
# M. Tech (Electrical Engineering)

## Ordinances, Scheme and Syllabus

## 2022-23

## As per NEP

## Total Credits- 70

# DESH BHAGAT UNIVERSITY, MANDI GOBINDGARH

## Faculty of Engineering and Applied Science

### Department of Electrical Engineering

### Program: M.Tech

**1. Duration of Course:**

The duration of course for regular candidates shall be two (2) academic years consisting of four (4) semesters i.e. two semesters in each year and for part time candidates shall be three (3) academic years consisting of six (6) semesters i.e. two semesters in each year. The duration of each semester will be 18-20 weeks with ninety (90) teaching days.

**2. Maximum period for passing M. Tech (Electrical Engineering)**

2.1 The maximum period for passing all the subjects of all the semesters in M. Tech (Electrical Engineering) course for regular candidates shall be four (4) years and for part time candidate shall be six (6) years, failing which the candidate shall not be allowed to continue his/her studies in the programme.

2.2 The conditions for completion and submission of dissertation shall be as specified in Ordinances20.

**3. Eligibility for Admission**

A candidate seeking admission to M. Tech. (Electrical Engineering) course

a) must have passed B. Tech. (Electrical Engineering) or any equivalent degree from any recognized University with at least 50% marks in aggregate, on the basis ofmerit.

OR

b) must have passed A and B Section of Institute of Engineering (India), Calcutta examination or I.E.T.E. Graduate Examination with at least 50% marks after having passed the Diploma Examination and has at least 5 years professional experience with a valid GATE score may be admitted to M. Tech. programme of the University.

c) Five (5) percent relaxation in marks shall be given to Schedule Caste/ Schedule Tribe or any rural and under privileged candidates.

**4. Medium of Instructions**

The medium of instruction during the course and examinations shall be English.

**5. Examination Schedule, examination fee and examinationforms:**

5.1 The examination of Odd semesters shall ordinarily be held in the month of December and that of Even semesters in the month of May, or on such other dates as may be fixed by the competent authority.

5.2 The candidates will be required to pay examination fees as prescribed by the University from time to time.

5.3 The Examination Form must reach in the office of the Controller of Examinations as per the schedule notified, from time totime.

5.4 The Examination Forms must be countersigned by the Director/Head of the Department along with the following certificate:--

(i) that he/she has been on the rolls of the University Teaching Department during the academic term preceding the end semester examination;
(ii) that he/she has attended not less than 75% Hour(s) delivered to that class in each paper; and
(iii) that he/she has a good moralcharacter.

5.5 The shortage in the attendance of Hour(s) of the candidate may be condoned by the Vice-Chancellor, on the recommendations of Head of the Department, as per rules.

**6. Re-admission**

In case name of a student is struck off from the rolls due to non-payment of fee or continued absence from classes in any subject for one month and he/she will be re-admitted after payment of re-admission fee as prescribed by the University from time to time. However, the student will be allowed to appearin the end semester examination of that paper (s) only after attending the required Hour(s)/practicals delivered to that paper(s). However, if a student falls short of attendance in all courses offered in a semester he/she shall be required to repeat the semester, along with the next batch ofstudents.

**7. Scheme of Examinations**

The examination in each semester shall be conducted according to the syllabus prescribed for the semester. The end semester examination for each paper shall be of three hours duration. There will be 50 internal marks and 100 external marks in paper.

**8. Minimum passmarks**

The minimum number of marks required to pass in each semester shall be 40% marks in each in Theory and Practical/Laboratory/Seminar/Viva-Voce paper and in Internal Assessment, separately.

## 9. Grading of performances

### 9.1 Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given hereunder:-

| Percentage of marks obtained | Letter Grade | Grade Point | Performance |
|---|---|---|---|
| 90.00 – 100 | O | 10 | Outstanding |
| 80.00 – 89.99 | A+ | 9 | Excellent |
| 70.00 – 79.99 | A | 8 | Very Good |
| 60.00 – 69.99 | B+ | 7 | Good |
| 50.00 – 59.99 | B | 6 | Average |
| 40.00 – 49.99 | C | 5 | Pass |
| Less than 40.00 | F | 0 | Fail |
| Absent | AB | 0 | Fail |

9.2 Grades from O to C are passgrades.

9.3 A student who fails in any end semester shall be assigned a letter grade 'F' and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in duecourse

9.4 A student who remains absent for any end semester examination shall be assigned a letter grade of 'AB' and a corresponding grade point ofzero.

**Semester Grade Point Average (SGPA) = ($\sum$ CiGi) /($\sum$ Ci)**

Where $C_i$ = No. of credits assigned to $i_{th}$ semester
$G_i$ = No. of Grade equivalent point assigned to $i^{th}$ semester.

Cumulative Grade Point Average (CGPA) = $\sum$ **(SGPAj X Cj) /** $\sum$ **Cj**

Where SGPA**j** = SGPA score of $j^{th}$ Semester
C**j** = Total no. of credits in the $j^{th}$ Semester

9.5 Percentage can be calculated as CGPA*10

## 10. Declaration of class and Division

The class shall be awarded on the basis of CGPA as follows:

| | |
|---|---|
| CGPA: ≥7.5 provided that the candidate must have passed all the Semester Examinations in the first available attempt. | First Division with Distinction |

| | |
|---|---|
| CGPA: 6.0 to 7.49 | First Division |
| CGPA: 5.0 to 5.99 | Second Division |
| CGPA: 4.0 to 4.99 | Third Division |

**11. Internal Assessment of failed candidate**

The internal assessment award of a candidate who fails in the external examination shall be carried forward to the next Examination, if passed in Internal Assessment.

**12. Grace Marks**

12.1 The grace marks of 1% of total marks of the semester shall be given to a candidate to his best advantage so as to enable him to pass in one or more written papers, to make up aggregate to pass the examination/paper or for changing the result from FAIL to COMPARTMENT/PASS. If a fraction works out to be half or more, it shall be counted as one mark and fraction less than half shall beignored

12.2 If a candidate appears in an examination to clear re-appear/compartment paper, the grace marks of 1% will be given only on the total marks of that particularpaper.

**13. Re-evaluation**

A candidate who is not satisfied with his result may apply to the Examination Branch for re-evaluation in a subject/paper within 15 days of declaration of result along with a fee as prescribed by the university from time to time.

**14. Re-checking**

A candidate who is not satisfied with his result may apply to the Examination Branch for re-evaluation in a subject/paper within 15 days of declaration of result along with a fee as prescribed by the university from time to time.

**15. Special Examination**

A Special Examination will be conducted for those students who are passing out but having re-appear(s) in the last semester and/or in the lower semesters. The special examination will be conducted within one month of the declaration of final semester result. The student shall have to pay prescribed fee for Special Examination.

**16. Re-appear/Supplementary Examination**

In case of re-appear examination, the University will adopt even/odd semester examination or open semester system. The student will be eligible to appear in the re-appear papers of odd semester along with the odd semester regular examinations of subsequent batches and re-appear of even semester's paper of the even semester regular examinations in the case of even/odd semester

examination. The student will be eligible to appear in the re-appear papers of all semesters (even/odd) along with regular examinations of open semester examinations. Controller of Examination will implement any of the above examination system with the approval of theVice-Chancellor.

**17. Mercy Chance**

The candidate will be given maximum two changes to appear in the supplementary examinations. After that, mercy chance may be given by the Vice-Chancellor on the recommendations of the Director of the concerned school on payment of a special fee.

**18. Syllabus for re-appear candidates**

A student who obtains re-appear(s) in a subject will be examined from the same syllabus which he/she studied as a regular student.

**19. Promotion Criteria**

19.1 A candidate who joins First Semester of M. Tech. (Electrical Engineering) may on completing attendance requirements appear in 1st semester examination. He/she shall be allowed to continue his/her studies in the 2nd Semester even if he/she does not clear any paper of the 1st semester and on completing attendance requirements may appear in the 2nd Semester examination.

19.2 A candidate shall not be eligible to join 3rd Semester of M. Tech (Electrical Engineering) if he/she has yet to clear more than 50% papers of First and Second Semesters taken together. A candidate who has cleared 50% or more papers of M. Tech. (Electrical Engineering) 1st and 2nd Semesters taken together may join 3rd Semester and on completing attendance requirements may take 3rd Semester Examination. He/she shall be allowed to continue his/her studies in the 4th Semester even if he/she does not clear any paper of the 3rd Semester and on completing attendance requirements may appear in 4th Semester examination.

19.3 A candidate shall not be eligible to join 5th Semester of M. Tech. (Electrical Engineering) if he/she has yet to clear more than 50% papers of 3rd and 4th Semesters taken together. A candidate who has cleared 50% or more papers of M. Tech. (Electrical Engineering) 3rd and 4th Semesters taken together may join 5th Semester and on completing attendance requirements may take 5th Semester Examination. He/she shall be allowed to continue his/her studies in the 6th Semester even if

he/she does not clear any paper of the 5th Semester and on completing attendance requirements may appear in 6th Semester examination.

**20. Division Improvement**

A candidate who has passed M. Tech examination from this University may re-appear for improvement of division in one or more subjects in the succeeding semesters with regular candidates in order to increase the percentage for obtaining higher division. However, final year candidates who have passed an examination of the University may re-appear for improvement of performance under special examination as per rules of the university.

**21. Dissertation**

21.1 A regular candidate**,**shall submit dissertation before appearing in the 4th Semester examination provided that he/she has appeared in all the papers of 3rd Semester and a part time candidate shall submit dissertation before appearing in 6th Semester examination provided that he/she has appeared in all the papers of 5th Semester.

Provided further that the Head of the Department may give extension up to three months for submission of dissertation, keeping in view the reasons for delay, on the request of the candidate made through his/her Supervisor.

Provided further that the Vice-Chancellor may extend the period of submission of dissertation for another three months, on the recommendation of the Head of the Department.

Provided further that Vice-Chancellor may give another extension up to one year, under exceptional circumstances, with a late fee as prescribed by the University from time totime.

21.2 The candidate shall prepare his/her dissertation under the supervision of the teacher concerned in the University Department/School. If, however, the Head of the Department/Director is satisfied that facilities for preparing the dissertation exist elsewhere, the candidate may be allowed to prepare the dissertation there but the period shall count towards the requirement for the Master's Degree Programme and candidate shall spend a minimum of four weeks for completing the dissertation, under the direct supervision of his/her teacher. In such a case, the candidate will be allowed to have supervisor from the concernedinstitution.

21.3 The Supervisor of the dissertation may be changed with prior approval of the Vice-Chancellor, on the recommendation of Head of the Department.

21.4 In case the supervisor of the dissertation leaves the University Department and joins some other recognized institution/university or some R & D Organizations within the State of Punjab, he/she may continue to guide the dissertation work of the candidates registered withhim/her.

21.5 In case the Supervisor after leaving this University is not willing to guide the dissertation, the Vice-Chancellor, on the recommendation of the concerned Director/HOD, may change theSupervisor.

21.6 The dissertation shall present an orderly and critical exposition of the existing knowledge of the subject or shall embody results of original investigation and shall demonstrate the capability of the candidate to do independent research work. While writing the dissertation the candidate shall lay out clearly the work done by him/her independently and the sources from which he/she has obtained other information contained in his/herdissertation.

21.7 Four typed copies (along with a soft copy in CD) of the Dissertation shall be submitted to the Head of the Department along with a certificate of approval by theSupervisor.

21.8 The Head of the Department, through its Director, will submit the dissertation to the Research Cell along with a list of five External Examiners, after getting their consent, for evaluation ofdissertation.

21.9 The Director Research will get approval of two external examiners from the Vice-Chancellor and Examination Branch will dispatch the dissertation to the concerned external examiners, with all the detail in a covering letter like report format, honorarium and time allocated for evaluation etc. A maximum of 20 days will be given to the concerned evaluator forevaluation.

21.10 The external examiner will send the report & dissertation to the Controller of Examinations, which will further be forwarded to the Research Cell. A panel of experts for conduct of final Viva-Voce will be got approved from the Vice-Chancellor by the concerned Research Cell.

21.11 In case the candidate has not passed all the papers of 3rd Semester or 6th Semester, as the case may be for Regular and Part Time candidate, Viva-Voce may be conducted but the report shall be kept pending by the HOD concerned, in a sealed cover till the candidate has passed all the papers of previous semesters.

21.12 A candidate who fails to secure pass marks in the Dissertation may be allowed by the Vice-Chancellor to submit a revised Dissertation on the same topic, but he/she shall have to secure pass marks in the Dissertation within a period of three years from the date of admission

to 3rd semester or 5th semester, as the case may be, for regular and part time candidates.

