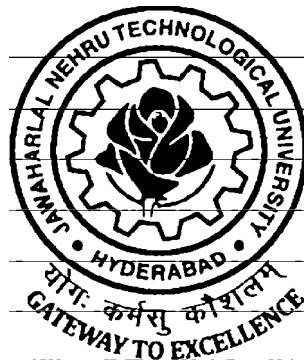


**ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS**

**M.TECH
POWER PLANT ENGINEERING
AND ENERGY MANAGEMENT**

(Applicable for the batches admitted from 2013-14)



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD – 500 085.**

ACADEMIC REGULATIONS R13 FOR M. TECH. (REGULAR) DEGREE COURSE**Applicable for the students of M. Tech. (Regular) Course from the Academic Year 2013-14 and onwards**

The M. Tech. Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the program and who fulfil all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

2.0 AWARD OF M. TECH. DEGREE

- 2.1 A student shall be declared eligible for the award of the M. Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years. However, he is permitted to write the examinations for two more years after four academic years of course work.
- 2.2 A student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his admission, shall forfeit his seat in M. Tech. course.
- 2.3 The student shall register for all 88 credits and secure all the 88 credits.
- 2.4 The minimum instruction days in each semester are 90.

3.0 A. COURSES OF STUDY

The following specializations are offered at present for the M. Tech. course of study.

1. Advanced Manufacturing Systems
2. Aerospace Engineering/ Aeronautical Engineering
3. Automation
4. Biomedical Signal Processing and Instrumentation
5. Bio-Technology
6. CAD/CAM
7. Chemical Engineering
8. Communication Systems
9. Computer Networks
10. Computer Networks and Information Security
11. Computer Science
12. Computer Science and Engineering
13. Computers and Communication Engineering.
14. Construction Management
15. Control Engineering
16. Control Systems
17. Cyber Forensic / Cyber Security & Information Technology
18. Design for Manufacturing/ Design and Manufacturing
19. Digital Electronics and Communication Engineering.
20. Digital Electronics and Communication Systems
21. Digital Systems and Computer Electronics
22. Electrical Power Engineering
23. Electrical Power Systems
24. Electronics & Instrumentation

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25. Electronics and Communication Engineering
 26. Embedded Systems
 27. Embedded Systems and VLSI Design
 28. Energy Systems
 29. Engineering Design
 30. Environmental Engineering
 31. Geoinformatics and Surveying Technology
 32. Geotechnical Engineering.
 33. Heating Ventilation & Air Conditioning.
 34. Highway Engineering
 35. Image Processing
 36. Industrial Engineering and Management
 37. Information Technology
 38. Infrastructure Engineering
 39. Machine Design
 40. Mechatronics.
 41. Microwave & Radar Engineering
 42. Nano Technology
 43. Neural Networks
 44. Parallel Computing
 45. Power and Industrial Drives
 46. Power Electronics
 47. Power Electronics and Electrical Drives
 48. Power Engineering and Energy Systems
 49. Power Plant Engineering & Energy Management
 50. Power System Control and Automation
 51. Power System with Emphasis H.V. Engineering / H.V. Engineering
 52. Production Engineering.
 53. Real Time Systems
 54. Software Engineering
 55. Structural Engineering
 56. Systems & Signal Processing
 57. Thermal Engineering.
 58. Transportation Engineering
 59. VLSI
 60. VLSI and Embedded System/ Electronics Design Technology
 61. VLSI Design
 62. VLSI System Design
 63. Web Technologies
 64. Wireless and Mobile Communication

and any other course as approved by the University from time to time.

