Smart Cards, Digital Currencies.

**Text Books/Reference Books**

1. Electronics Commerce – Pete Loshin & John, Vacca – Publication
2. Electronics Commerce from vision to fulfillment - AWAD, PHI Publication
3. Electronics Commerce By – R. Geol – New Age International Publication
4. E-Commerce – T.N. Chhalra & R.K. Suri - Dhenpatrai

**HS 2722 TECHNOLOGY MANAGEMENT**

**Module I**

Definition-scope-components, History of technology developments-Issues in managing new technology, Life cycle approach to technology management.

**Module II**

Approaches to forecasting, Technology performance parameters. Use of Experts in technology forecasting, planning technological process, Morphological analysis of a Technology system.

**Module III**

Techno-Economic feasibility study, Application of multi-criteria decision making techniques in technologies evaluation and selection-AHP, fuzzy AHP.

**Module IV**

Modes of global technology transfer-Technology–Human Interface-Organization structures and Technology Implementation issues in new technology.

**Module V**

Introduction to IPR Act, effectiveness and management of patents, Trademarks and copy rights.

**Text Books/Reference Books:**

1. Handbook of Technology Management ,Gerard H.Gaynor , McGraw-Hill.
2. “Forecasting and Management of Technology”,Alan L. Porter, A. Thomas Roper, Thomas Wimason , Jery Banks,Fredrick A. Rossini.

**CS 2722 SOFTWARE TECHNOLOGY**

**Module I**

White-box and black box testing, Test Case Generation, Integration Testing Bottom-up & Top-down Testing, System Testing, Foundation Testing, Performance Testing, Acceptance Testing, Installation Testing, Theoretical Foundation of Testing, Formal Verification, Test Tools.

**Module II**

Module Introduction, objectives of Usability, How to approach usability, designing with usability in mind, Measuring usability, Guidelines for user interface design.

**Module III**

Software Reliability: Reliability, Hazard, Repair and Availability, Steady-state Availability, Estimation of residual errors, Reliability Models, Software Complexity.

**Module IV**

Issues in Project Management – Management Functions, Software Project Management Plan, Software Management Structures, Personal Productivity, Software Project Complexity.

**Module V**

Software Matrix – Basic Considerations Size Oriented, Function Point Oriented, Software cost estimation techniques. Algorithmic cost modeling. The COCOMO Model.

**Module VI**

Software project scheduling and the establishment of relationship among the different tasks. Tasks, dependencies and conflict resolution. Resources management and allocation.

**Text Books/Reference Books**

1. Software Quality Management, John D. Cooper, Matthew J. Fisher
2. Software Quality Management, M. Ross
3. Software Engineering Management, John C. Munson
4. Software Engineering Project Management, R.Chopra, S.K. Kataria & Son
5. Software Engineering: - Sajan Mathew, S. Chand

**HS 2724 KNOWLEDGE MANAGEMENT**

**Module I**

Knowledge society-from data to information to knowledge- Drivers of knowledge management-Intellectual capital- KM and learning organizations- case studies.

**Module II**

Strategic alignment- creating awareness- articulation- Evaluation and strategic alignment -Infrastructural development and deployment- Leadership, measurement and refinement- Role

of CKO.

**Module III**

Analyzing business environment-knowledge audit and analysis – designing KM team – creating KM system blue print- implementation- capture –store and sharing.

**Module IV**

Technology components- Intranet and Groupware solutions- tools for collaborative intelligence, Social networking-package choices- knowledge security.

**Module V**

Integrating with web -based and internal operational & support systems- change management- reward systems- continuous improvement- case studies.

**Text Books/ Reference Books:**

1. “HBR on Knowledge Management”, Peter Drucker, Harvard University Press.
2. “Knowledge Management”, Fernandez, Gonzalez & Sabherwal, Pearson.

**PROFESSIONAL ELECTIVE - I**

**7th SEMESTER**

**EE 2721 ELECTRIC DRIVES**

**Module-I**

Study of Motor Drives: Electrical Drives, Advantages of Electrical Drives, Electrical Motors, Power Modulators, Choice of electrical Drives, Fundamentals of Torque Equations, Speed Torque Conventions and Multi-quadrant Operation, Equivalent Values of Drive Parameters, Components of Load Torques, Nature and Classification of Load Torques, Calculation of Time and Energy Loss in Transient Operations, Steady State Stability, Load Equalization, Control of Electrical Drives, Thermal Model of Motor for Heating and Cooling, Classes of Motor Duty, Determination of Motor Rating.

**Module-II**

Steady State Performance of DC/AC Drives: Closed Loop Control of Drives, DC Motors and their Performances, Starting, Braking, Transient Analysis, Speed Control, Methods of Armature Voltage Control, Transformer and Uncontrolled Rectifier Control, Controlled Rectifier Fed DC Drives, Chopper Controlled DC Drives.

Induction Motor Drives: Speed Control, Pole Changing, Pole Amplitude Modulation, Stator Voltage Control, Variable Frequency Control from Voltage Source, Voltage Source Inverter Control, Variable Frequency Control from Current Source, Current Source Inverter Control, Current Regulated Voltage Source Inverter Control, Rotor Resistance Control, Slip Power Recovery.Synchronous Motor Drives: Synchronous Motor Variable Speed Drives, Variable Frequency Control of Multiple Synchronous Motors.

**Module-III**

Traction Drives: Nature of Traction Load, Calculation of Traction Drive Ratings and Energy Consumption, Tractive Effort and Drive Ratings, Specific Energy Consumption, Maximum Allowable Tractive Effort, Conventional DC and AC Traction Drives, 25 kV AC Traction using Semiconductor Converter Controlled DC Motors, DC Traction employing Polyphase AC Motors, AC Traction employing Polyphase AC Motors.