21.13 The concerned Director/HOD will submit the report of Viva-Voce to the Controller of Examinations with a certificate that the candidate has passed all the papers of previous semesters.

21.14 The result of the dissertation shall be declared only after the candidate has passed in viva-voce, labs/projects, seminar and all the theory papers of all these mesters.

## 22. Migration to this University

22.1 Migration to this University will be allowed only after completion of the 1st year and is applicable only to those students who are eligible to register for 3rd semester.

22.2 Migration shall be allowed after completion of the second semester but before start of the 3rd semester.

22.3 The candidates shall not be allowed to change his/ her discipline of study in the process ofmigration.

22.4 Migration to an affiliated College /Institute of the University from other recognized universities will be allowed 15 days prior to of the start of the 3rd semester. The following conditions shall beapply:-

i) The candidate should have passed all the courses of the first year of the University from where he/she wants tomigrate.
ii) The courses studied by the candidate in first year must be equivalent to the courses offered in this University. Deficiency, if any, should not be of more than two subjects. The candidate would be required to furnish an undertaking that he/she will attend classes and pass these courses (found deficient). The institute and the University where the student is studying and the Institute, to which migration is sought, have no objection to the migration.
iii) There is a vacant seat available in the discipline in the college in which migration issought.

22.5 **Power of Relaxatio**n: Notwithstanding the existing Migration Rules, the Vice-Chancellor, after obtaining an undertaking/affidavit from the candidate, to hissatisfaction, to be recorded in writing, shall be authorized to consider the migration for the cases that are not otherwise covered under the above Migration Rules, with the approval of the Chancellor.

**23. Migration to any other University**

23.1 Migration to any other University will be allowed 15 days prior to of the start of the 3rd semester.

23.2 The candidate seeking migration from this University shall be apply for the approval of his migration to the University within 15 working days after passing the 2nd Semester/First Year Examination.

23.3 The Director/Head of the department concerned of the University will issue "No Objection Certificate" after the candidate has paid all the fees due for the remaining period of the full session as well as the annual dues as per rules. In addition to the above, Migration fee as prescribed by the University shall be charged from suchcandidates.

23.4 If a candidate, on completion of any course, applies for Migration Certificate, the same shall be issued on receipt of fee prescribed for Migration Certificate and on completion of other formalitiesetc.

**24. Award of Detail Marks Card**

Each candidate of First Year M. Tech (Electrical Engineering) (i.e. Semester-I & Semester-II), Second Year (i.e. Semester-III & Semester-IV) and Third Year M.Tech(i.e. Semester –V and Semester – VI), on successfully completion of course and passing all the papers of each semester, shall be supplied detail of Marks Cards indicating CGPA score and Division obtained by him/her in the examination.

**25. Award of Degree**

The degree of M. Tech. (Electrical Engineering) stating the CGPA score and Division, will be awarded to the candidate who has successfully completed the course, passed all the papers of all the semesters and passed in the Dissertation. The degree will be awarded at the University Convocation. However, a degree in absentia can be issued before the convocation, on completion of required formalities and payment of prescribed fee.

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# DESH BHAGAT UNIVERSITY, MANDI GOBINDGARH

## Faculty of Engineering and Applied Science

### Department of Electrical Engineering

### Program: M. Tech

**Vision of the Department:**

To produce dynamic, competent, knowledgeable electrical engineers who shall lead a Nation to a better future by establishing the strong teaching and research environment.

**Mission of the Department:**

**M1:** To provide our students an education of the highest quality.

**M2:** To promote excellence in teaching, research, consultancy activities and positive contribution to the society.

**M3:** To create and sustain an environment of learning in which students transform theory into practice with due consideration of ethical and economic issues

**M4:** To prepare our students for life-long learning to meet intellectual, ethical and career challenges.

**Program Educational Objectives (PEO's):**

**PEO1:** Encourage to develop start-up companies developing Electrical Engineering equipment's/appliances/machines to contribute to the society

**PEO2:** Graduates will be able to communicate effectively, adopt lifelong learning, act with Integrity and have inter-personal skills needed to engage in, lead and nurture diverse teams, with commitment to their ethical and social responsibilities.

**PEO3:** To train students of Electrical Engineering program who can contribute to teaching profession, research & development by pursuing higher studies.

**Program Specific Outcomes (PSO's):**

**PSO1:** To model, analyze, design, and realize physical systems, components or processes related to high current electrical engineering systems.

**PSO2:** To carry out research /investigation independently to solve practical problems.

**Program Outcomes (PO's):**

**PO1: Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, Simulation tools, modern techniques and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem Analysis:** Independently carry out research /investigation and development work to solve practical problems related to Electrical Engineering.

**PO3: Design & Development of Solutions:** To design and develop a system to meet desired needs within social areas such as economics, environmental, and ethics.

**PO4: Conduct Investigations of Complex Problems:** To work upon unfamiliar problems through investigative studies and research and contribute to the development of technological knowledge and intellectual property.

**PO5: Modern Tool Usage:** Apply appropriate methodology and modern engineering/IT tools to meet the international standards in the area of Electrical Engineering

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

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

**PO8: Ethics:** Acquire integrity and ethics of research to execute projects efficiently.

**PO9: Individual and Team Work:** Recognize the need for lifelong learning & research independently, with a high level of enthusiasm, commitment and accuracy to improve knowledge and competence continuously

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

**PO11: Project Management and Finance:** Observe and examine critically the outcomes of one's actions and make corrective measures subsequently, and learn from mistakes without depending on external feedback.

**PO12: Life-Long Learning:** Design one system for Electrical Engineering efficient system and make project report for its concept to implementation based on learnings above.

(U/S 2(f) and 12B of the UGC Act1956, NAAC Accredited)

# DESH BHAGAT UNIVERSITY, MANDI GOBINDGARH

## Faculty of Engineering and Applied Science

### Department of Electrical Engineering

### Program: M.Tech

**Semester-I**

| Sr. No. | Course Code | Course Name | Category | Internal | External | Total | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | MTEE-101 | Advanced Power System Analysis & Design | CC | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 2. | MTEE -102 | Research Methodology | CC | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 3. | MTEE -103 | Applied Instrumentation & Measurements | CC | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 4. | MTEE -104 | Power System Software Lab | CC | 40 | 60 | 100 | 0 | 0 | 2 | 1 |
| **Elective-I (Select any one)** | | | | | | | | | | |
| 5. | MTEE -105 | Energy Management and Energy Auditing | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 6. | MTEE -106 | Microprocessors & Embedded Control | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 7. | MTEE -107 | Non-Conventional Energy Resources | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 8. | MTEE -108 | Wind Energy and Small Hydro Energy Station | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| **Elective-II (Select any one)** | | | | | | | | | | |
| 9. | MTEE -109 | EHVAC & HVDC Transmission Systems | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 10. | MTEE -110 | Digital Signal Processing & its Applications | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 11. | MTEE -111 | Adaptive Control | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 12. | MTEE-112 | Discrete Time Control Systems | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| **Life Skill Courses** | | | | | | | | | | |
| 13. | DBSS-101 | Soft Skill-I | LSC | 40 | 60 | 100 | 1 | 0 | 2 | 2 |
| **Total** | | | | **280** | **420** | **700** | **16** | **0** | **4** | **18** |

**L- Lecture , T- Tutorial , P- Practical , C- Credits , CC- Core Course , DE- Departmental Elective, LSC- Life Skill Course, Q-Qualified, NQ-Not Qualified**

**Course Code: MTEE-101**

**Title of the Course: Advanced Power System Analysis & Design**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Explain different methods of power flow solutions.
CO2: Solve optimal power flow problem.
CO3: Analyze various types of short circuit faults
CO4: Discuss different techniques dealing with sparse matrix for large scale power systems.

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | W | M | W | W | M | M | W | M | M | W | M |
| CO2 | M | M | S | S | S | M | W | M | S | M | M | M |
| CO3 | W | S | S | S | M | W | M | W | M | W | W | S |
| CO4 | S | M | S | M | S | M | M | W | W | W | M | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Network modeling – Conditioning of Y Matrix – Load Flow-Newton Rapson method- Decoupled – Fast decoupled Load flow -three-phase load flow. | 9 |
| 2 | Single phase and three phase -AC-DC load flow - DC system model – Sequential Solution Techniques – Extension to Multiple and Multi-terminal DC systems – DC convergence tolerance – Test System and results. | 9 |
| 3 | Analysis of balanced and unbalanced three phase faults – fault calculations – Short circuit faults – open circuit faults.<br>Strategy for two generator systems – generalized strategies – effect of transmission losses - Sensitivity of the objective function- Formulation of optimal power flow-solution by Gradient Method-Newton's method | 9 |
| 4 | Method of least squares – statistics – errors – estimates – test for bad data – structure and formation of Hessian matrix – power system state estimation | 9 |
| | | **Total -36** |

**Recommended Books**


1. *D.P. Kothari, I.J. Nagrath, "Modern Power System Analysis",* 4th *Edition*,2011
2. M.A.Pai,'ComputerTechniquesinPowerSystemAnalysis',TataMcGrawHill,NewDelhi,2014 .
3. J.J.GraingerandW.D.Stevenson,'PowerSystemAnalysis',TataMcGrawHill,NewDelhi, 2017.
4. X.-F. *Wang* et al., *"Modern Power Systems Analysis".Springer,2008 (e-book) https://www.pdfdrive.com/modern-power-systems-analysis-power-electronics-and-power-systems-e184195439.html*
5. https://nptel.ac.in/course.html
6. https://swayam.gov.in/nc_details

**Course Code: MTEE-102**

**Title of the Course: Research Methodology**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Able to select and define appropriate research problem and Parameters.
CO2: Able to select the data from different methods.
CO3: Able to organize and conduct research in a more appropriate manner.
CO4: Able to understand and apply statistical.

**CO/PO Mapping**
(S/M/W indicates strength of correlation ) S – Strong, M – Medium, W – Weak

| COs | Programme Outcomes (POs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | M | M | S | M | M | M | W | W | M | S | M |
| CO2 | S | S | S | S | M | M | M | W | W | M | S | M |
| CO3 | S | S | M | S | M | M | M | W | W | M | S | M |
| CO4 | S | S | M | S | S | M | M | W | W | M | S | M |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis | 9 |
| 2 | Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statically package (Sigma STAT,SPSS for student t-test, ANOVA, etc.), hypothesis testing. | 9 |

| | | |
|---|---|---|
| 3 | Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions. | 9 |
| 4 | Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Engineering, Impact factor of Journals, When and where to publish. Ethical issues related to publishing, Plagiarism and Self-Plagiarism.<br>Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism | 9 |

**Total - 36**

**Recommended Books:**


1. R.I. Levin and D.S. Rubin, 'Statistics for Management', 7th Edn., Pearson Education New Delhi.
2. N.K. Malhotra, 'Marketing Research–An Applied Orientation', 4th Edn., Pearson Education New Delhi.
3. Donald Cooper, 'Business Research Methods', Tata McGraw Hill, NewDelhi.
4. Sadhu Singh, 'Research Methodology in Social Sciences', HimalayaPublishers.
5. Darren George & Paul Mallery, 'SPSS for Windows Step by Step', Pearson Education NewDelhi.
6. C.R. Kothari, 'Research Methodology Methods & Techniques', 2nd Edn., New Age InternationalPublishers.
7. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition, by John W. Creswell.


**E-Books and online learning material**

1. https://www.pdfdrive.com/
2. modares.ac.ir/uploads/Agr.Oth.Lib.17.pdf
3. https://www.free-ebooks.net/
4. http://e-library.net/free-ebook.htm

**Online Courses and Video Lectures**

1. https://nptel.ac.in/courses/121/106/121106007/
2. https://nptel.ac.in/courses/107108011/
3. https://nptel.ac.in/courses/109105115/

**Course Code: MTEE-103**

**Title of the Course: Applied Instrumentation & Measurements**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Acquire the knowledge in choosing the right transducer for measuring any electrical parameter in a measurement system
CO2: Know basic principles of telemetry
CO3: Expose various data acquisition system
CO4: Understand the basic principles of virtual instrumentation and develop programmes in it for any application.