3.0 B. Departments offering M. Tech. Programmes with specializations are noted below:

<p>Civil Engg.</p>	<p>Construction Management Environmental Engineering Geoinformatics and Surveying Technology Geotechnical Engineering Highway Engineering Infrastructure Engineering Structural Engineering Transportation Engineering</p>
<p>EEE</p>	<p>Control Engineering Control Systems Electrical Power Engineering Electrical Power Systems Power and Industrial Drives Power Electronics Power Electronics and Electrical Drives Power Engineering and Energy Systems Power Plant Engineering & Energy Management Power System Control and Automation Power System with Emphasis H.V. Engineering / H.V. Engineering</p>
<p>ME</p>	<p>Advanced Manufacturing Systems Automation CAD/CAM Design for Manufacturing/ Design and Manufacturing Energy Systems Engineering Design Heating Ventilation & Air Conditioning Industrial Engineering and Management Machine Design Mechatronics. Power Plant Engineering & Energy Management Production Engineering Thermal Engineering.</p>
<p>ECE</p>	<p>Biomedical Signal Processing and Instrumentation Communication Systems Computers and Communication Engineering. Digital Electronics and Communication Engineering. Digital Electronics and Communication Systems Digital Systems and Computer Electronics Electronics & Instrumentation Electronics and Communication Engineering Embedded Systems Embedded Systems and VLSI Design</p>

	Microwave & Radar Engineering Systems & Signal Processing VLSI VLSI and Embedded System/ Electronics Design Technology VLSI Design VLSI System Design Wireless and Mobile Communication
CSE	Computer Networks Computer Networks and Information Security Computer Science Computer Science and Engineering Cyber Forensic / Cyber Security & Information Technology Image Processing Information Technology Neural Networks Parallel Computing Real Time Systems Software Engineering Web Technologies
Aeronautical Engg.	Aerospace Engineering / Aeronautical Engineering
Bio-technology	Bio-Technology
Chemical Engg.	Chemical Engineering
Nano Technology	Nano Technology

4.0 ATTENDANCE

The programs are offered on a unit basis with each subject being considered a unit.

- 4.1 A student shall be eligible to write University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- 4.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be granted by the College Academic Committee.
- 4.3 Shortage of Attendance below 65% in aggregate shall not be condoned.
- 4.4 Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class and their registration shall stand cancelled.
- 4.5 A prescribed fee shall be payable towards condonation of shortage of attendance.
- 4.6 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- 4.7 A candidate shall put in a minimum required attendance at least in three (3) theory subjects in the present semester to get promoted to the next semester. In order to qualify for the award of the M. Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.
- 4.8 A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the previous semester including the days of attendance in sports, games, NCC and NSS activities.

5.0 EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

- 5.1 For the theory subjects 60 marks shall be awarded based on the performance in the End Semester Examination and 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a total duration of 120 minutes with Part A as compulsory question (16 marks) which consists of four sub-questions and carries 4 marks each and Part B with 3 questions to be answered out of 5 questions each question for 8 marks. If any candidate is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the University. The details of the Question Paper pattern for End Examination (Theory) is given below:
- The End semesters Examination will be conducted for 60 marks which consists of two parts viz. i).Part-A for 20 marks, ii). Part –B for 40 marks.
 - Part-A is compulsory question where it consists of five questions one from each unit and carries four marks each. This will be treated as Question 1.
 - Part-B consists of five Questions (numbered from 2 to 6) carries 8 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice (that means there will be two questions from each unit and the student should answer only one question)
- 5.2 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations and 40 marks shall be awarded based on the day-to-day performance as Internal Marks.
- 5.3 There shall be two seminar presentations during I year I semester and II semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.
- 5.4 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the students' understanding of various subjects he has studied during the M. Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.
- 5.5 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.
- 5.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.5) he has to reappear for the End semester Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and so has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stand cancelled.
- 5.7 In case the candidate secures less than the required attendance in any subject, he shall not be permitted to write the End Examination in that subject. He shall re-register the subject when next

offered.

- 5.8 Laboratory examination for M. Tech. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be another Laboratory Teacher.

6.0 EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

- 6.1 A Project Review Committee (PRC) shall be constituted with Principal as Chairperson, Heads of all the Departments offering the M. Tech. programs and two other senior faculty members.

- 6.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

- 6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Departmental Academic Committee for approval. Only after obtaining the approval of the Departmental Academic Committee can the student initiate the Project work.

- 6.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Departmental Academic Committee. However, the Departmental Academic Committee shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

- 6.5 A candidate shall submit his status report in a bound-form in two stages at least with a gap of 3 months between them.