Drives for Specific Applications: Drive Considerations for Textile Mills, Steel Rolling Mills, Cranes and Hoist Drives, Cement Mills, Sugar Mills, Machine Tools, Paper Mills, Coal Mines, Centrifugal Pumps.

Microprocessors and Control of Electrical Drives: Dedicated Hardware Systems versus Microprocessor Control, Application Areas and Functions of Microprocessors in Drive Technology, Control of DC Drives using Microprocessors.

**Text Books/ Reference Book:**

1. Electric Drives-Concepts and Applications- Vedam Subramanyam, Tata McGraw Hill Publication.
2. Modern Power Electronics and AC drives- B.K.Bose, Pearson Education.

**EE 2722 SPECIAL ELECTRICAL MACHINES**

**MODULE-I**

**Three winding transformer:** Unbalanced operation of three phase transformer.Switching transient and mechanical forces.Electro-mechanical energy conversion.Energy and co-energy.Toque/Force in a single excited and multiple excited electromechanical systems.Introduction to generalized machine theory.

**MODULE-II**

**Windings:** Three phase windings for rotating machines,Windings for D.C Machines.

**MODULE-III**

**D.C machines:** Flux and mmf waves ,Commutation.Ward-Leonard method,Braking,Parallel operation of generators,dynamic equations.Block diagram and transfer functions.Speed control and braking

**MODULE-IV**

**Introducton machines:**Machine equations stationary rederence frame (d-q axis model),dynamic and steady state performance.Speed control methods.

**MODULE-V**

**Synchronous Machines:**Winding inductance,Machine equation in rotor reference frame(d-q axis model).Sudden Three phase short circuit and transient circuit model.Steady state equations.Synchronous machine dynamics.

**MODULE-VI**

**Special mahines:**Stepper motor,Swiched reluctance motor and Brushless D.C motors.

**Text Books/References Books:**

1. Performance and design of Alternating current machines,CBS by M.G Say.
2. Electrical Machine by S.K Sen.

**EE 2723 HIGH VOLTAGE DC TRANSMISSION**

**MODULE-I**

**HVDC Transmission**: Introduction, Equipment required for HVDC Systems, Comparison of AC and DC Transmission, Limitations of HVDC Transmission Lines, Reliability of HVDC Systems, Comparison of HVDC Link with EHVAC Link, HVDC-VSC Transmission Systems.

**HVDC Converters**: Introduction, HVDC Converter Valves and Valve Assembly, HVDC-Voltage Source Converters: Principle and Operation, 3-phase 6-pulse Converters using SCRs or Thyristors, 12-pulse Bridge Converters.

**6-Pulse Converter Operation and Analysis**: Introduction, Conduction Sequence in 6-pulse Converter Configuration, The Ideal Commutation Process without Gate Control, DC Output Voltage, Gate Control (Phase Control) of Valves, Analysis of Voltage Waveforms with Overlap Angle (μ), Complete Characteristics of Converter as Rectifier/Inverter, Analysis of 12-pulse Converter, Power Flow in HVDC Links, Operation and Analysis of VSC Converters

**MODULE-II**

**Control of HVDC Converter and Systems**: Mechanism of AC Power Transmission, Principle of Control, Necessity of Control in case of a DC link, Rectifier Control, Compounding of Rectifiers, Power Reversal in a DC Link, Voltage Dependent Current Order Limit (VDCOL)-Characteristics of the Converter, System Control Hierarchy and Basic Philosophy, Inverter Extinction Angle Control (EAG), Pulse Phase Control, Starting and Stopping of a DC Link, Constant Power Control, Control Systems for HVDC Converters, Inverter Operation Problems, Control of VSC Converters.

**Harmonics in HVDC Systems**: Importance of Harmonic Study, Generation of Harmonics by Converters, Characteristic Harmonics on the DC Side, Characteristic Current Harmonics, Characteristic variations of Harmonic Currents with Variation of α & μ, Effect of Control modes on Harmonics, Non-Characteristic Harmonics, Harmonics in VSC Converters.

**MODULE-III**

**Harmonic Suppression in HVDC System-Filters**: Harmonic Model & Equivalent Circuit, Use of Filters, Filter Configurations, Design of a Band-Pass Filter, Design of High-Pass Filters, Protection of Filters, DC Filters.

**Faults and Protection Schemes in HVDC Systems**: Nature and Types of Faults, Faults on AC Side of Converter Stations, Converter Faults, Faults on DC Side of the System, Protection against Over Currents/ Over Voltages, Protection of Filter Units.

**Multi-terminal HVDC Systems** : Types of Multi-terminal (MTDC) Systems, Parallel Operation Aspects of MTDC, Paralleling (Disconnecting) of Units or Converter, Control of Power in MTDC, VSC-Multi-level DC Systems.

**Text Books/ Reference Book**:

1. “HVDC Transmission” By S. Kamakshaiah & V. Kamaraju, TMH Education Private Ltd., New Delhi.
2. “HVDC Power Transmissions Systems: Technology & Systems Interaction”, K.R. Padiyar, New Age Publication.

**EE 2724 POWER SYSTEM OPERATION & CONTROL**

**Module – I**

Fundamentals of Power System

Introduction, Single Subscript Notation, Double Subscript Notation, Power in Single Phase AC Circuit, Complex Power, Power Triangle, Direction of Power Flow, Voltage and Current in Balanced Three Phase Circuits, Power in Balanced Three Phase Circuits, Per- Unit Quantities, Changing the Base in Per- Unit Quantities, Node Equations, Single Line Diagram, Impedance and Reactance Diagrams.