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | S | S | S | W | W | W | W | S | W | W | M |
| CO2 | S | W | S | W | S | W | M | W | W | M | M | M |
| CO3 | S | M | W | M | M | M | W | W | M | W | W | W |
| CO4 | S | S | M | W | W | W | M | W | M | W | M | W |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Classification of Transducers including analog and digital transducers, Selection of Transducers, Static and Dynamic response of transducer System, Measurement of length & thickness, linear Displacement, Angular Displacement, force, weight, torque, Moisture, Level, Flow, pH & Thermal Conductivity, Measurement of Frequency. | 9 |
| 2 | Basic Principles, Proximity & remote Action Telemetry systems, Multiplexing; Time Division and frequency division. | 9 |
| 3 | Digital Data Acquisition System, Interfacing transducers to Electronics Control and Measuring System, Instrumentation Amplifier, An Introduction to Computer-Controlled Test Systems, IEEE-488 GPIB Bus, Supervisory Control and Data Acquisition Systems (SCADA), Q- meter, Electrical noise in control signals and its remedial measures. | 9 |
| 4 | Introduction to Virtual Instrumentation, conventional vs. Virtual instrumentation, advantages and basic representations, Applications of virtual instrumentation in various fields like Industrial applications, defense, Medical.<br>Aircraft instrumentation, measurement of aircraft speed, measurement of | 9 |

| | | |
|---|---|---|
| | fluid velocity, local linear velocity & bulk velocity strain and thrust measurement, acceleration, aircraft rocket-study instrumentation, missile control instrumentation, instrumentation in space research | |

**Total -36**

**Recommended Books**


1. W.D. Cooper & A.D. Helfrick, 'Electronic Instrumentation and Measurement Techniques', PHI2007
2. B.C. Nakra and K.K. Chaudhary, 'Instrumentation Measurement Analysis', TataMcGraw-Hill,4th edition, 2016
3. Sanjay Gupta & Joseph John, 'Virtual Instrumentation Using Lab VIEW', TMG; Tata McGraw Hills,2014.
4. Related IEEE/IEEPublications.
5. PrithwirajPurkait, BudhadityaBiswas, "Electrical and Electronics Measurements and Instrumentation", TataMcGraw-Hill, 2013 (e-book)
6. https://www.pdfdrive.com/electrical-and-electronics-measurements-and-instrumentation-e33434708.html
7. https://nptel.ac.in/course.html
8. https://swayam.gov.in/nc_details

**Course Code: MTEE-104**

**Title of the Course: Power System Software Lab**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Outcomes:**

CO1: Familiarize Optimization programming tools and Software: MATLAB- SIMULINK
CO2: Develop programmes for solving simultaneous linear algebraic equations.
CO3: Analyze the techniques of numerical parameters

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | M | M | S | M | M | W | M | M | M | S |
| CO2 | M | M | S | S | S | M | W | W | M | S | S | M |
| CO3 | W | S | W | M | M | S | S | W | S | W | S | S |

**Experiments**

1. Introduction to power word simulator
2. Design a two bus, two generators & two load network.
3. Design five bus, two generator & four load network.
4. Design a three bus, two generator & one load network. Also find the solution using $Y_{bus}$.
5. Design a six bus, three generator & three load network to find the solution using $Y_{bus}$.
6. Develop MATLAB program for $Y_{BUS}$ formation.
7. Develop MATLAB program for G-S Load Flow Analysis.
8. Develop MATLAB program for N-R Load Flow Analysis.
9. Develop MATLAB program for FDLF Load Flow Analysis.
10. Develop MATLAB program for Short Circuit Analysis.
11. Transient Stability Analysis for Single Machine connected to Infinite Bus by Point by Point Method.
12. Develop PSPICE Program for Generation System Reliability Analysis.
13. Develop PSPICE Program for Distribution System Reliability Analysis

**Course Code: MTEE-105**

**Title of the Course: Energy Management and Energy Auditing**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Acquire the knowledge of basic principles of energy auditing, types and objectives, instruments used.
CO2: Analyze the data collected during performance evaluation and recommend energysaving measures
CO3: Analyze energy saving opportunities, auditing and apply suitable methods to estimate the economic benefits of conservation, management and auditing of energy

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | W | M | W | W | M | W | W | W | M | S |
| CO2 | M | S | M | S | S | M | M | W | M | W | M | S |
| CO3 | S | S | M | W | M | M | M | W | S | M | M | M |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Energy Scenario :** Energy needs of growing economy, Long term energy scenario, Energy pricing, Energy sector reforms, Energy and environment: Air pollution, Climate change, Energy security, Energy conservation and its importance, Energy strategy for the future, Energy conservation Act- 2001 and its features. | 9 |
| 2 | **Energy Management and Audit :** Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach- understanding energy costs, Bench marking, Energy performance, matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments. | 9 |
| 3 | **Analytical Techniques :** Incremental cost concept, mass and energy balancing techniques, Inventory of Energy inputs and rejections, Heat transfer calculations, Evaluation of Electric load characteristics, process and energy system simulation | 9 |
| 4 | **Energy Audit and Instruments:** The plant energy study report- Importance, contents, effective organization, report writing and presentation, Instruments for Audit and Monitoring Energy and Energy Savings, Types and Accuracy. | 9 |

**Total -36**

**Recommended Books**


1. C.B. Smith, 'Energy Management Principles', PergamonPress,2nd Edition , 2015
2. Related IEEE/IEE Publications, scholarly articles.
3. W.C. Turner, 'Energy Management Handbook', John Wiley and Sons, A WileyInterscience, 7th edition, 2012
4. Hirzel,Simon, "A Study on Energy Efficiency in Enterprises: Energy Audits and Energy Management",European Commission, 2016 (e-book) https://www.pdfdrive.com/a-study-on-energy-efficiency-in-enterprises-energy-audits-and-energy-management-e124282152.html
5. https://nptel.ac.in/course.html
6. https://swayam.gov.in/nc_details

**Course Code: MTEE-106**

**Title of the Course: Microprocessors & Embedded Control**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Understand the 8086 microprocessor and its interfacing with I/O devices.
CO2: Know the architecture and instruction set of Microcontroller and its applications
CO3: Understand embedded system and assembly language programming with case studies

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | W | W | W | W | M | W | W | M | M | W |
| CO2 | W | W | M | M | W | M | W | W | M | W | W | M |
| CO3 | S | S | S | M | S | W | W | W | W | W | S | M |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Introduction:** Microprocessor 8086, Architecture, PIN Diagram, BIU and EU, memory addressing, Clock generator 8284, buffers and latches, maximum and minimum modes. | 9 |
| 2 | **Addressing Modes :**Addressing modes of 8086, Assembly language Programming, Assemblers and Procedures, Macros, Interrupts. Interfacing of 8086: IC 8155 (Static RAM with ports and timers), 8755 (EPROM with I/O ports), 8251A (USART), 8255 A, 8253/8254,8257 and 8259controllers. | 9 |
| 3 | **Microcontroller : I**ntroduction to microcontrollers, Architecture, Pin Diagram, I/O ports, Internal RAM and registers, Interrupts, addressing modes, memory organization and external addressing, Instruction set. Interfacing with LCD, ADC, DAC, Stepper motor, Key Board and sensors. | 9 |
| 4 | **Embedded Systems :**Introduction, Classification, Processors, Hardware units, Software embedded into systems, applications and products of embedded systems, Structural Units in processor, Memory Devices,I/O Devices, Buses, Interfacing of Processor memory and I/O devices. Case Study of an embedded system for a smart card | 9 |
| | | **Total -36** |

**Recommended Books**


1. Mazidi, Mazidi&McKinlay, 'The 8051 Microcontroller and Embedded Systems using Assembly and C',PHI, 2nd edition,2008
2. K. Raj, 'Embedded Systems- Architecture, programming and Design', Tata McGraw Hill Publishing, New Delhi,2007.
3. Barry B. Brey, 'The Intel Microprocessors 8086/8088, 8086, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and Interfacing', Prentice Hall of India Private Limited, New Delhi,8th edition 2009 (e-book)
   https://www.pdfdrive.com/the-intel-microprocessors-80868088-8018680188-80286-80386-80486-pentium-pentium-pro-e76457550.html
4. https://nptel.ac.in/course.html
5. https://swayam.gov.in/nc_details

**Course Code: MTEE-107**

**Title of the Course: Non-Conventional Energy Resources**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Create awareness among students about Non-Conventional sources of energy technologies
CO2: Students will get knowledge about utilization of renewable energy sources and solar energy.
CO3: They will learn about wind energy conversion and bio-mass energy conversion systems.
CO4: They will become aware about geothermal energy, energy from biomass

CO/PO Mapping
(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | W | W | M | W | S | S | W | W | W | M | W |
| CO2 | S | M | W | W | W | M | W | W | W | M | W | S |
| CO3 | M | M | S | M | S | S | M | W | S | W | S | S |
| CO4 | S | W | M | W | M | M | M | W | W | W | M | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Introduction to Energy Sources :** World Energy Futures, Conventional Energy Sources, Non-Conventional Energy Sources, Prospects of Renewable Energy Sources. | 9 |
| 2 | **Solar Energy:** Introduction to Solar Radiation and its measurement, Introduction to Solar Energy Collectors and Storage. Applications of Solar Energy: Solar, Thermal Electric Conversion Systems, Solar Electric power Generation, Solar Photo-Voltaic, Solar Cell Principle, Semiconductor Junctions, Conversion efficiency and power output, Basic Photovoltaic System for Power Generation. | 9 |
| 3 | **Wind Energy:** Introduction to wind energy Conversion, the nature of the wind, Power in the wind. Wind data and energy estimation, Site Selection Considerations, Basic Components of a Wind Energy Conversion System, Classification of WEC Systems, Schemes for Electric Generation using Synchronous Generator and Induction Generator, Wind energy Storage. | 9 |
| 4 | **Energy from Biomass:** Biomass conversion technologies, photosynthesis, | 9 |

| | | |
|---|---|---|
| | Bio-gas generation, types of bio-gas plants. Biomass as a Source of Energy: Method for obtaining energy from Bio-mass, Biological Conversion of Solar Energy. | |

**Total -36**

**Recommended Books**


1. G.D. Rai, 'Non-Conventional Sources of Energy', KhannaPublishers,2007
2. N.K. Bansal and M. Kleemann, M. Heliss, 'Renewable Energy Sources and Conversion Technology, Tata McGraw Hill,1990.
3. Mudryk K. & Werle S. , "Renewable Energy Sources:Engineering, Technology, Innovation, Springer, 2016 (e-book)
4. https://www.pdfdrive.com/renewable-energy-sources-engineering-technology-innovation-icores-2017-volume-in-springer-proceedings-in-energy-springer-d158438456.html
5. https://nptel.ac.in/course.html
6. https://swayam.gov.in/nc_details

**Course Code: MTEE-108**

**Title of the Course: Wind Energy and Small Hydro Energy Station**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Learn about wind energy conversion

CO2: Know the working of hydro power plant and hybrid system with wind.

CO3: Acquire knowledge about the effects of power factor in setting up the tariff and its improvement.

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | M | S | M | S | S | M | W | S | W | S | S |
| CO2 | S | M | S | S | S | W | M | W | W | W | W | M |
| CO3 | S | S | M | S | S | S | S | W | S | S | S | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Wind Energy** Introduction, general theory of wind machines, basic laws and concepts of aerodynamics, Micro- siting, Description and performance of the horizontal–axis wind machines. Introduction to blade design, Description and performance of the vertical–axis wind machines, generation of electricity by wind machines and casestudies. | 9 |
| 2 | **Hydro Power Plant** Overview of micro mini and small hydro, site selection and civil works. Penstocks and turbines, speed and voltage regulation, investment issues | 9 |
| 3 | **Tariffs** Study of load management and tariff scheme, distribution and marketing issues related to power generation. | 9 |
| 4 | **Hybrid Power System** Wind and hydro based stand-alone / hybrid power systems, control of hybrid power systems, wind diesel hybrid systems | 9 |
| | | **Total -36** |

**Recommended Books**


1. O.L. Martin Hansen, 'Aerodynamics of Wind Turbines', Earthscan,2008.
2. Fernando D. Bianchi, Hernan De Battista and Ricardo J. Mantz, 'Wind Turbine Control Systems- Principles, Modelling and Gain Scheduling Design', Springer,2007.
3. Mudryk K. & Werle S. , "Renewable Energy Sources: Engineering, Technology,

Innovation, Springer, 2016
4. ImeneYahyaoui , "Advances in Renewable Energies and Power Technologies Volume 1: Solar and Wind Energies" Elsevier,2018 (e-book)
5. https://www.pdfdrive.com/advances-in-renewable-energies-and-power-technologies-volume-1-solar-and-wind-energies-e158317006.html
6. https://nptel.ac.in/course.html
7. https://swayam.gov.in/nc_details

**Course Code: MTEE-109**

**Title of the Course: EHVAC & HVDC Transmission Systems**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Understand the factors that decide rating of EHVAC Transmission.
CO2: Understand basics of HVDC system, converters control schemes harmonics filters reactive power control and power flow analysis in HVDC systems
CO3: Analyze the Effect of corona on various parameters such as power loss and travelling waves.