- 6.6 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Principal through Head of the Department and make an oral presentation before the PRC.

- 6.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/School/Institute.

- 6.8 The thesis shall be adjudicated by one examiner selected by the University. For this, the Principal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.

- 6.9 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected.

- 6.10 If the report of the examiner is favourable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work as one of the following:

- A. Excellent
- B. Good
- C. Satisfactory
- D. Unsatisfactory

The Head of the Department shall coordinate and make arrangements for the conduct of Viva- Voce examination.

If the report of the Viva-Voce is unsatisfactory, the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva- Voce examination, he will not be eligible for the award of the degree.

7.0 AWARD OF DEGREE AND CLASS

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

Class Awarded	% of marks to be secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

The marks in internal evaluation and end examination shall be shown separately in the memorandum of marks.

8.0 WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

9.0 TRANSITORY REGULATIONS

- 9.1 Discontinued, detained, or failed candidates are eligible for admission to two earlier or equivalent subjects at a time as and when offered.
- 9.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R13 academic regulations.

10. GENERAL

- 10.1 Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- 10.2 The academic regulation should be read as a whole for the purpose of any interpretation.
- 10.3 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- 10.4 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct <i>If the candidate:</i>	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
 - (i) A show cause notice shall be issued to the college.
 - (ii) Impose a suitable fine on the college.
 - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH - POWER PLANT ENGINEERING AND ENERGY MANAGEMENT
COURSE STRUCTURE AND SYLLABUS

I Year I Semester

Code	Group	Subject	L	P	Credits
		Basic Power Plant Engineering	3	-	3
		Energy Scenarios	3	-	3
		Computational Fluid Dynamics	3	-	3
		Power Generation Methods	3	-	3
		Thermal and Nuclear Power Plants	3	-	3
	Elective -I	Material Management Power Plant Erection, Commissioning and Operation Advanced Testing Methods Energy Optimization Techniques	3	-	3
	Lab	Power Plant Engineering Lab-I	-	3	2
		Seminar	-	-	2
		Total Credits	18	3	22

I Year II Semester

Code	Group	Subject	L	P	Credits
		Advanced Power Plant Engineering	3	-	3
		Power Plant Instrumentation	3	-	3
		Power Plant Maintenance	3	-	3
		Energy Conservation	3	-	3
		Equipment Design for Thermal Systems	3	-	3
	Elective-II	Environment & Safety Engineering Power Plant Protection & Switch Gear Power Distribution System Power Plant Performance, Monitoring & Testing	3	-	3
	Lab	Power Plant Engineering Lab-II	-	3	2
		Seminar	-	-	2
		Total Credits	18	3	22

II Year - I Semester

Code	Group	Subject	L	P	Credits
		Comprehensive Viva	-	-	2
		Project Seminar	-	3	2
		Project work	-	-	18
		Total Credits	-	3	22

II Year - II Semester

Code	Group	Subject	L	P	Credits
		Project work and Seminar	-	-	22
		Total Credits	-	-	22

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

BASIC POWER PLANT ENGINEERING**UNIT- I:**

Introduction, Conventional & Non-Conventional Sources of Energy and their availability in India, Different Types of Power Plants, Choice of Type of Power Generation, Power Plants in India.

Thermal Power Generation : Operating Principle, Site selection, Coal to Electricity, General Layout of Thermal Power Plant, Brief description of different parts/systems and their functions, Advantages and Limitations.

UNIT- II:

Hydro Power Generation : Hydrology – Hydrographs, Flow Duration Curve, Mass Curve; Principle of working, Classification, Site selection; Different components & their functions; Types of Dams; Types, Characteristics & Selection of Hydro-Turbines; Specific Speed of Hydro-Turbines; Power Output Equation; Turbine Governing; Draft Tube; Bearings; Water Hammer & Surge Tank, Cavitation, General arrangement and Operation of Hydro-electric Power Plant, Mini & Micro Hydro Power Plants, Pumped Storage Power Plants; Advantages of Hydro-electric Power Plants; Hydro Power in India & future trends.