Admittance Models & Network Calculations

Branch and Node Admittances, Mutually Coupled Branches in Y bus, An Equivalent Admittance Network, Modification of Y bus, Network Incidence Matrix and Y bus.

Power Flow Solutions

Power-Flow Problem, Gauss-Seidal Method, Newton-Raphson Method, Newton-Raphson Method, Power-Flow Studies in System Design and Operation, Regulating Transformers, Decoupled Method.

**Module – II**

Economic Operation of Power System

Distribution of Load within a Plant, Distribution of Load between Plants, The Transmission-Loss Equation, An interpretation of Transformation **C**, Classical Economic Dispatch with Losses, Automatic Generation Control, Unit Commitment, Solving the Unit Commitment Problems.

Load Frequency Control, Control Area Concept

Automatic Load-Frequency Control of Single Area Systems: Speed-Governing System, Hydraulic Valve Actuator, Turbine-Generator Response, Static Performance of Speed Governor, Closing ALFC Loop, Concept of Control Area, Static Response of Primary ALFC Loop, Dynamic Response of ALFC Loop, Physical Interpretation of Results, Secondary (“Reset”) ALFC Loop, Economic Dispatch Control.

**Module – III**

Two Area System

ALFC of Multi-Control-Area Systems: Two Area Systems, Modeling Tie-Line, Block Diagram Representation of Two Area System, Mechanical Analog of Two Area System, Dynamic Response of Two Area System, Static System Response, Tie-Line Bias Control of Multi-area Systems.

Power System Stability

Stability Problem, Rotor Dynamics and Swing Equation, Power-Angle Equation, Synchronizing Power Coefficients, Equal- Area Criterion for Stability, Multi-machine Stability Studies: Classical Representation, Step-By-Step Solution of the Swing Curve, Computer Programmes for Transient Stability Studies.

**Text Books/ Reference Books:**

1. Power System Analysis- John. J. Grainger & W. D. Stevenson, Jr.,TMH Publications.
2. An Introduction to Electric Energy System Theory- O. I. Elgerd, TMH Pub.
3. Power System Analysis- Hadi Saadat, TMH Publications.
4. Power System Analysis Operation and Control- A. Chakrabarti and S. Haldar, PHI Publications.

**EE 2725 NON CONVENTIONAL ENERGY SOURCES**

**Module I**

**Introduction:** Fossil fuel based systems, Impact of fossil fuel based systems, Non conventional energy – seasonal variations and availability, Renewable energy – sources and features

**Module II**

**Solar Photovoltaic systems**: Operating principle, Photovoltaic cell concepts, Cell, module, array, Series and parallel connections, Maximum power point tracking, Applications, Battery charging, Pumping, Lighting, Peltier cooling Solar processes and spectral composition of solar radiation; Radiation flux at the Earth’s surface. Solar collectors. Types and performance characteristics. Applications

**Wind Energy:** Wind energy conversion; types of converters, aerodynamics of wind rotors, “**power ~ speed and torque ~ speed”** characteristics of wind turbines, wind turbine control systems; conversion to electrical power: grid connected and self excited induction generator operation, constant voltage and constant frequency generation with power electronic control, Characteristics of wind power plant. Applications:

**Module III**

**Biomass Power:**Operating principle, Combustion and fermentation, Anaerobic digester. Wood gassifier, Pyrolysis, Applications, Bio gas, Wood stoves, Bio diesel, Combustion engine. Application,

**Hybrid Systems**

Need for Hybrid Systems, Range and type of Hybrid systems, Case studies of Diesel-PV, Wind-PV, Microhydel-PV, Biomass-Diesel systems, electric and hybrid electric vehicles

**Module IV**

**Small Hydroplants(SHP):**Selection of sites,energy/Power equations.

**Tidal Energy:**Wave power conversion devices,Ocean thermal energy conversion.

**Magneto Hydro Dynamics(MHD):**Principal of operation-introduction.

**Geo Thermal Energy:**Hot springs,power plants.

**Text Books/ Reference Books:**

1. Renewable Energy Sources and Emerging Technologies, D. P. Kothari, K. C. Singal, R. Ranjan, Prentice Hall of India, New Delhi.
2. Non-Conventional Energy Resources, B.H.Khan, Tata McGrawHill.
3. Wind Electrical Systems, S. N. Bhadra, D. Kastha, S. Banerjee, Oxford Univ. Press, New Delhi.
4. Renewable Energy Sources and Their Environmental Impact, S. A. Abbasi, N. Abbasi, Prentice Hall of India, New Delhi.

**OPEN ELECTIVE - II**

**8th SEMESTER**

**CS – 2831 IT IN MARKETING MANAGEMENT**

**Module I**

Core concepts of marketing -Need, Want & Demand, Product, value and satisfaction, Marketing & Markets. Production concept, Product concept, Selling concept, Marketing concept etc.

**Module II**

Macro and Micro factors in the marketing environment, Macro features like demography, economic features, socio technological environments etc. Micro features like supplier’s competitors etc.

**Module III**

A model for consumer buying Behaviour, factors influencing consumer behavior, buying decision process- Buying roles & stages in buying.

Demand Estimation: flow to measure market demand - Estimating market size, share, potential, Estimating current and future demands.

**Module IV**

Segmentation: Approach. Patterns and Segmentation procedures, basis for segmenting consumer market - Targeting - positioning.