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | S | M | W | M | W | M | W | M | W | M | W |
| CO2 | S | S | M | S | S | S | M | W | M | W | W | M |
| CO3 | W | S | W | W | W | W | W | W | M | W | M | M |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Overview** Comparison of EHV AC and DC transmission, description of DC transmission systems, modern trends in AC and DC transmission.<br><br>**EHVAC Systems** Limitations of extra-long AC transmission, Voltage profile and voltage gradient of conductor, Electrostatic field of transmission line, Reactive Power planning and control, traveling and standing waves, EHV cable transmission system. | 9 |
| 2 | **HVDC System** Converter configurations and their characteristics, DC link control, converter control characteristics; Monopolar operation, converter with and without overlap, smoothing reactors, transients in DC line, converter faults and protection, HVDC Breakers. | 9 |
| 3 | **Corona and Interference** Corona and corona loss due to EHV AC and HVDC, Radio and TV interference due to EHV AC and HVDC systems, methods to reduce noise, radio and TV interference. | 9 |
| 4 | **Power Flow Analysis in AC/DC Systems** Component models, solution of DC load flow, per unit system for DC quantities, solution techniques of AC-DC power flow equations, Parallel operation of HVDC/AC systems, Multi | 9 |

| | | |
|---|---|---|
| | terminal systems. | |

**Total -36**

**Recommended Books**


1. K.R.Padiyar,'HVDCPowerTransmissionSystems',NewAgeInternationalPublishers, 2011.
2. E.W. Kimbark, 'Direct Current Transmission', Vol.1, Wiley Interscience, 1971
3. S. Kamakshaiah and V. Kamaraju, 'HVDC Transmission', McGraw HillEducation, 2017.
4. https://www.pdfdrive.com/high-voltage-direct-current-transmission-converters-systems-and-dc-grids-e157997309.html
5. https://www.pdfdrive.com/ehv-ac-undergrounding-electrical-power-performance-and-planning-e186074659.html
6. https://nptel.ac.in/course.html
7. https://swayam.gov.in/nc_details

**Course Code: MTEE-110**

**Title of the Course: Digital Signal Processing & its Applications**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Understand the nature of discrete time signals and DFS computation
CO2: Understand DTFT, DFT and the fast computation of DFT using FFT algorithms and implement in real-time applications.
CO3: Design IIR and FIR Digital filters for the given specifications.
CO4: Design Real time systems using the multirate processing techniques and the DSP processors.

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | W | W | S | W | W | W | W | W | M | W | M |
| CO2 | S | M | M | S | M | W | M | W | M | M | W | S |
| CO3 | M | S | S | M | S | M | W | W | W | W | M | M |
| CO4 | M | M | S | M | S | M | W | W | S | S | S | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Introduction** Limitations of analog signal processing, Advantages of digital signal processing and its applications; Some elementary discrete time sequences and systems; Basic elements of digital signal processing such as convolution, correlation and autocorrelation, Concepts of stability, causality, linearity, difference equations. DFT and its properties; Linear Periodic and Circular convolution; Linear Filtering Methods based on DFT; Fast Fourier Transform algorithm using decimation in time and decimation frequency techniques. | 9 |
| 2 | **Z Transform** Introduction, Z-Transform, Region of convergence; Inverse Z Transform methods, properties of Z transform. | 9 |
| 3 | **Design of Digital Filters** Structures of realization of discrete time system, direct form, Cascade form, parallel form and lattice structure of FIR and IIR systems. Linear Phase FIR filters; Design methods for FIR filters | 9 |
| 4 | **DSP Processors** Architectures of ADSP and TMS series of processor. Digital Signal Processing Principles, Algorithms and Application | 9 |
| | | **Total -36** |

**Recommended Books**


1. Andreas Antoniou "Digital Filters: Analysis, Design, and Signal Processing Applications" Tata McGrowHill Edition 2018
2. S. Salivahan, A. Vallavaraj, Gnanpiya, 'Digital Signal Processing', Tata McGrawHill,2011
3. S.K. Mitra, 'Digital Signal Processing - A Computer based Approach', Tata McGrawHill,2013
4. https://nptel.ac.in/courses/108/106/108106151/
5. https://nptel.ac.in/courses/108/105/108105055/
6. http://dl.icdst.org/pdfs/files/025bf242e23c7ed259ea93f3cdfbb2f2.pdf

**Course Code: MTEE-111**

**Title of the Course: Adaptive Control**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Detailed knowledge of on-line parameter estimation and the development and properties of the various methods.
CO2: Detailed knowledge of adaptive and learning control systems and their development and properties.
CO3: Detailed knowledge of methods and tools for stability analysis of adaptive and learning systems.

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | S | W | S | W | W | W | W | W | M | W | M |
| CO2 | S | M | M | S | M | W | M | W | M | M | W | S |
| CO3 | M | S | S | M | S | M | W | W | W | W | M | M |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Introduction to Adaptive Control** Development of adaptive control problem-The role of Index performance (IP) in adaptive systems-Development of IP measurement process model. | 9 |
| 2 | **System Response Identification** Identification by Cross Correlation - Synthesis techniques for flat spectrum Pseudo random signals Quasi Linearization-Impulse Response Expansion-Identification using matched filter, Adaptive control using steepest Descent. | 9 |
| 3 | **Self-Tuning Regulators and Model Reference Adaptive Systems** Introduction - Pole Placement Design-Indirect Self-tuning regulators - Continuous Time Self- Tuners - Direct self-tuning regulators - Linear quadratic self - Tuning regulators - Adaptive predictive control, The MIT rule – Determination of Adaptation Gain – Design of MRAS using Lyapunov theory – BIBO Stability – Applications to Adaptive control-Model Free Adaptive Control | 9 |
| 4 | **Gain Scheduling** Principle-Design of Gain Scheduling Controllers - Nonlinear Transformations of second Order Systems Applications of Gain Scheduling, Case study - ABB Adaptive Controllers, Satt Control ECA40, The First Control Adaptive Controller | 9 |
| | | **Total -36** |

**Recommended Books**


1. Karl J. Astrom and Bjorn Wittenmark, 'Adaptive Control', 2nd Edn., Pearson Education Inc., New Delhi,2008.
2. Shankar Sastry and Marc Bodson, 'Adaptive Control – Stability, Convergence and Robustness', Prentice Hall, Englewood Cliffs, New Jersey,1989. https://www.pdfdrive.com/adaptive-control-stability-convergence-and-robustness-prentice-hall-advanced-reference-series-e156639085.html
3. L. Ljung, 'System Identification: Theory for the User', Prentice Hall, Englewood Cliffs,1999. https://www.pdfdrive.com/system-identification-theory-for-the-user-e165696693.html
4. V.V. Chalam, 'Adaptive Control Systems – Techniques and Applications', Marcel Dekker Inc., New Jersey,1987.
5. Kumpathi S. Narendra, Romeo Ortega and PederDorator, 'Advances in Adaptive Control', IEEE Press, New Jersey,1991.
6. https://nptel.ac.in/course.html
7. https://swayam.gov.in/nc_details

**Course Code: MTEE-112**

**Title of the Course: Discrete Time Control Systems**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Develop the mathematical model of the system.
CO2: Know how to find Z – transform and Modified Z – transform of transfer functions and to solve various systems
CO3: Gain the knowledge on basic concepts of stability and analyze the stability of the system.
CO4: Design digital control systems with digital controllers

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Programme Outcomes (PO's) | | | | | | | | | | | |
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | M | S | M | M | M | W | W | W | W | W | M |
| CO2 | M | S | W | S | W | W | M | W | M | M | M | S |
| CO3 | S | S | W | M | M | M | W | W | W | W | M | M |
| CO4 | W | W | S | S | S | S | S | W | W | W | M | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Introduction** Configuration of the basic Digital Control Systems, types of sampling operations, Sample and Hold operations, Sampling theorem, Basic discrete time signals. | 9 |
| 2 | **Control Systems Analysis Using State Variable Methods** State variable representation, conversion of state variable models to transfer function and vice- versa, Eigen values and Eigen vectors, Solution of state equations, Concepts of controllability and Observability | 9 |
| 3 | **Stability Methods** Mapping between s-plane and z-plane, stability methods: Modified Routh Criterion, Jury's method, modified Schur-Cohn criterion. **Models of Digital Control Systems** Digital temperature control System, Digital position control system, stepping motors and their control. | 9 |
| 4 | **State Variable analysis of Digital Control Systems** State variable description of digital control systems, conversion of state variable models to pulse transfer function and vice versa, solution of state difference equations, controllability and observability | 9 |

**Total -36**

**Recommended Books**


1. M. Gopal, 'Digital Control and State Variable Methods', TataMcGraw-Hill, 2009 https://www.pdfdrive.com/digital-control-and-state-variable-methods-e38195713.html
2. K. Ogata, 'Discrete Time Control Systems', Pearson Education, Singapore, ThomsonPress India,2014
3. I.J. Nagrath&Gopal, 'Control System Engineering', John Wiley &Sons,2017
4. https://www.pdfdrive.com/discrete-time-control-system-design-with-applications-e176035665.html
5. https://www.pdfdrive.com/control-systems-engineering-sixth-edition-e17317677.html
6. https://nptel.ac.in/course.html
7. https://swayam.gov.in/nc_details

**Course Code: DBSS-101**

**Title of the Course: Soft Skills-I**

| L | T | P | Credits |
|---|---|---|---|
| 1 | 0 | 2 | 2 |

**Course Outcomes:**

CO1: To groom students to be Resilient and to be better equipped to cope with the unfamiliar circumstances, to manage disappointments and deal with conflicts.
CO2: To enable the students to connect and work with others to achieve a set task.
CO3: The course will train the students to gain Leadership skills and be a Leader who can assess and identify the strengths within the team and utilize the diverse skills of the group to achieve the set objectives
CO4. To cause a basic awareness about the significance of soft skills in professional and interpersonal communications and facilitate an all-round development of personality

**CO/PO Mapping**
(S/M/W indicates strength of correlation ) S – Strong, M – Medium, W – Weak

| COs | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | W | S | M | M | W | M | S | S | M | S |
| CO2 | M | M | M | S | S | M | W | S | S | S | S | S |
| CO3 | M | M | M | M | S | S | M | M | S | S | S | S |
| CO4 | S | M | M | W | S | W | M | M | S | S | S | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| Unit-I | **Introduction to Communication Skills in English**<br>A) The Importance of Communication and the Process of communication-Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context.<br>B) Everyday Conversations.<br>C) Barriers to Communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional Barriers. | 8 |
| Unit-II | **Team Work & Leadership Skills**<br>A) Broader Meaning of a Leader, Traits of a Leader. A Leader's Commitment to Mission and Vision of an Organisation. Managers versus Leaders.<br>B) Developing Leadership Skills. Addressing Ethics in Leadership Skills. | 8 |
| Unit-III | **Written English Communication**<br>A) Progression of thoughts and ideas.<br>B) Structure of Paragraph and Essay. | 8 |

| | | |
|---|---|---|
| | C) Formal and Informal Letter Writing<br>D) Corporate Communication | |
| Unit-IV | **Etiquettes & Manners – Social & Business**<br>A) Communication Etiquettes<br>B) Principles of Trust<br>C) Disability Etiquettes<br>D) Gadget Etiquettes | 8 |

**Reference Books:**


1. Klaus, Peggy (2009).The Hard Truth about Soft Skills. Harper Collins Publishers.
2. Fleming, Kerrie (2016).The Leader's Guide to Emotional Agility. Pearson Education Limited.
3. Riggio & Sherylle J, Tan (2014). Leader Interpersonal and Influence Skills. Routledge.
4. Rutherford, J. Andrea (2000). Basic Communication Skills for Technology. Pearson Education.
5. Kumar, Sanjay (2011). Communication Skills. Oxford University Press.
6. Robbins, Stephen.P (2013).Organizational Behaviour. Pearson.
7. Gill, Hasson (2011). Brilliant Communication Skills.Pearson.
8. Ramesh, Gopala Swamy (2013).The Ace of Soft Skills: Attitude, Communication and Etiquette for Success. Pearson.