UNIT- III:

Diesel & Nuclear Power Generation : Applications of Diesel Engine, Advantages & disadvantages, Types of Diesel Plants, General Layout, Combustion in CI Engines, Performance Characteristics, Supercharging, Layout of a Diesel Engine Power plant, Principle of Nuclear Energy, Nuclear Power Plant Components & their Functions; Nuclear Fuels, Radioactivity, Nuclear Reaction & Classification.

UNIT- IV:

Gas Power Generation : Operating Principle; Classification – Open Cycle, Closed Cycle, Combined Cycle; Fuels for Gas Turbine Power Plants; Different Components and their functions; Gas Turbine Characteristics, Cycle Efficiency, Operational Aspects, Advantages and Limitations.

UNIT- V:

Energy Storage: Pumped hydro, Compressed Air Energy Storage(CAES), Flywheel energy storage, Electrochemical Energy Storage, Thermal Energy Storage, Magnetic Energy Storage, Chemical Energy Storage, Hydrogen Energy storage.

REFERENCES :

1. Power Plant Engineering – P.C.Sharma / S.K.Kataria Pub.
2. A Course in Power Plant Engineering: / Arora and S. Domkundwar.
3. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications.
4. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
5. An Introduction to Power Plant Technology / G.D. Rai/Khanna Publishers.
6. Power plant Engg / Elanchezhian/ I.K. International Pub.
7. Power plant Engineering/ Ramalingam/ Scietech Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

ENERGY SCENARIOS

UNIT-I

Global Energy Scenario: Role of energy in economic development and social transformation: Energy & GDP, GNP and its dynamics. Discovery of various energy sources: Energy Sources and Overall Energy demand and availability, Energy Consumption in various sectors and its changing pattern, Exponential increase in energy consumption and Projected future demands.

Energy Resources: Coal, Oil, Natural Gas, Nuclear Power and Hydroelectricity, Solar and Other Renewable etc. Depletion of energy sources and impact exponential rise in energy consumption on economies of countries and on international relations.

UNIT-II

Energy Security: Chemical and Nuclear: Non Proliferation, Energy Security, Energy Consumption and its impact on environmental climatic change.

International Energy Policies of G-8 Countries, G-20 Countries, OPEC Countries, EU Countries. International Energy Treaties (Rio, Montreal, Kyoto), INDO-US Nuclear Deal. Future Energy Options: Sustainable Development, Energy Crisis: Transition from carbon rich and nuclear to carbon free technologies, parameters of transition.

UNIT-III

Indian Energy Scenario: Energy resources & Consumption: Commercial and noncommercial forms of energy, Fossil fuels, Renewable sources including Bio-fuels in India, their utilization pattern in the past, present and future projections of consumption pattern, Sector wise energy consumption Impact of Energy on Economy, Development and Environment, Energy for Sustainable Development, Energy and Environmental policies, Need for use of new and renewable energy sources.

UNIT-IV

Status of Nuclear and Renewable Energy: Present Status and future promise Energy Policy Issues: Fossil Fuels, Renewable Energy, Power sector reforms, restructuring of energy supply sector, energy strategy for future. 5th Energy Conservation Act-2001 & its features, Electricity Act-2003 & its features. Framework of Central Electricity Authority (CEA), Central & States Electricity Regulatory Commissions (CERC & ERCs).

UNIT-V

Energy Policy: Global Energy Issues, National & State Level Energy Issues, National & State Energy Policy, Industrial Energy Policy, Energy Security, Energy Vision. Energy Pricing & Impact of Global Variations, Energy Productivity (National & Sector wise productivity).

REFERENCES:

1. Energy for a sustainable world/ Jose Goldenberg/Thomas Johansson, A.K.N.Reddy Robert Williams/ Wiley Eastern.
2. Energy policy/ B.V.Desai/Weiley Eastern
3. Modeling approach to long term demand and energy implication /J.K.Parikh.
4. Energy Policy and Planning/B.Bukhootsow.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

COMPUTATIONAL FLUID DYNAMICS

UNIT - I

Introduction: Finite difference method, finite volume method, finite element method, governing equations and boundary conditions, Derivation of finite difference equations.