**Module V**

New product Development - Idea generation, Idea screening concept development and using, Product development. market testing etc.

**Module VI**

Marketing strategies in the various stages of the PLC (Product Life Cycle) Strategies to be followed in the introduction, growth, maturity and decline stages.

Market Planning Process - stages. - The nature and contents of marketing plan (introductory aspects).

Text Books/Reference Books:

1. Marketing management,Grover & T.N Chhalsa,Dhanpatrai.
2. Marketing management,K. Philip & Kellv,PHI.
3. Marketing management,Kelvin,Hartley,Berkowatz,Rudelius,Tata McGraw Hill(New Delhi)

**HS 2832 HUMAN VALUES**

The objectives of the course is an exploration of human values which go into making a ‘good’ human being, a ‘good’ human society and a ‘good’ life. The context is the work life and the personal life of modern Indian professionals.

**Course Structure**

1. The value-crisis in the contemporary Indian Society.
2. The nature of values: The value spectrum for a ‘good’ life.
3. The Indian system of values.
4. Material development and its values: the challenge of science and technology.
5. Psychological values: integrated personality; mental health.
6. Societal values: the modern search for a ‘good’ society; justice, democracy, rule of law; values in the Indian constitution.
7. Aesthetic values: perception and enjoyment of beauty.
8. Moral and ethical values; nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.
9. Work ethics; professional ethics, commitment =, valuing time.
10. Spiritual values; different concepts; secular spirituality.
11. Relative and absolute values.
12. Human values; humanism, human rights; freedom creatively, love and wisdom, courage, integrity, honesty, living peacefully, respect for others.
13. Management by values: professional excellence; inter-personal relationship at work place; leadership and term building; caring sharing; conflict resolution and stress management; management power.

**Text Books/Reference Books**

* Code of practice for corporate member; Institute of Engineers 1994
* Human values – professional Ethics, Ritu Soryan- Dhanpat Rai & Co.

**HS 2833 SCIENCE TECHNOLOGY AND SOCIETY**

The course deals with social, human and ethical implications of engineering and technology, with special reference to the Indian situation. Its three main components are:

* Social and Cultural history of technology,
* Social and Human critiques of technology,
* Engineering Ethics and Professional Ethics,

**Course Structure**:

**Module I**

1. Science, Technology and Engineering, a tool for social and professional activities.
2. Technology growth vs social, economic and cultural growth.
3. Ancient, medieval and modern technology/Industrial revolution and its impact.

**Module II**

1. Social and Human critiques of technology.
2. Rapid technological growth and depletion of resources, sustainable development.

**Module III**

1. Energy crisis; renewable energy recourses.
2. Environmental degradation and pollution. Eco-friendly technologies.

Environmental regulation.

**Module IV**

1. Technology and the arms race. The nuclear threat.
2. Appropriate technology movement.
3. Technology and the developing nations. Problems of technology transfer.

**Module V**

1. Human operator in engineering projects and industries. Problems of man machine interaction.
2. Industrial hazards and safety. Safety regulations.

**Module VI**

1. Politics & technology: Authoritarian vs democratic central of technology, social and ethical audit of industrial organizations.
2. Engineering profession – Ethical issues in engineering practice, business demands and professional ideals, code of professional ethics.

**CS – 2832 IT IN HUMAN RESOURCE MANAGEMENT**

**Module I**

Introduction, meaning, significance of HRM. Environmental influence, HRM-mission, objective, strategy and tactics, evolution and development.

**Module II**

HR Planning: integrated strategic planning, process of HR and control review mechanism, Recruitment: Objective, strategies sources, techniques, process and assessment. Selection, placement and Induction: Procedures.

**Module III**

Development: Concept, significance, framework, functions. Performance Appraisal: Concept, objectives, system, and methods feed back and counseling. Employee and Executive Training and Development: Essential ingredients of T &D, Training procedures.

**Module IV**

Techniques evaluation and feedback. Career Planning & Development-Planning and development counseling.

**Module V**

Job Evaluation: Concept, methods, advantages & disadvantages. Reward systems : Terminologies, role of wage differentiation, mechanism of wage and salary Administration; Executive compensation issues, fringe benefits.

**Module VI**

Introduction, objective, conditions for Healthy Industrial Relations; Trade unions: functions, role, future. Grievance procedure and Disciplinary procedures. Collective Bargaining. Industrial conflicts: definition, reasons, resolution machinery. Workers participation in Management.

**Text Books/ Reference Books**

1. “Human resources Management”, Cary dessler, Prentice Hall of India.
2. “Human resoursces & personal Management”, K. Ashwathappa,Tata McGraw Hill.
3. “Human resource Management”,T.N. Chhalos,Dhanpatrai.

**CS – 2833 IT IN FINANCIAL MANAGEMENT**

**Module I**

Financial management-Concepts- scope- Need- Time value of money- Valuation concepts—Recent development in the domain of financial management.

**Module II**

Financial statement analysis- Break even analysis –Employment of these concepts for managerial decisions.

**Module III**

Capital Budgeting — cost of capital concepts capital structure- designing capital structure- Capital structure theories. NI, NOI, MM approach -New Financial Instruments .

**Module IV**

Financing decisions – operating, financial combined leverages- capital markets, - term loan financing-other types like leasing, hire purchase. - Dividend Theories & Policies.

**Module V**

Working capital management-planning-financing- inventory, cash, receivables management.