(U/S 2(f) and 12B of the UGC Act1956, NAAC Accredited)

# DESH BHAGAT UNIVERSITY, MANDI GOBINDGARH

## Faculty of Engineering and Applied Science

### Department of Electrical Engineering

### Program- M. Tech

**Semester-II**

| Sr. No. | Course Code | Course Name | Category | Internal | External | Total | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | MTEE -201 | Power System Operation and Control | CC | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 2. | MTEE -202 | Advanced Electrical Machines | CC | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 3. | MTEE -203 | Power Electronic Devices & Controllers | CC | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 4. | MTEE -204 | Research Lab | CC | 40 | 60 | 100 | 0 | 0 | 2 | 1 |
| **Elective-III (Select any one)** | | | | | | | | | | |
| 5. | MTEE -205 | Electrical Distribution Automation | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 6. | MTEE -206 | Customized Power Devices | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 7. | MTEE -207 | Advanced Electrical Machine Design | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 8. | MTEE -208 | Artificial Intelligent Techniques | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| **Elective-IV (Select any one)** | | | | | | | | | | |
| 9. | MTEE-209 | Engineering Optimization | OE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 10. | MTEE-210 | Load Forecasting and Load Management | OE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 11. | MTEE-211 | Neural Networks & Fuzzy Logic | OE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| **Life Skill Courses** | | | | | | | | | | |
| 12. | DBES-101 | EVS | LSC | 40 | 60 | 100 | 1 | 0 | 2 | 2 |
| **Total** | | | | **280** | **420** | **700** | **16** | **0** | **4** | **18** |

**L- Lecture , T- Tutorial , P- Practical , C- Credits , CC- Core Course , DE- Departmental Elective, OE-Open Elective , LSC- Life Skill Course, EVS-Environmental Studies, EDP- Entrepreneurship Development Programme, Q-Qualified, NP-Not Qualified**

**Course Code: MTEE-201**

**Title of the Course: Power System Operation and Control**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Understand the power system controls namely load-frequency and AVR control for both single-machine infinite bus system and multi machine systems
CO2: Understand the optimal system operation through optimal generation dispatch, unit commitment, hydro-thermal scheduling and pumped storage plant scheduling
CO3: Implement various classical methods to the system

CO/PO Mapping
(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | W | M | W | W | M | M | W | M | M | W | M |
| CO2 | S | W | M | S | M | M | W | M | S | W | M | M |
| CO3 | M | S | S | S | S | W | M | W | M | W | W | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Introduction** Characteristics of power generation units (thermal, nuclear, hydro, pumped hydro), variation in thermal unit characteristics with multiple valves, Economic dispatch with and without line losses, lambda iteration method, gradient method, Economic dispatch without line losses, economic dispatch with line losses, Newton Raphson method, base point and participation factors. | 9 |
| 2 | **Transmission Losses** Coordination equations, incremental losses, penalty factors, B matrix loss formula (without derivation), methods of calculating penalty factors.<br>**Unit Commitment** Constraints in unit commitment, priority list method, Dynamic programming method and Lagrange relaxation methods. | 9 |

| | | |
|---|---|---|
| 3 | **Hydro Thermal Co-Ordination** Introduction to long range and short range hydro scheduling, Types of short range scheduling problem, Scheduling energy. The short term hydro- thermal scheduling problems and its solution by Lambda-Gamma iteration method and gradient method **Generation With Limited Energy Supply** Take or pay fuel supply contract, composite generation production cost function, gradient search techniques. | 9 |
| 4 | **Optimal Power Flow Formulation** Gradient and Newton method, linear programming methods. **Automatic Generation Control:** Load frequency control, single area system, multi- area system, tie line control, automatic voltage control. | 9 |

**Total -36**

**Recommended Books**


1. D.P. Kothari and J.S. Dillon, 'Power System Optimization', Prentice-Hall of India Pvt. Ltd. New Delhi,2011.
2. G.L.K. Kirchmayer, 'Economic Operation of Power Systems', John Willey & Sons, N.Y.,2004.
3. A.J. Wood, B.F. Wollenberg, 'Power Generation Operation and Control', 3rd edition, 2013 https://www.pdfdrive.com/power-generation-operation-and-control-3rd-edition-by-allen-j-wood-and-bruce-f-wollenberg-e60361717.html
4. S. Sivanagaraju, "Power System Operation and Control", Pearson,2013 (e book)
5. https://www.pdfdrive.com/power-system-operation-and-control-d187176753.html
6. https://nptel.ac.in/course.html
7. https://swayam.gov.in/nc_details

**Course Code: MTEE-202**

**Title of the Course: Advanced Electrical Machines**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 2 |

**Course Outcomes:**

CO1: Give a systematic approach for modelling and analysis of all rotating machines under both transient and steady state conditions.
CO2: Analyze all types of electrical machines.
CO3: Attain complete knowledge about electromagnetic energy conversion and time response analysis of reference frame theories for modelling of machines

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | S | S | M | M | W | W | W | W | M | M |
| CO2 | M | S | M | S | M | W | S | W | M | M | S | S |
| CO3 | M | M | S | M | S | S | S | W | M | W | W | S |

| it | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Polyphase Synchronous Machines** Mathematical: Basic Synchronous machine parameters, Voltage, Flux linkage and inductance relations, Park's transformation – its physical concept, equations of performance. **Balanced Steady State Analysis** Phasor equations and phasor diagrams, Power- angle characteristics, cylindrical rotor and Salient pole machines, Short circuit ratio | 9 |
| 2 | **Transient Analysis & Machine Dynamics** Three phase short-circuits, Armature and field transients, Transient torque, Sudden reactive loading and Unloading. Transient Analysis-a qualitative approach, Reactance and Time –Constants from equivalent circuits, Measurement of reactance, Transient Power-angle characteristics, The basic electromechanical equation, Linearized analysis, Large Angular/oscillation, Non-linearanalysis. | 9 |

| | | |
|---|---|---|
| 3 | **Transformers & Its Transients** Multi-Circuit Transformers: General theory, Equivalent circuits, Three winding transformer as a multi-circuit transformer, Determination of parameters. In-rush current phenomena, Qualitative approach, Analytical approach, In-rush current in 3-phasetransformers. | 9 |
| 4 | **Excitation Phenomena In Transformer** Study of excitation and its effect on transformer performance, Harmonics in: Single phase transformers, three-phase transformers, Disadvantages of harmonics, Suppression of harmonics. | 9 |

**Total = 36**

**Recommended Books**


1. P.S. Bimbhra, 'Generalized Theory of Electrical Machines',2010.
2. E.W. Kimbark., 'Power System Stability', Vol. III,1998.
3. A. Draper, 'Electrical Machines',2011.
4. Jan A. Melkebeek , Electrical machines and drives-fundamentals and advanced modeling, Springer, 2018 (e book)
5. https://www.pdfdrive.com/electrical-machines-and-drives-fundamentals-and-advanced-modelling-e158453884.html
6. https://www.rsisinternational.org/IJRSI/Issue34/67-71.pdf
7. https://swayam.gov.in/nc_details

**Course Code: MTEE-203**

**Title of the Course: Power Electronic Devices & Controllers**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Knowledge of power semiconductor devices and their Gate and base drive circuits
CO2: Develop skills to utilize the different PWM schemes
CO3: Know about the different types of power converters and their applications

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | S | S | W | W | W | W | S | W | W | M |
| CO2 | M | W | S | W | S | W | M | W | W | M | M | M |
| CO3 | S | S | W | M | M | M | W | W | M | W | W | W |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Conduction Process in semiconductors, PN Junction, Charge control description, Avalanche breakdown, Power diodes, Thyristors, Gate Turn Off Thyristor (GTO), VI characteristics, Dynamic characteristics, ratings, protection. | 9 |
| 2 | POWER MOSFET and IGBT- Basic structure, I-V Characteristic, Physics of device operation, switching characteristics, operating limitation and safe operating area.<br>Power junction Field effect transistor (FET), Integrated Gate-Commutated Thyristor (IGCT), Field Control Thyristor, Metal oxide semiconductor (MOS) Control Thyristor etc. Power ICs, New semiconductormaterials. | 9 |
| 3 | SNUBBER Circuits. Types of Snubber circuits, needs of Snubber circuit with diode, thyristor and transistors, Turn-off Snubber, over voltage snubber, turn on snubber, Snubber for bridge circuit configurations, GTO Snubber circuit | 9 |

| | | |
|---|---|---|
| 4 | GATE and Basic Drive Circuits Design Consideration, De-coupled drive circuits, electrically isolated drive circuits, cascade connected drive circuits, Power device protection in drive circuits, circuit layoutconsiderations | 9 |

**Total -36**

**Recommended Books**


1. Mohan, Undeland and Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley andSons, 3rd edition, 2002
2. D. Finney, 'The Power Thyristor and its Applications', McGraw Hill, NewYork,1980
3. M.H. Rashid, 'Power Electronics - Circuits, Devices and Applications', PHI,India, 2014 https://www.pdfdrive.com/power-electronics-devices-circuits-and-applications-d187559996.html
4. https://www.pdfdrive.com/power-electronics-circuit-analysis-and-design-e158276112.html
5. https://nptel.ac.in/courses/108107128/

**Course Code: MTEE-204**

**Title of the Course: Research Lab**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Outcomes:**

At the end of the course,

CO1: Familiarize with various tools and Softwares like like MATLAB, ETAP, GAMS, Power System Toolbox, Power world Simulator, Network Simulator, LABVIEW

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | S | S | M | S | M | M | W | M | S | M | S |

Students will be made familiar with one or more available softwares like MATLAB, ETAP, GAMS, Power System Toolbox, Power world Simulator, Network Simulator, LABVIEW, etc. so that students can use any one or more of them for their dissertation. Students will be advised to go through maximum research papers and conclude a particular domain to work further.

**Course Code: MTEE-205**

**Title of the Course: Electrical Distribution Automation**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Design equipment for distribution system and sub-stations
CO2: Design protective systems and co-ordinate the devices..
CO3: Understand of distribution automation
CO4: Understand the concepts of power system automation.

CO/PO Mapping
(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | W | M | W | W | M | W | W | W | M | S |
| CO2 | M | S | M | S | S | M | S | W | M | W | M | S |
| CO3 | S | S | M | W | M | M | M | W | S | M | M | M |
| CO4 | M | S | M | S | S | M | S | W | M | W | M | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Introduction to Distribution systems, an overview of the role of computers in distribution system planning-Load modelling and characteristics - definition of basic terms like demand factor, utilization factor, load factor, plant factor, diversity factor, coincidence factor, contribution factor and loss factor-Relationship between the load factor and loss factor - Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics | 9 |
| 2 | Distribution Feeders and Substations: Design consideration of Distribution feeders: Radial and loop types of primary feeders, voltage levels, and feeder-loading. Design practice of the secondary distribution system. Location of Substations: Rating of a Distribution Substation, service area with 'n' primary feeders. Benefits derived through optimal location of substations | 9 |

| | | |
|---|---|---|
| 3 | Protective devices and coordination: Objectives of distribution system protection, types of common faults and procedure for fault calculation. Protective Devices: Principle of operation of fuses, circuit reclosers, line sectionalizer and circuit breakers. Coordination of protective devices: General coordination procedure; types of coordination | 9 |
| 4 | Distribution automation functions: Electrical system automation, EMS functional scope, DMS functional scope functionality of DMS- Steady state and dynamic performance improvement; Geographic information systemsAM/FM functions and Database management; communication options, supervisory control and data acquisition: SCADA functions and system architecture;Synchrophasors and its application in power systems. | 9 |

**Total -36**

**Recommended Books**


1. Electric Power Distribution-by A.S.Pabla, Tata McGraw-Hill Publishing Company, 4th edition, 1997.
2. Electrical Distribution V.Kamaraju-McGraw Hill
3. Handbook of Electrical Power Distribution – Gorti Ramamurthy-Universities press
4. "Electric Power Distribution System Engineering " by Turan Gonen, McGraw-Hill Book Company,1986.
5. Distribution System Analysis and Automation, by Juan M. Gers, The Institution of Engineering and Technology, UK 2014

**Course Code: MTEE-206**

**Title of the Course: Customized Power Devices**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Select suitable FACTS device for the enhancement of power transfer capability and to control the power flow in an efficient manner.
CO2: Introduce advancements in Power Electronics Industry led to rapid development of Power Electronics controllers for fast real and reactive power control
CO3: Compensate and analyze the issues of power quality

CO/PO Mapping
(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | W | W | W | W | M | W | W | M | M | W |
| CO2 | S | W | M | M | S | M | W | W | M | W | W | M |
| CO3 | W | S | S | M | M | W | W | W | W | W | S | M |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Static Power Frequency Changers Fundamental Ideas: Historical Background, Basic Operational features and Operating Principles. Mathematical Representation (output voltage and Input Current) of Static Frequency Changers. Synthesis of the Output Voltage Waveform, Control of the Output Voltage (PWM, Amplitude Dependent Frequency Modulation, Phase Shift). Application of Static Frequency Changers: Speed Control of AC Machines, Constant Frequency Power Supplies and Static VAR Generators. | 9 |
| 2 | Static shunt compensators, Static series compensators, Static Voltage and phase angle regulators, Principle of operation of Controllers, Control and characteristics, Model of IPFC for power flow and optimum power flow studies. FACTS Controller interactions –SVC–SVG interaction -co- | 9 |

| | | |
|---|---|---|
| | ordination of multiple controllers using linear control techniques – Quantitative treatment of control coordination. | |
| 3 | Power Quality Improvement Harmonic filters: passive, Active and hybrid filters –Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation usingDSTATCOM, protecting sensitive loads using DVR, UPQC –control strategies: P-Q theory, Synchronous detection method –Custom power park –Status of application of custom powerdevices. | 9 |
| 4 | Recent Trends Application of basic active filters, multilevel and multipulse converters and Z-source inverter in various FACTS and FACDS devices for improving the performances of transmission system net work and distribution system network. | 9 |