Solution Methods: Solution methods of elliptical equations — finite difference formulations, interactive solution methods, direct method with Gaussian elimination. Parabolic equations-explicit schemes and Von Neumann stability analysis, implicit schemes, alternating direction implicit schemes, approximate factorization, fractional step methods, direct method with tridiagonal matrix algorithm.

UNIT – II

Hyperbolic Equations: explicit schemes and Von Neumann stability analysis, implicit schemes, multi step methods, nonlinear problems, second order one-dimensional wave equations. Burgers equations: Explicit and implicit schemes, Runge-Kutta method.

UNIT - III

Formulations of Incompressible Viscous Flows: Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods.

Treatment of Compressible Flows: potential equation, Euler equations, Navier-stokes system of equations, flow field-dependent variation methods, boundary conditions, example problems.

UNIT - IV

Finite Volume Method: Finite volume method via finite difference method, formulations for two and three-dimensional problems.

UNIT - V

Standard Variational Methods: Linear fluid flow problems, steady state problems, Transient problems.

REFERENCES:

1. Computational fluid dynamics/ T. J.C'hung/ Cambridge University press,2002.
2. Text book of fluid dynamics/ Frank Choriton/ CBS Publishers & distributors, 1985.
3. Numerical heat transfer and fluid flow / Suhas V. Patankar/ Hema shava Publishers corporation & Mc Graw Hill.
4. Computational Fluid Flow and Heat Transfer/ Muralidaran/ Narosa Publications.
5. Computational Fluid Dynamics: Basics with applications/John D. Anderson/ Mc Graw Hill.
6. Fundamentals of Computational Fluid Dynamics/Tapan K. Sengupta / Universities Press.
7. Introduction to Theoretical and Computational Fluid Dynamics/C. Pozrikidis /Oxford University Press/ 2nd Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

POWER GENERATION METHODS

UNIT - I

Solar Energy: Availability of solar energy, Measurement of sunshine, solar radiation data, estimation of average solar radiation, the black body, absorptance and emittance, Kirchoff's law. Reflection from surfaces, Solar energy selection, selective surfaces, Construction of solar flat plate and evacuated tube collectors, Performance of solar energy collectors, Solar heating and cooling.

UNIT - II

Wind Energy: wind mills and wind turbine systems, Classification of wind machines: Horizontal & Vertical axis configuration. High and low solidity rotors, Elements of wind mills and wind turbine systems, Aerodynamic models, Rankine Froud Actuator disc model, Betz limit, angular momentum wake rotation theory, Aerofoil sections and their characteristics, Estimation of power output and energy production – gust parameters.

UNIT - III

Ocean Thermal Energy: Ocean thermal energy sources, Ocean thermal energy power plant development, Closed and open cycles. Advantages and operating difficulties.

Tidal & Wave Energy: Tidal power sources, Conventional and latest design of tidal power system, The ocean wave, Oscillating water column (Japanese) and the Dam, Atol design.

UNIT - IV

Geothermal Energy: Earth as source of heat energy, stored heat and renewability of earth's heat, Nature and occurrence of geo thermal field, Classification of thermal fields, Model of Hyper thermal fields & Semi thermal fields, Aims of exploration, drilling hot water measurements, Heat & Power capacity of a bore.

Fuel Cell Energy: Description, properties and operation of fuel cells, Major components & general characteristics of fuel cells, Description of low power fuel cell systems, portable fuel cell systems. Indirect methanol fuel cell systems. Phosphoric acid fuel cell systems and molten carbonate fuel cell systems.

UNIT - V

Photo Voltaic Energy: solar cells. Photovoltaic conversion efficiency, Performance characteristics of solar cells as a function of light intensity, temperature and cell area, Solar cell response under normal condition, solar cell arrays, energy calculation of solar cells, Methods of concentration.

Biomass Energy: Types of conversion techniques for the production of solid, liquid and gaseous fuels by chemical and biochemical methods - Technology of biogas, - Principles and feed stock Design of bio-gas plants - Biomass gasifiers- Selection of a model and size, Technical, Climatic, geographical and economic issues.