**Text Books/ Reference Books:**

1. “ Financial Management”, Khan. M.Y, Jain.P.K, Tata Mc Graw Hill.
2. “ Financial Management Principles and applications”, ArthurJ.Keown, Pearson.
3. “ Fundamentals of Financial Management”, James C.Vanhorne ,JohnM,Wachowicz, Pearson Education.

**PROFESSIONAL ELECTIVE - II**

**8th SEMESTER**

**EE 2821 INDUSTRIAL AUTOMATION AND CONTROL**

(**Prerequisite: Control System Engineering – I**)

**Module I :**

**Process Control: Introduction:** Process Definition, Feedback Control, PID Control, Multivariable Control.

**PID Controller Tuning:** Introduction, Zeigler-Nichols Tuning Method (Based on Ultimate Gain and Period, and Process Reaction Curve), Digital PID Controllers.

**Module II**

**Special Control Structures:** Cascade Control, Feedforward Control, Feedforward-Feedback Control Configuration, Ratio Control, Selective Control, Adaptive Control, Adaptive Control Configuration.

**Actuators:** Introduction, Pneumatic Actuation, Hydraulic Actuation, Electric Actuation, Motor Actuators and Control Valves.

**Module III**

**Industrial Automation: Programmable Logic Controllers:** Introduction, Principles of operation, Architecture, Programming (Programming Languages, Ladder Diagram, Boolean Mnemonics)

**Distributed Control:** Distributed vs. Centralized, Advantages, Functional Requirements, System Architecture, Distributed Control Systems (DCS), Communication options in DCS.

**Real-time Programming:** Multi-tasking, Task Management, Inter-task Communication, Real-time Operating System.

**Text Books/ Reference Books:**

1. “Computer-Based Industrial Control”, Krishna Kant, PHI.
2. “Digital Control and State Variable Methods” M. Gopal, Tata McGraw Hill.
3. Process Control: Principles and Applications, Surekha Bhanot, Oxford university Press.
4. “Principles and Practice of Automatic Process Control”, Smith Carlos and Corripio, John Wiley & Sons.

**EE 2822 NEURAL NETWORK AND FUZZY SYSTEM**

**MODULE-I**

**Introduction**: Soft Computing Constituents and Conventional Artificial Intelligence, Neuro-Fuzzy and Soft Computing Characteristics.

**Fuzzy Sets**: Introduction, Basic Definitions and Terminology, Set Theoretic Operations, MF Formulation and Parameterization.

**Fuzzy Rules & Fuzzy Reasoning**: Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning.

**Fuzzy Inference Systems**: Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Other Considerations.

**MODULE-II**

**Neural Networks**: Neuron Abstraction, Neuron Signal Functions, Mathematical Preliminaries, Neural Networks Defined, Architectures: Feed forward and Feedback, Salient Properties and Application Domains of Neural Networks, Multi-layered Network Architectures, Back-propagation Learning Algorithm, Practical Considerations in Implementing the BP Algorithm, Structure Growing Algorithms, Universal Function Approximation and Neural Networks, Applications of Feed Forward Neural Networks, Reinforcement Learning, Radial Basis Function Networks, Regularization Theory Route to RBFNs, Generalized Radial Basis Function Network, Learning in RBFNs, Associative Learning, Hopfield Network, Content Addressable Memory, Bidirectional Associative Memory, Self Organizing Feature Maps, Applications of the Self Organizing Map.

**MODULE-III**

**Regression & Optimization**: System Identification: an Introduction, Least Squares Estimator, Geometric Interpretation of LSE, Recursive Least Squares Estimator.

**Derivative-Free Optimization**: Genetic Algorithms, Simulated Annealing, random Search, Downhill Simplex Search.

**Adaptive Neuro-Fuzzy Inference Systems (ANFIS)**: ANFIS Architecture, Hybrid Learning Algorithm.

**Text Books/ Reference Book**:

1. “Neuro-Fuzzy and Soft Computing”, J.-S.R.Jang, C.-T.Sun & E. Mizutani, PHI.
2. “Neural Networks: A Classroom Approach” , Saish Kumar, TMH Education.
3. “Neural Networks Fuzzy Logic & Genetic Algorithms; Synthesis & Applications,S.Rajasekaran & G.A. VijayaLaxmi Pai, Prentice Hall, India.
4. Principal of Soft Computing, S. N. Sivanandan & S. N. Deepa, Wiley India.

**EE 2823 UTILIZATION OF ELECTRICAL POWER**

**MODULE-I**

**Electrical Drives:** Review of motor performance characteristics,mechanical features,different types of industrial loads,standard rating,selection of motors,rating for different duty cycles,efficient operation of motors.

**MODULE-II**

Electric Heatingand its application ,various laws governing electric heating.Electric welding:different types,equipment used.

**MODULE-III**

**Illumination:**Photometric terms and laws,types of lamps,principle of lighting calculations.Design of residential/public buildings,road lightining.

**MODULE-IV**

**Electric traction:**Electric and diesel traction systems ,speed-time curves,traction motors,speed control and methods of brakings.

**MODULE-V**

**Economic Aspects:**Economic choice of equipment,initial cost and efficiency,reduction of energy costs,cost renewals,effects of power factor,costing of electrical energy.

**MODULE-VI**

**Electricity tariff**

**Text Books/References Books:**

1. Electric Drives , W. Leonhard.
2. Utilization of Electrical Energy , E.O. Taylor.
3. Generation ,Distribution and Utilization of Electrical Energy ,C.L. Wadhwa.

**EE 2824 ADVANCED CONTROL SYSTEMS**

**Module-I : Discrete - Time Control Systems** :

Introduction: Discrete Time Control Systems and Continuous Time Control Systems, Sampling Process.