**Total -36**

**Recommended Books**


1. N.G. Hingorani and L. Gyragyi, 'Understanding FACTS (Concepts and Technology of Flexible AC Transmission System)', Standard Publishers & Distributors, 2016 (e-book) https://www.pdfdrive.com/understanding-facts-concepts-and-technology-of-flexible-ac-transmission-systems-e187420780.html
2. R.M. Mathur and R.K. Verma, 'Thyristor based FACTS Controllers for Electrical Transmission Systems', IEEE Press, 2002
3. https://www.researchgate.net/publication/310706528_CUSTOM_POWER_DEVICES_AND_APPLICATIONS_IN_POWER_NETWORKS_STATCOM_and_SVC
4. https://nptel.ac.in/courses/108106025/
5. https://www.pdfdrive.com/flexible-ac-transmission-systems-facts-newton-power-flow-modeling-of-voltage-sourced-converter-e176088074.html

**Course Code: MTEE-207**

**Title of the Course: Advanced Electrical Machine Design**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Develop the basic elements of generalized theory and derive general equations for voltages and currents applicable to all types of rotating machines, to deal comprehensively with their steady-state, dynamic and transient analysis.
CO2: Obtain the voltage and torque equations for a symmetrical induction machine in terms of machine variables and transform these equations by applying reference-frame theory to analyze the dynamic performance of the machine.
CO3: Apply Park's transformation to transform the time varying synchronous machine equations to a time-invariant set of equations and study the dynamic performance.
CO4: Linearize the nonlinear equations of induction and synchronous machines to study the dynamic behaviour of small displacements about the operating point.

CO/PO Mapping
(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | W | S | M | W | S | S | W | W | W | M | W |
| CO2 | M | S | W | W | W | M | W | W | W | M | W | S |
| CO3 | M | M | M | S | S | S | M | W | S | W | S | S |
| CO4 | S | S | M | M | M | M | M | W | W | W | M | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Introduction** Design of Machines, Factors, limitations, Modern trends, Materials: Conducting, magnetic and insulating materials. Calculations of MMF for air gap and teeth, real and apparent flux densities, iron losses, field form, leakage flux, specific permanence. Modes of heat dissipation, Temperature gradients, types of enclosures, types of ventilation, conventional and direct cooling, amount of coolants used, Ratings. | 9 |

| | | |
|---|---|---|
| 2 | **Transformer** Magnetic circuit, core construction and design, winding types, insulation, Loss allocation and estimation, Reactance, Temperature rise.<br>**DC Machine** No. of poles and main dimensions, armature, windings, Magnetic circuit and magnetisation curve, commutator and brushes. | 9 |
| 3 | **Induction Machine-3 Phase** Rating specifications, standard frame sizes, Main dimensions specific loadings, Design of stator windings, Rotor design –slots and windings, calculations of equivalent circuit parameters.<br>**Synchronous Machine** Main dimensions, Magnetization characteristic, Field winding design. | 9 |
| 4 | **Computer Aided Design of Electrical Machines** Analysis and synthesis approaches, design algorithms, Introduction to optimization techniques, Implementing computer program for design of three phase induction motor. | 9 |

**Total -36**

**Recommended Books**


1. A.K. Sawhney, 'A Course in Electrical Machine Design', DhanpatRai&Co, 2013
2. E.S. Hamdi, 'Design of Small Electrical Machine', John Wiley and Sons,1994.
3. M. Ramamoorty, 'Computer Aided Design of Electrical Equipment', Eastern Press Private Limited,2010 (e-book)
4. https://www.pdfdrive.com/computer-aided-design-of-electrical-machines-e54592903.html
5. M.G. Say, 'Design and Performance of Machines', CBS Publications,1981.
6. https://www.pdfdrive.com/design-modelling-and-control-of-electrical-machines-e41027844.html (2017)
7. https://nptel.ac.in/courses/108106023/

**Course Code: MTEE-208**

**Title of the Course: Artificial Intelligent Techniques**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Outline the basic ANN architectures, algorithms and their limitations and will be able to know the different operations on the fuzzy sets.
CO2: Develop the ANN based models and control schemes for non-linear system
CO3: Develop the fuzzy logic rules for modeling and control of non-linear systems
CO4: Analyze the Genetic Algorithms for power system optimization problems

CO/PO Mapping
(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | W | M | W | S | M | W | S | W | S | S |
| CO2 | M | W | S | S | S | W | M | W | W | W | W | M |
| CO3 | M | W | S | S | S | S | S | W | S | S | S | S |
| CO4 | W | S | M | M | M | M | M | W | M | M | M | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Neural Networks** Neural Networks – biological neurons – Artificial neurons – activation function – Course rules – feed forward networks – supervised & Unsupervised Course –perceptron network- linear separability – back propagation networks Algorithms-Radial basis function networks. | 9 |
| 2 | **Associative Models And Control Schemes in NN** Auto & hetero associative memory – bi-directional associative memory – Self organizing feature Maps-Hopfield Networks-Neural Networks for non – linear system – Schemes of Neuro control – System identification – forward model and – Inverse model – Case studies. | 9 |
| 3 | **Fuzzy Logic and Genetic Algorithm** Fuzzy set - Crisp set – vagueness – uncertainty and imprecision – fuzzy set – | 9 |

| | | |
|---|---|---|
| | fuzzy operation- properties – crisp versus fuzzy relations – fuzzy relations – fuzzy Cartesian product and composition – composition of fuzzy Relations- Fuzzy to crisp conversion –structure of fuzzy logic controller – database – rule base – Inference engine. GA: Working principles – terminology – Importance of mutation – comparison with traditional methods – constraints and penalty function – GA operators – Real coded GAs. | |
| 4 | **Applications** Applications of Neural network, Fuzzy system & Genetic algorithms for power systems and power electronics Systems-Designing of controllers using Simulation Software, NN tool box & Fuzzy Logic Toolbox | 9 |

**Total -36**

**Recommended Books**


1. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', McGraw Hill International Edition, USA, 2012 (e-book) https://www.pdfdrive.com/fuzzy-logic-with-engineering-applications-e40345033.html
2. LawreneFausett, 'Fundamentals of Neural Networks', Prentice Hall of India, New Delhi, 2004.
3. SimonHaykin,'NeuralNetworks– AComprehensiveFoundation',PearsonEducationAsia,2008.
4. https://www.pdfdrive.com/fuzzy-logic-models-and-fuzzy-control-an-introduction-e183968373.html (2017)
5. https://nptel.ac.in/courses/127105006/
6. https://nptel.ac.in/courses/108104157/
7. https://www.pdfdrive.com/artificial-intelligence-and-machine-learning-fundamentals-e185802940.html (2018)

**Course Code: MTEE-209**

**Title of the Course: Engineering Optimization**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Recognize the importance and value of Optimization Techniques in solving practical problems in industry
CO2: Understand Optimization models and apply them to real life problems
CO3: Analyze the Genetic Algorithms for power system optimization problems

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | M | S | M | S | S | M | W | S | W | S | S |
| CO2 | S | M | S | S | M | W | M | W | W | W | W | M |
| CO3 | S | S | M | S | S | S | S | W | S | S | S | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Introduction:** Definition, Classification of optimization problems, Classical Optimization Techniques, Single and Multiple Optimization with and without inequality constraints. | 9 |
| 2 | **Linear Programming (LP) and Non Linear Programming (NLP):** Simplex method of solving LP, revised simplex method, duality, Constrained Optimization, Theorems and procedure, linear programming, mathematical model, solution technique, duality. Steepest descent method, Conjugate gradient method, Newton Method, Sequential quadratic programming, Penalty function method, augmented Lagrange multipliermethod. | 9 |
| 3 | **Dynamic Programming (DP):** Multistage decision processes, concept of sub-optimization and principle of optimality, Recursive relations, Integer Linear programming, Branch and bound algorithm. | 9 |
| 4 | **Genetic Algorithm (GA):** Introduction to Genetic Algorithm, working principle, coding of variables, fitness function, GA operators; Similarities | 9 |

| | | |
|---|---|---|
| | and differences between GA and traditional methods; Unconstrained and constrained optimization using genetic Algorithm, real coded GA, Advanced GA, global optimization using GA, Applications to power system. | |

**Total -45**

**Recommended Books**


1. D.A. Pierre, 'Optimization Theory with Applications', WileyPublications,1986
2. Pelin G Canbolat, 'Introduction to Operation Research', 9th Edn, 2014 (e-book) https://www.pdfdrive.com/introduction-to-operations-research-d34458313.html
3. S.S. Rao, ' Engineering Optimization –Theory and Applications', Wiley-Eastern Limited,2009 (e-book) https://www.pdfdrive.com/engineering-optimization-theory-and-practice-fourth-edition-e17279363.html
4. D.P. Kothari & J.S. Dhillon, 'Power System Optimization', PHIPublishers,2004
5. https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_1/M1L1slides.pdf
6. https://nptel.ac.in/courses/108104112/

**Course Code: MTEE-210**

**Title of the Course: Load Forecasting and Load Management**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Acquire skills of load related energy management and tariff structure.
CO2: Gain knowledge about annual and monthly peak demands.
CO3: Model the energy scenario and analyze it with the help of case studies.

CO/PO Mapping
(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | M | S | M | M | S | M | M | S | W | S | S |
| CO2 | S | M | W | W | W | W | M | W | W | W | W | M |
| CO3 | W | M | S | S | S | S | S | W | S | S | S | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Load Forecasting:**Classification and characterization of loads,Approaches to load forecasting, Forecasting methodology, Energy forecasting, Peak demand forecasting, Non-weather sensitive forecast and Weather sensitive forecast, Total forecast, Annual and monthly peak demand forecasts, Applications of state estimation to load forecasting. | 9 |
| 2 | **Load Management:** Introduction to Load management,Electric energy production and delivery system structure (EEPDS), Design alternatives for EEPD systems, Communication/control techniques for load management, Tariff structure and load management, principles of macro and microeconomics and energy pricing strategies, Assessing the impacts of loadmanagement | 9 |
| 3 | **Energy Demand Forecasting:** Static and dynamic analysis of energy demand, Elements of energy demand forecasting, Methodologies and models for energy demand forecasting,Techno economic approach in energy demand forecasting, Energy auditing, Energy management, Power Pools and Energy Banking | 9 |
| 4 | **Trends and Case Studies:** Energy management strategy, Symbiotic relation | 9 |

| | | |
|---|---|---|
| | between information, Energy models and decision making, Case studies like industrial energy forecasting, Transportation energy forecasting, Residential, Commercial and agricultural energy forecasting. | |

**Total -36**

**Recommended Books**


1. J. Martino, 'Technological Forecasting for Decision Making', Elsevier Press,1992.
2. S. Makridakis, 'Forecasting Methods and Applications', John Wiley and Sons,1997.
3. R.G. Brown, 'Smoothing, Forecasting and Prediction of Discrete Time Series', PHI Int.,1963.
4. https://www.pdfdrive.com/research-and-development-management-technology-journey-through-analysis-forecasting-and-decision-e191746360.html
5. http://almozg.narod.ru/bible/lf.pdf
6. https://nptel.ac.in/content/storage2/courses/110101005/downloads/Lecture%2015.pdf

**Course Code: MTEE-211**

**Title of the Course: Neural Networks & Fuzzy Logic**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Acquire the skills required to innovate and build, smart and intelligent applications in electrical and electronics engineering.
CO2: Understand review of Neural Networks: models of a neuron, various activation functions, Threshold function, piecewise – linear function, stochastic model of a neuron, feedback.
CO3: Take up fuzzy systems approach to solve applications in engineering.

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | M | S | M | S | S | M | W | S | W | S | S |
| CO2 | S | M | S | S | M | W | M | W | W | W | W | M |
| CO3 | S | S | M | S | S | S | S | W | S | S | S | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **Review of Neural Networks:** models of a neuron, various activation functions: Threshold function, piecewise – linear function, stochastic model of a neuron, feedback. | 9 |
| 2 | **Network Architecture:** Single layer feed forward network, multiplayer feed forward network, recurrent network, knowledge representation. | 9 |
| 3 | **COURSE Processes:** Memory Based COURSE Hebbian COURSE, Competitive COURSE, Boltzmann COURSE, COURSE with a teacher, COURSE without a teacher, adaptation, single layer perceptions, multi-layer perceptions | 9 |
| 4 | **Introduction to fuzzy logic:** membership function, rule generation, fuzzy concept, fuzzification, defuzzification ,time dependent fuzzy logic,temporary | 9 |

| | | |
|---|---|---|
| | fuzzy logic,fuzzy artificial neural network, neuro fuzzy control, fuzzy neural nets, Fuzzy Based ABS system,applications. | |

**Total -36**

**Recommended Books**


1. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', McGraw Hill International Edition, USA, 2012 (e-book) https://www.pdfdrive.com/fuzzy-logic-with-engineering-applications-e40345033.html
2. LawreneFausett, 'Fundamentals of Neural Networks', Prentice Hall of India, New Delhi, 2004.
3. SimonHaykin,'NeuralNetworks– AComprehensiveFoundation',PearsonEducationAsia,2008.
4. https://www.pdfdrive.com/fuzzy-logic-models-and-fuzzy-control-an-introduction-e183968373.html (2017)
5. https://nptel.ac.in/courses/127105006/
6. https://nptel.ac.in/courses/108104157/
7. https://www.pdfdrive.com/artificial-intelligence-and-machine-learning-fundamentals-e185802940.html (2018)

**Course Code: DBES-100**

**Title of the Course: Environmental Studies**

| L | T | P | Credits |
|---|---|---|---|
| 1 | 0 | 2 | 2 |

**Course Outcomes:**

CO1: Articulate the interdisciplinary context of environmental issues.
CO2: Identify and justify key stakeholders in humanities and social sciences that need to be a part of sustainable solutions.
CO3: Formulate an action plan for sustainable alternatives that integrate science, humanist, and social perspectives.
CO4: Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.

**CO/PO mapping**

(S/M/W indicates strength of correlation )
S- Strong , M-Medium , W- Weak

| CO'S | Program Outcome (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | S | M | W | S | S | W | W | S | M | S | M |
| CO2 | S | S | M | M | S | M | M | W | W | S | M | S |
| CO3 | S | M | S | M | S | W | S | M | S | W | S | S |
| CO4 | S | S | M | W | S | S | W | W | S | M | S | M |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | **The Multidisciplinary Nature of Environmental Studies**<br>Definition, scope and importance<br>Need for public awareness.<br>**Natural Resources**<br>Renewable and Non-renewable Resources:<br>• Natural resources and associated problems.<br>(a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.<br>(b) Water resources: Use and over-utilization of surface and ground | 8 |

| | | |
|---|---|---|
| | water, floods, drought, conflicts over water, dams-benefits and problems.<br>(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.<br>(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, Case studies.<br>(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.<br>(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.<br>• Role of an individual in conservation of natural resources.<br>• Equitable use of resources for sustainable lifestyles. | |
| 2 | **Ecosystems**<br>• Concept of an ecosystem.<br>• Structure and function of an ecosystem.<br>• Producers, consumers and decomposers.<br>• Energy flow in the ecosystem.<br>• Ecological succession.<br>• Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem:<br>(a) Forest ecosystem<br>(b) Grassland ecosystem<br>(c) Desert ecosystem<br>(d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) **Unit Biodiversity and Its Conservation**<br>• Introduction, definition: genetic, species and ecosystem diversity.<br>• Biogeographical classification of India.<br>• Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.<br>• Biodiversity at global, National and local levels.<br>• India as a mega-diversity nation.<br>• Hot-spots of biodiversity.<br>• Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.<br>• Endangered and endemic species of India.<br>• Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity | 10 |

| | | |
|---|---|---|
| 3 | **Environmental Pollution**<br>• Definition<br>• Causes, effects and control measures of<br>(a) Air pollution (b) Water pollution<br>(c) Soil pollution (d) Marine pollution<br>(e) Noise pollution (f) Thermal pollution<br>(g) Nuclear hazards<br>• Solid waste management: Causes, effects and control measures of urban and industrial wastes.<br>• Role of an individual in prevention of pollution.<br>• Pollution case studies.<br>• Disaster management: Foods, earthquake, cyclone and landslides.<br>**Social Issues and the Environment**<br>• From unsustainable to sustainable development.<br>• Urban problems related to energy.<br>• Water conservation, rain water harvesting, watershed management.<br>• Resettlement and rahabilitation of people; its problems and concerns. Case studies.<br>• Environmental ethics: Issues and possible solutions.<br>• Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.<br>• Wasteland reclamation.<br>• Consumerism and waste products.<br>• Environment Protection Act.<br>• Air (Prevention and Control of Pollution) Act.<br>• Water (Prevention and Control of Pollution) Act.<br>• Wildlife Protection Act.<br>• Forest Conservation Act.<br>• Issues involved in enforcement of environmental legislation.<br>• Public awareness. Common UGC Syllabus for Environmental Studies xiii | 12 |
| 4 | **Human Population and the Environment**<br>• Population growth, variation among nations.<br>• Population explosion—Family Welfare Programme.<br>• Environment and human health.<br>• Human rights.<br>• Value education.<br>• HIV/AIDS.<br>• Women and Child Welfare.<br>• Role of Information Technology in environment and human health.<br>• Case Studies.<br>**Field Work**<br>• Visit to a local area to document environmental assets— | 15 |

| | | |
|---|---|---|
| | river/forest/grassland/hill/mountain.<br>• Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.<br>• Study of common plants, insects, birds.<br>• Study of simple ecosystems—pond, river, hill slopes, etc.<br>• (Field work equal to 5 lecture hours | |

**Total -45**

**Recommended Books**


1. " Environmental Science" by Miller T G.
2. " Introduction to Environmental Engineering and Science" by Gilbert M Masters.
3. " The Biodiversity of India" by BharuchaErach.
4. " Essentials of Ecology" by Townsend C and Michael Begon.
5. https://nptel.ac.in/courses/122102006/
6. https://swayam.gov.in/nd2_cec19_bt03/preview
7. https://www.pdfdrive.com/environmental-science-e12033451.html

(U/S 2(f) and 12B of the UGC Act1956, NAAC Accredited)

# DESH BHAGAT UNIVERSITY, MANDI GOBINDGARH

## Faculty of Engineering and Applied Science

### Department of Electrical Engineering

### Program- M. Tech EE

**Semester-III**

| Sr. No. | Course Code | Course Name | Category | Internal | External | Total | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | MTEE -301 | Power System Planning and Reliability | CC | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 2. | MTEE -302 | Project | CC | 40 | 60 | 100 | 0 | 0 | 8 | 4 |
| 3. | MTEE -303 | Seminar | CC | 100 | - | 100 | 0 | 0 | 4 | 2 |
| 4. | MTEE -304 | Research Paper Writing | CC | 100 | - | 100 | 0 | 0 | 4 | 2 |
| **Elective-V (Select any one)** | | | | | | | | | | |
| 5. | MTEE -305 | Electric and Hybrid Vehicles | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 6. | MTEE -306 | Electric Traction System | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 7. | MTEE -307 | Distribution System Operation & Analysis | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 8. | MTEE -308 | Smart Grid Technologies | DE | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| **Life Skill Courses** | | | | | | | | | | |
| 9. | DBSS-102 | Soft Skills-II | LSC | 40 | 60 | 100 | 1 | 0 | 2 | 2 |
| **Total** | | | | **360** | **240** | **600** | **7** | **0** | **16** | **16** |

**L- Lecture , T- Tutorial , P- Practical , C- Credits , CC- Core Course , DE- Departmental Elective, P-Qualified, NP-Not Qualified**

**Course Code: MTEE-301**

**Title of the Course: Power System Planning and Reliability**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: To use reliability theory as a tool for decision support for design, operation and planning of electric power system.
CO2: To familiarize the students with various aspects of probability theory
CO3: To acquaint the students with reliability and its concepts
CO4: To introduce the students to methods of estimating the system reliability of simple and complex systems

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | W | W | W | M | M | W | M | M | W | M |
| CO2 | M | S | S | S | S | M | W | M | S | M | M | M |
| CO3 | M | W | S | S | M | W | M | W | M | W | W | S |
| CO4 | W | S | S | S | S | M | M | W | W | W | M | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Introduction, Factors affecting Load Forecasting, Load Growth Characteristics, Classification of Load and Its Characteristics, Load Forecasting Methods (i) Extrapolation (ii) Co-Relation Techniques, Energy Forecasting, Peak Load Forecasting, Reactive Load Forecasting, Non Weather Forecasting, Weather Forecasting, Annual Forecasting, Monthly Forecasting, Total Forecasting | 9 |
| 2 | Reliability Concepts-The General reliability function, Hazard rate, MTTF, Markov processes. Static Generating Capacity Reliability Evaluation- | 9 |

| | | |
|---|---|---|
| | Capacity outage probability tables, loss of load probability method, Frequency and duration approach. | |
| 3 | Transmission Planning and Reliability -Introduction, Objectives of Transmission Planning, Network Reconfiguration, System and Load Point Indices, Data required for Composite System Reliability. | 9 |
| 4 | Distribution Planning and Reliability- Radial Networks - Introduction, Network Reconfiguration, Evaluation Techniques, Interruption Indices, Effects of Lateral Distribution Protection, Effects of Disconnects, Effects of Protection Failure, Effects of Transferring Loads, Distribution Reliability Indices. | 9 |

**Total -36**

**Recommended Books**


1. Modern Power System Planning - X. Wang & J.R. McDonald, McGraw Hill Book Company
2. Power System Planning - R.N. Sullivan, Tata McGraw Hill Publishing Company Ltd.
3. Electrical Power Distribution Engineering - T. Gonen, McGraw Hill Book Company
4. Reliability Evaluation of Power System - Roy Billinton & Ronald N. Allan, Springer Publication 5. Generation of Electrical Energy - B.R. Gupta, S. Chand Publications
5. Ali Chowdhury Don Koval, 'Power Distribution System Reliability: Practical Methods and Applications', Wiley-IEEEPress, 2011 (e book)
6. https://www.pdfdrive.com/power-distribution-system-reliability-practical-methods-and-applications-ieee-press-series-on-power-engineering-
7. https://nptel.ac.in/course.html
8. https://swayam.gov.in/nc_details

**Course Code: MTEE-302**

**Title of the Course: Project**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 12 | 6 |

**Course Outcomes:**

CO1: Formulate, Design, Analyze and implementation of various problems in practical form
CO2: Impart skills in preparing detailed report describing the project and results.

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | W | S | S | M | S | M | S | W | S | M | M | S |
| CO2 | S | W | M | S | M | S | M | W | S | S | S | S |

| **Internal Marks** | | **External Marks** | |
|---|---|---|---|
| 1. Formulation of Problem | 10 | Implementation | 10 |
| 2. Design | 10 | Result & Analysis | 10 |
| 3. Implementation | 20 | Report | 10 |
| 4. Testing & Analysis | 10 | Viva-Voce | 10 |
| 5. Report | 10 | ---- | --- |
| **Total Marks** | 60 | **Total Marks** | 40 |

**Course Code: MTEE-303**

**Title of the Course: Seminar**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Outcomes:**

CO1: Collect useful information from the literature on the particular topic chosen by student

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | W | S | S | S | S | M | S | W | S | M | M | S |

Each student will be required to prepare a Seminar Report and present a Seminar on a topic in any of the areas of modern technology related to Electrical Engineering including interdisciplinary fields.