Digital Control Systems: Sample and Hold, Analog to digital conversion, Digital to analog conversion.

The Z-transform: Discrete-Time Signals, The Z-transform, Z-transform of Elementary functions, Important properties and Theorms of the Z-transform. The inverse Z-transform, Z-Transform method for solving Difference Equations.

Z-Plane Analysis of Discrete Time Control Systems: Impulse sampling & Data Hold, Reconstruction of Original signals from sampled signals: Sampling theorm, folding, aliasing. Pulse Transfer function: Starred Laplace Transform of the signal involving Both ordinary and starred Laplace Transforms; General procedures for obtaining pulse Transfer functions, Pulse Transfer function of open loop and closed loop systems. Mapping between the s-plane and the z-plane, Stability analysis of closed loop systems in the z-plane: Stability analysis by use of the Bilinear Transformation and Routh stability critgion, Jury stability

**Module -II : State Variable Analysis & Design:**

Introduction: Concepts of State, State Variables and State Model (of continuous time systems): State Model of Linear Systems, State Model for Single-Input-Single-Output Linear Systems, Linearization of the State Equation. State Models for Linear Continuous – Time Systems: State-Space Representation Using Physical Variables, State – space Representation Using Phase Variables, Phase variable formulations for transfer function with poles and zeros, State – space Representation using Canonical Variables, Derivation of Transfer Function for State Model. Diagonalization: Eigenvalues and Eigenvectors, Generalized Eigenvectors. Solution of State Equations: Properties of the State Transition Matrix, Computation of State Transition Matrix, Computation by Techniques Based on the Cayley-Hamilton Theorem, Sylvester’s Expansion theorm. Concepts of Controllability and Observability: Controllability, Observability, Effect of Pole-zero Cancellation in Transfer Function. Pole Placement by State Feedback, Observer Systems. State Variables and Linear Discrete – Time Systems: State Models from Linear Difference Equations/z-transfer Functions, Solution of State Equations (Discrete Case), An Efficient Method of Discretization and Solution, Linear Transformation of State Vector (Discrete-Time Case), Derivation of z-Transfer Function from Discrete-Time State Model.

**Module -III : Nonlinear Systems :**

Introduction : Behaviour of Non linear Systems, Investigation of nonlinear systems.

Common Physical Non Linearities: Saturation, Friction, Backlash, Relay, Multivariable Nonlinearity.

The Phase Plane Method: Basic Concepts, Singular Points: Nodal Point, Saddle Point, Focus Point, Centre or Vortex Point, Stability of Non Linear Systems: Limit Cycles, Construction of Phase Trajectories: Construction by Analytical Method, Construction by Graphical Methods. The Describing Function Method: Basic Concepts: Derivation of Describing Functions: Dead-zone and Saturation, Relay with Dead-zone and Hysteresis, Backlash. Stability Analysis by Describing Function Method: Relay with Dead Zone, Relay with Hysteresis, Stability Analysis by Gain-phase Plots. Jump Resonance. Liapunov’s Stability Analysis: Introduction, Liapunov’s Stability Critrion: Basic Stability Theores, Liapunov Functions, Instability. Direct Method of Liapunov & the Linear System: Methods of constructing Liapunov functions for Non linear Systems.

**TextBooks/Reference Books :**

1. Discrete-Time Control System, by K.Ogata, 2nd edition, PHI.
2. Control Systems Engineering, by I.J. Nagrath and M.Gopal,New Age International (P) Ltd. Publishers.
3. 3.Control Systems (Principles & Design), by M.Gopal, 3rd Edition, Tata Mc.Graw Hill Publishing Company Ltd.

**CS 2828 COMPUTER NETWORK & DATA COMMUNICATION**

**Module – I**

Overview of Data Communications and Networking.

Physical Layer : Analog and Digital, Analog Signals, Digital Signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals.

Digital Transmission: Line coding, Block coding, Sampling, Transmission mode.

Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals. Multiplexing : FDM , WDM , TDM ,

Transmission Media: Guided Media, Unguided media (wireless)

Circuit switching and Telephone Network: Circuit switching, Telephone network.

**Module –II**

**Data Link Layer**

Error Detection and correction: Types of Errors, Detection, Error Correction

Data Link Control and Protocols:

Flow and Error Control, Stop-and-wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC.

Point-to –Point Access: PPP

Point –to- Point Protocol, PPP Stack,

Multiple Access

Random Access, Controlled Access, Channelization.

Local area Network: Ethernet.

Traditional Ethernet, Fast Ethernet, Gigabit Ethernet. Token bus, token ring

Wireless LANs: IEEE 802.11, Bluetooth virtual circuits: Frame Relay and ATM.

**Module – III**

**Network Layer:**

Host to Host Delivery: Internetworking, addressing and Routing

Network Layer Protocols: ARP, IPV4, ICMP, IPV6 ad ICMPV6

Transport Layer: Process to Process Delivery: UDP; TCP congestion control and Quality of service.

**Application Layer :**

Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW.

**Text Books/ Reference Book:**

1. Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw-Hill.