Seminar will carry 2 credits. It will be done on any topic within/outside the curriculum. Its evaluation will be done as under:

| Sr. No. | Parameters for Evaluation | Internal Marks | External Marks |
|---|---|---|---|
| 1 | Depth & Coverage of Topic | 40 | - |
| 2 | PPT Presentation & Report | 20 | - |
| 3 | Presentation | 20 | - |
| 4 | Questions & Answers | 20 | - |
| **Total** | | **100** | **-** |

**Course Code: MTEE-304**

**Title of the Course: Research Paper Writing**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Outcomes:**

CO1: To get useful information in writing a good research paper on the topic chosen by student

| CO/PO Mapping (S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | W | S | S | S | S | M | S | W | S | M | M | S |

Each student will be required to prepare a Research Paper on a topic in any of the areas of modern technology related to Electrical Engineering including interdisciplinary fields.
It will carry 2 credits. It will be done on any topic within/outside the curriculum. Its evaluation will be done as under:

**Course Code: MTEE-305**

**Title of the Course: Electric and Hybrid Vehicles**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Understand upcoming technology of hybrid system
CO2: Understand different aspects of drives application
CO3: Learn the electric Traction

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | S | S | S | W | W | W | W | S | W | W | M |
| CO2 | S | W | S | W | S | W | M | W | W | M | M | M |
| CO3 | M | S | S | M | M | M | W | W | M | W | W | W |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies, Basics of vehicle performance, Vehicle power source characterization, Transmission characteristics, Mathematical models to describe vehicle performance | 9 |
| 2 | Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis | 9 |
| 3 | Matching the electric machine and the internal combustion engine (ICE) ,Sizing the propulsion motor, Sizing the power electronics, Selecting the | 9 |

| | | |
|---|---|---|
| | energy storage technology, Communications, Supporting subsystems | |
| 4 | Introduction to energy management and their strategies used in hybrid and electric vehicle, Classification of different energy management strategies, Comparison of different energy management strategies, Implementation issues of energy strategies. | 9 |

**Total -36**

**Recommended Books**


1. J. Upadhyay S.N. Mahendra, 'Electric Traction', Allied Publishers Ltd., DhanpatRaiandSons, Delhi,2000
2. H. Partab, 'Modern Electric Traction', DhanpatRai and Sons, NewDelhi,2013
3. J.B. Gupta, 'Electric Power Utilization', Kataria and Sons, NewDelhi,10th edition ,2012
4. Andreas Steimel, "Electric Traction – Motive Power and Energy Supply", Karl Heinz Pantke,2008 (e-book)
   https://www.pdfdrive.com/electric-traction-motion-power-and-energy-supply-basics-and-practical-experience-e183991627.html
5. https://nptel.ac.in/course.html
6. https://swayam.gov.in/nc_details

**Course Code: MTEE-306**

**Title of the Course: Electric Traction System**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Evaluate tractive effort for the propulsion of train, name the traction motors, list the traction motor control, track equipment and collection gear
CO2: Distinguish different traction systems and latest trends in traction systems
CO3: Control different types of traction motors
CO4: Apply various control methods applied to traction motors

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | S | S | S | W | W | W | W | S | W | W | M |
| CO2 | S | W | S | W | S | W | M | W | W | M | M | M |
| CO3 | M | S | S | M | M | M | W | W | M | W | W | W |
| CO4 | M | S | S | S | M | W | M | W | W | M | S | W |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Traction Systems and Latest Trends<br>Present scenario of Indian Railways – High speed traction, Metro, Latest trends in traction-Metro, monorail, Magnetic levitation Vehicle, Steam, diesel, diesel-electric, Battery and electric traction systems, General arrangement of D.C., A.C. single phase and 3-phase, Composite systems, Choice of traction system - Electric and Diesel- Electric. | 9 |
| 2 | Mechanism of Train Movement-Analysis of speed time curves for main line, suburban and urban services, Simplified speed time curves. | 9 |

| | | |
|---|---|---|
| | Relationship between principal quantities in speed time curves, Requirement of tractive effort, Specific energy consumption and Factors affecting it. | |
| 3 | Features of traction motors, Significance of D.C. series motor as traction motor, A. C. Traction motors-single phase, Three phase, Linear Induction Motor, Comparison between different traction motors, Series-parallel control, Open circuit, Shunt and bridge transition, Pulse Width Modulation control of induction motors, Types of electric braking system. | 9 |
| 4 | Important features of electric locomotives, Different types of locomotives, Current collecting equipment, Coach wiring and lighting devices, Power conversion and transmission systems, Control and auxiliary equipment, Distribution systems pertaining to traction (distributions and feeders), Traction sub-station requirements and selection, Method of feeding the traction sub-station. | 9 |

**Total -36**

**Recommended Books**


1. J. Upadhyay S.N. Mahendra, 'Electric Traction', Allied Publishers Ltd., DhanpatRaiandSons, Delhi,2000
2. H. Partab, 'Modern Electric Traction', DhanpatRai and Sons, NewDelhi,2013
3. J.B. Gupta, 'Electric Power Utilization', Kataria and Sons, NewDelhi,10th edition ,2012
4. Andreas Steimel, "Electric Traction – Motive Power and Energy Supply", Karl Heinz Pantke,2008 (e-book)
   https://www.pdfdrive.com/electric-traction-motion-power-and-energy-supply-basics-and-practical-experience-e183991627.html
5. https://nptel.ac.in/course.html
6. https://swayam.gov.in/nc_details

**Course Code: MTEE-307**

**Title of the Course: Distribution System Operation and Analysis**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Analyze the transmission system planning
CO2: Use equipment in substations and their design considerations
CO3: Describe the concepts of voltage regulation, automation and various control cases
CO4: Explain the concepts linked with protection and coordination of protective devices in distribution systems

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation)

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | M | S | W | M | W | M | W | W | W | W | M | M |
| CO2 | M | W | S | S | S | M | M | W | W | W | M | S |
| CO3 | S | M | W | W | M | M | M | W | W | W | M | M |
| CO4 | S | W | M | M | W | W | M | W | M | W | M | W |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Distribution system planning, Factors affecting system planning, present planning techniques, planning models, Introduction to optimum line network. future trends in planning, systems approach, distribution automation. Load Characteristic: Basic definitions, relation between load and loss factors, maximum diversified demand, load forecasting, Load management. | 9 |
| 2 | Distribution systems, economics and finance, mapping, Design of substation and feeder, Operation criteria, voltage measurements, | 9 |

| | | |
|---|---|---|
| | harmonics, load variations, system losses, Introduction to energy management. | |
| 3 | Quality of Service and Voltage Standards, Voltage Control, Line Drop Compensation, Distribution capacitor automation, Voltage fluctuations, SCADA and Communication with Load Dispatch Centres. | 9 |
| 4 | Objective of distribution system protection, high impedance faults coordination of protective devices: fuse to fuse co-ordination, re-closer to re-closer coordination, re-closer to fuse coordination, re-closer to substation transformer high side fuse coordination, fuse to circuit breaker coordination, re-closer to circuit breaker coordination, lightning protection. | 9 |

**Total -36**

**Recommended Books**


1. Gonen, Turan, 'Electric Power Distribution System Engineering', CRC PRESS, 2012, 3rd Indian Reprint.
2. A.S. Pabla, 'Electric Power Distribution', 6th Edn., TMH,2011
3. A. J. Panseni, "Electrical Distribution Engineering", CRC Press,2012
4. T. Gonen, " Electric Distribution System engineering", 2nd edition, 2007

   https://www.pdfdrive.com/electric-power-distribution-system-engineering-second-edition-e175376615.html
5. http://www.nptel.ac.in/courses/108106022/8
6. https://swayam.gov.in/nc_details

**Course Code: MTEE-308**

**Title of the Course: Smart Grid Technologies**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1: Understand the challenging issues and architecture of smart grid
CO2: Understand the communication and wide area monitoring in smart grid
CO3: Acquire the knowledge in computational intelligence and security issues in smart grid

CO/PO Mapping

(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation)

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | W | S | M | M | W | W | M | M | W | S |
| CO2 | S | W | M | M | S | M | M | W | M | S | W | S |
| CO3 | M | S | S | M | S | W | W | W | W | W | S | M |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| 1 | Introduction to Smart Grid-Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self-Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid. | 9 |
| 2 | Introduction to Smart Meters, Real Time Pricing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS), Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers. Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, | 9 |

| | | |
|---|---|---|
| | SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU). | |
| 3 | Concept of micro grid, need & applications of micro grid, formation of micro grid, Issues of interconnection, protection & control of micro grid. Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel cells, micro turbines, Captive power plants, Integration of renewable energy sources | 9 |
| 4 | Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit. Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN). | 9 |

**Total -36**

**Recommended Books**


1. C.W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press , 2009
2. J. Ekanayake, N. Jenkins, K. Liyanage, "Smart Grid: Technology and Applications", Wiley 2012
3. S.Borlase, "Smart Grid: Infrastructure, Technology and solutions " CRC Press,2012
4. A.G.Phadke, "Synchronized Phasor Measurement and their Applications", Springer, 2012
5. https://swayam.gov.in/courses/4778-july-2018-introduction-to-smart-grid
6. https://onlinecourses.nptel.ac.in/noc18_ee42/preview

**Course Code: DBSS-102**

**Title of the Course: Soft Skills-II**

| L | T | P | Credits |
|---|---|---|---|
| 1 | 0 | 2 | 2 |

**Course Outcomes:**

CO1: The course will skill the student to learn Effective Communication, writing skills in English and Listening Skills.
CO2: to address various challenges of communication as well as behavioral skills faced by individual at work place and organizations.
CO3: This course will help the student gain Emotional maturity and Emotional health.
CO4: to enhance the employability of the students.

**CO/PO Mapping**

(S/M/W indicates strength of correlation ) S – Strong, M – Medium, W – Weak

| COs | Programme Outcomes (POs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | S | M | W | S | M | M | W | M | S | S | M |
| CO2 | M | S | M | M | S | S | M | W | S | S | S | S |
| CO3 | M | M | M | M | M | S | S | M | M | S | S | S |
| CO4 | S | S | M | S | W | S | W | M | M | S | S | S |

| Unit | Course Outlines | Hour(s) |
|---|---|---|
| Unit-I | **Introduction to Non-verbal Communication Skills in English**<br>A) Non- Verbal Communication and Body Language. Basic Elements of Body Language, Kinesics.<br>B) Basic Listening Skills: Becoming an Active Listener<br>C) Basic Writing Skills: Fundamentals of Grammar, Letter Writing & Paragraph Writing | 6 |
| Unit-II | **Management Skills**<br>A) Time Management – Program Evaluation Review Technique (PERT), The Pareto Principle, The Law of the Three, The | 6 |

| | | |
|---|---|---|
| | Important Versus the Urgent.<br>B) Anger Management – What is Anger, Effects of Anger, Types of Anger,1-2-3 Turtle Rule, Anger Management.<br>C) Stress Management- Signs & Symptoms, Sources of Stress, Practicing the 4 A's.<br>D) | |
| Unit-III | **Social & Organisational Well-Being**<br>A) Emotional Intelligence- Traits, Self-Awareness, Self-Regulation, Motivation, Empathy, EQ vs. IQ, Spiritual Intelligence, Whole Brain Training (IQ+EQ+SQ= 3Q).<br>B) Business Dress and Dining Etiquette – Why a Dress Code, Business and Casual Dress Code, Table Manners.<br>C) Netiquette- What is Netiquette, Why Netiquette, Netiquette Norms, E-Mail Etiquette. | 10 |
| Unit-IV | **Interview Skills, Presentation Skills & Group Discussion**<br>A)Curriculum Vitae and Resume Writing, Do's and Don'ts of an Interview<br>B) Planning and Structuring your Presentation. Techniques of Delivering a Presentation like a Pro.<br>C) Group Discussion- Do's & Don'ts of a GD. How to Ace a GD. | 10 |

**Total-32**

**Reference Books:**


1. Klaus, Peggy (2009).The Hard Truth about Soft Skills. Harper Collins Publishers.
2. Fleming, Kerrie (2016).The Leader's Guide to Emotional Agility. Pearson Education Limited.
3. Butterfield, Jeff (2010).Problem Solving& Decision Making, Course Technology.Cengage Learning.
4. Pellerin, Charles. J. (2009). How NASA Builds Teams: Mission Critical Soft Skills for Scientists, Engineers, and Project Teams. John Wiley & Sons. Inc.
5. Riggio & Sherylle J, Tan (2014). Leader Interpersonal and Influence Skills. Routledge.
6. Rutherford, J. Andrea (2000). Basic Communication Skills for Technology. Pearson Education.

(U/S 2(f) and 12B of the UGC Act1956, NAAC Accredited)

# DESH BHAGAT UNIVERSITY, MANDI GOBINDGARH

## Faculty of Engineering and Applied Science

### Department of Electrical Engineering

### Program: M. Tech

**Semester-IV**

| Sr. No | Course Code | Course Name | Category | Evaluation Criteria | L | T | P | C |
|---|---|---|---|---|---|---|---|---|
| 1. | MTEE - 401 | Dissertation | CC | Satisfactory/ Unsatisfactory | 0 | 0 | 32 | 16 |

**L- Lecture , T- Tutorial , P- Practical , C- Credits , CC- Core Course**

**Course Code: MTEE-401**

**Title of the Course: Dissertation**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 32 | 16 |

**Course Outcomes:**

CO1: Implement innovative ideas in the field of Electrical and Power Systems.
CO2: Prepare good technical project reports for publication in journals and conferences.
CO3: Enhance presentation skills

| CO/PO Mapping<br>(S-Strong Correlation, M- Medium Correlation, W-Weak Correlation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | Programme Outcomes (PO's) | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | S | M | W | S | M | M | W | S | M | S | W | S |
| CO2 | S | W | M | M | S | M | M | W | M | S | W | S |
| CO3 | M | S | S | M | S | W | W | S | S | W | S | M |