2. Computer Networks: A. S. Tannenbum, D. Wetherall, Prentice Hall, Imprint of Pearson.

3. Data and Computer Communications: William Stallings, Prentice Hall, Imprint of Pearson.

4. Data communication & Computer Networks: Gupta, Prentice Hall of India.

**PROFESSIONAL ELECTIVE - III**

**8th SEMESTER**

**EC 2824 BIOMEDICAL INSTRUMENTATION**

**Module – I**

**Fundamentals of Biomedical Instrumentation:** Sources of Biomedical Signals, Basic Medical Instrumentation System, Intelligent Medical Instrumentation Systems, PC Based Medical Instrumentation Systems, General Constraints & Regulations of Medical Devices

**Biomedical Signals & Electrodes:** Origin of Bioelectric Signals-Repolarization, Depolarization, Resting Potential Recording Electrodes – Ag-AgCl Electrodes, Electrodes for ECG, EEG, EMG, Microelectrodes, Skin Contact Impedance, Motion Artifacts

**Module – II**

**Physiological Transducers:** Introduction to Physiological Transducers, Classification of Transducers, Pressure Transducers, Transducers for Body Temperature Measurement, Biosensors, Smart Sensors

**Biomedical Recording Systems:** Basic Recording Systems, General Considerations for Signal Conditioners, Biomedical Signal Analysis Techniques, Signal Processing Techniques, Writing Systems: Direct Writing Recorders, Inkjet Recorder, Potentiometric Recorders, Digital Recorders

**Biomedical Recorders:** Electrocardiograph (ECG), Phonocardiograph, Electroencephalograph (EEG), Electromayograph (EMG)

**Module – III**

**Patient Monitoring Systems:** System Concepts, Measurement of Heart Rate, Blood Pressure Measurement, Measurement of Respiration Rate

**Blood Flow meters:** Electromagnetic Blood Flow meter, Ultrasonic Blood Flow meter, NMR Blood Flow meter, Laser-Doppler Blood Flow meter

**Patient Safety:** Electric Shock Hazards, Leakage Currents, Safety Codes for Biomedical Equipment

**Text Books/ Reference Books:**

1. Hand Book of Biomedical Instrumentation- by R.S.Khandpur, Tata McGraw Hill .
2. Biomedical Instrumentation and Measurements- by Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, PHI learning Pvt. Ltd.
3. Introduction to Biomedical Equipment Technology- by Joseph J. Carr, John M. Brown, Pearson Education.

**EE 2825 OPTOELECTRONICS DEVICES & INSTRUMENTATION**

**Module –I**

Wave Optics: Wave properties of light: Propagation, polarization, interference, diffraction, transmission of light through slab and cylindrical waveguides.

Optical Fiber:

Construction of step and graded index fibers, single mode and multimode fibers, loss and dispersion characteristics;

**Module –II**

Fiber optic components: couplers, splicer, polarizer.

Sources and Detectors :

Sources: LED, Lasers-fundamentals, conditions for oscillations, construction and principle of operation of gas and semiconductor, pulsed and continuous type lasers;

Detectors: photodiodes- PN, PIN and APD.

**Module –III**

Optoelectronic Instrumentation

Modulation techniques: intensity, polarization, interference, electro-optic, electromagnetic; Sensing techniques for displacement, pressure, acceleration, flow, current and voltage measurement, Fiber optic gyroscope, Distributed fiber optic sensors- OTDR and OFDR principles.

**Text Books/ Reference Books:**

1. Introduction to Fiber Optics, A. Ghatak and K. Tyagrajan, Cambridge University Press, New Delhi.
2. Optoelectronics: An Introduction , J. Wilson and J.F.B. Hawkes, PHI, New Delhi.
3. Principles of Optical Communications and Optoelectronics , N. Bala Saraswathi and I. Ravi Kumar, Laxmi Publications, New Delhi.
4. Measurement and Instrumentation:Trends and Applications, M.K. Ghosh, S.Sen and S. Mukhopadhyay , Ane Books, New Delhi.
5. Fibre Optics & Optoelectronics, R.P.Khare, Oxford University Press, New Delhi.

**EE 2826 MECHATRONICS**

**Module – I**

* **Sensors and Transduceers:-** Sensors and transducers, Performance terminology, Displacement, position and proximitry, Velocity and motion, Force, Fluid pressure, Liquid flow, Liquid level, Temperature, Light sensors, Selection of sensors, Inputting data by switches.
* **Signal conditioning:-** Signal conditioning, The operational amplifier, Protection, Filtering, Pulse modulation.
* **Digital Signals:-** Digital signals, Analogue and digital signals, digital-to-analogue and analogue-to-digital converters, Multiplexers, Data acquisition, Digital signal processing.
* **Pneumatic and Hydraulic Actuation Systems:-** Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure control valves, Cylinders, Servo and proportional control valves, process control valves, Rotary actuators.

**Module – II**

* **Mechanical Actuation Systems:-** Mechanical systems, Types of motion, Kinematic chains, Cams, GTears, Belt and chain drives, bearings, Mechanical aspects of motor selection.
* **Electrical Actuation Systems:-** Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. motors, A.C. motors, Stepper motors.
* **Basic System Models:-** Mathematical models, Mechanical system building blocks, Electrical system building blocks, Electrical system building blocks, Fluid system building blocks, Thermal system building blocks.

**Module – III:-**

* **System Models:-** Engineering systems, Rotational-translational systems, Electromechanical systems, Electromechanical systems, Linearity, Hydraulic-mechanical systems, Summary, Problems.
* **Closed-loop Controllers:-** Continuous and discrete control processes, Terminology, Two-step mode, Proportional mode, Derivative control, Integral control, PID controller, Digital controllers, Control system performance, Controller tuning, Velocity control, Adaptive control, Summary, Problems.
* **Programmable Logic Controllers:-** Introduction to PLCs, Basic Structure of a PLC, Principles of Operation, PLCs versus Computers, Introduction to Internal Architecture and Hardware Components, PLC Programming, Analog I/O, Selecting a PLC for the Application, Application of PLCs for Control.

**Text Books/ Reference Books:**

1. Mechatronics Electronic Control Systems in Mechanical and Electrical Engg., William Bolton Pearson Publication.
2. Mechatronics Integrated Mechanical Electronic Systems*,* K. P. Ramachandran, G. K. Vijayaraghavan, M. S. Balasundaram, Wiley India Edition.
3. Mechatronics integrated Technologies for Intelligent Machines*,* A. Smaili, F.Mrad, Oxford University Press.

**EC 2827 VLSI DESIGN**

**Module – I**

**Introduction:** Historical Perspective, VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concept of Regularity, Modularity and Locality, VLSI Design Styles, Computer-Aided Design Technology.

**Fabrication of MOSFETs:** Introduction, Fabrication Processes Flow – Basic Concepts, The CMOS n-Well Process, Layout Design Rules, Stick Diagrams, Full-Customs Mask Layout Design.

**MOS Transistor:** The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structure and Operation of MOS Transistor (MOSFET), MOSFET Current-Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitance.

**Module – II**

**MOS Inverters – Static Characteristics:** Introduction, Resistive-Load Inverters, Inverters with n-Type MOSFET Load, CMOS Inverter.

**MOS Inverters – Switching Characteristics and Interconnect Effects:** Introduction, Delay-Time Definitions, Calculation of Delay-Times, Inverter Design with Delay Constraints, Estimation of Interconnect Parasitics, Calculation of Interconnect Delay, Switching Power Dissipation of CMOS Inverters.

**Combinational MOS Logic Circuits:** Introduction, MOS Logic Circuits with Depletion nMOS Loads, CMOS Logic Circuits, Complex Logic Circuits, CMOS Transmission Gates (Pass Gates).

**Module – III**

**Sequential MOS Logic Circuits:** Introduction, Behaviour of Bistable Elements, SR Latch Circuits, Clocked Latch and Flip-Flop Circuits, CMOS D-Latch and Edge-Triggered Flip-Flop.

**Module – IV**

**Dynamic Logic Circuits:** Introduction, Basic Principles of Pass Transistor Circuits, Voltage Bootstrapping, Synchronous Dynamic Circuit Techniques, Dynamic CMOS Circuit Techniques, High Performance Dynamic CMOS Circuits.

**Module – V**

**Semiconductor Memories:** Introduction, Dynamic Random Access Memory (DRAM), Static Random Access Memory (SRAM), Non-volatile Memory, Flash Memory.

**Module – VI**

**Design for Testability:** Introduction, Fault Types and Models, Ad Hoc Testable Design Techniques, Scan-Based Techniques, Built-In Self-Test (BIST) Techniques, Current Monitoring IDDQ Test.

**Text Books/ Reference Books:**

1. CMOS Digital Integrated Circuits: Analysis and Design, Sung-Mo Kang and Yusuf Leblebici, Tata McGraw-Hill Publishing Company Limited.
2. VLSI Design, Debaprasad Das, Oxford University Press, New Delhi.

**EE 2828 MODERN POWER STATION PRACTICE**

**MODULE-1**

* Introduction to different sources of energy and general discussion on their application to generation, Indian Energy Scenario.

Load duration curves, Load Factor, Capacity Factor, Reserve Factor, Demand Factor, Diversity Factor, Plant Use Factor, Base Load, Intermediate Load and Peak Load Plants.

* ECONOMICS OF POWER GENERATION:

Construction costs, Fixed cost and Depreciation, Fuel cost, Economic scheduling principle, Annual Operating Costs, Effect of Load Factor on cost per kWh.

**MODULE-2**

* HYDEL POWER STATION:

Classification of Hydroelectric Power Plants:

Selection of site for hydro-electric power plant.

Hydrology: Hydrological cycle, precipitation, run-off and its measurement, hydrograph, flow duration and mass curves, Estimation of amount stored by a dam across the river, Storage and Pondage.

* Turbines: Operational principle of Kaplan and Francis Turbine and Pelton wheel, Speed and Pressure Regulation, Work done, efficiency
* Elements of a Hydro-electric Power Plant: Catchment area, Reservoir, Dam, Head Gate, Spillways, Pen stock, Surge Tanks, Scroll case, Draft tubes and Tail Race, Power House, Classification of Hydroelectric Power Plants.

Plant auxiliaries

**MODULE-3:**

THERMAL POWER STATION:

Selection of site for thermal power plant.

Overall Block Diagram indicating the air circuit, coal and ash circuit, water and steam circuit, various types of steam turbines,High Pressure and High capacity water tube boilers, Economizer, Superheaters, De-Superheater, Re-heater, Air Pre-heater.

Draft System: Natural, Induced Forced and Balance Draft, PA fan, FD fan, ID fan, Chimney.

Condensers, Feed water heaters, Evaporators, Make-up water, Bleeding of steam, Cooling water system.

Electrostatic Precipitator: Basic working Principle and constructional details Plant auxiliaries

NUCLEAR POWER STATION:

Introduction to fission & fusion, reactor construction, controlled chain reaction, operational control of reactors, Brief study of various types of reactors (Boiling water, pressurized water, heavy water, breeder) , Location and layout of nuclear power plant

**Text Books/Reference Books:**

1*)* “Power Plant Engineering”, P. K. Nag, Tata McGraw Hill Publication.

2) Elements of Electrical Power Station Design, M. V. Deshpande,PHI.

3) *‘*A Course in Power Plant Engineering’, Arora & Domkundwar, Dhanpat Rai and sons.