REFERENCE:

1. Principles of Solar Engineering/ F.Kreith&J.F.Krieder/McGraw Hill Book Co.
2. Non conventional sources of energy / GD Rai /Khanna Publishers.
3. Photo Voltaic Energy Systems, Design&Applications/ Mathew Buresch/ Mc Graw Hill Book Co.
4. Bio Gas Technology - Practical Hand Book/ K.C.Khendelwal & S.S.Mahdi /McGraw Hill Book Co.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

THERMAL AND NUCLEAR POWER PLANTS

UNIT -I:

Introduction: Sources of energy, Type of Power plants. Direct energy conversion system, Energy sources in India, Recent developments in power generation, Combustion of coal, Volumetric analysis, Gravimetric analysis. Fuel gas analysis.

Steam Power Plant: Introduction. General layout of steam power plant, Modern coal. Fired Steam, Steam power plant. Power plant cycle, Fuel Handling, Combustion equipment, Ash handling, Dust collectors.

Steam Generators: Types, Accessories. Feed water heaters, Performance of boiling, Water treatment, Cooling towers. Steam turbines. Compounding of turbines, Steam condensers, Jet and surface condensers.

UNIT-II:

Gas Turbine Power Plant: Cogeneration. Combined cycle power plant, Analysis, Waste heat recovery, IGCC power plant, Fluidized bed, Combustion, Advantages, Disadvantages

UNIT-III:

Nuclear Power Plant: Nuclear physics, Nuclear Reactor, Classification, Types of reactors, Site selection. Method of enriching uranium. Application of nuclear power plant. Nuclear Power Plant Safety: Bi-Product of nuclear power generation, Economics of nuclear power plant, Nuclear power plant in India, Future of nuclear power.

UNIT-IV:

Economics of Power Generation: Factors affecting the economics, Loading factors, Utilization factor, Performance and operating characteristics of power plant, Point economic load sharing, Depreciation. Energy rate, Criteria for optimum loading. Specific economic energy problem

UNIT-V:

Power Plant Instrumentations: Classification, Pressure measuring instrument, Temperature measurement and Flow Measurement, Analysis of combustion gases, Pollution types, Methods of control.

REFERENCES:

1. Power Plant Engineering / P.K.Naga / TMH.
2. Power Plant Engineering / R.K.Rajput/ Lakshmi Publications.
3. Power Plant Engineering / P.C.Sharma/ Kotearia Publications.
4. Power Plant Technology / Wakil.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

MATERIAL MANAGEMENT**(Elective-I)****UNIT-I**

Introduction to Integrated Materials Management - need, scope, functions, objectives and Importance of Materials Management, Purchasing function - Objectives and scope of purchasing - purchase budget and materials budget - purchase order cycle - Source selection and development - Negotiations In purchasing - public buying - Just in Time concept.

UNIT – II

Imports - Import trade control, foreign trade (Development and Regulations) Act and Rules -Import Procedures - Importation cycle, Inventory Management- Functions - Associated Costs - Classification – ABC VED - FSN analysis - Basic BOQ model.

UNIT -III

Inventory control systems - Periodic Review - P system and Continuous review systems – Q systems - Lead-time analysis - Reorder point level Calculations, MRP - Introduction - Terminology - Types of demand input to the MRP -Working Principle of MRP - Output of MRP - advantages and disadvantages.

UNIT-IV

Stores Management- Stores function - types of stores - storage procedures- stock Verification and stock accounting - stores records - Disposal of Surplus, scrap, reclamation and salvage of materials.

UNIT-V

Material Handling: layout, selection of equipment, principles of materials handling - Packaging, types of material handling equipment.

REFERENCES:

1. Purchasing and Materials Management/ P Gopalakrisnan / TMH.
2. Industrial Engineer in g and Management/ Ravi Shankar / Galgotia Publicatons / 2003.
3. Production & Operations Management/ Chase / Mc Graw Hill.
4. Purchasing and Materials Management/ Lamar Lee & Donald W. Dobler / McGraw Hill.
5. Materials Management / Chitle A. K / PHI Learning.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

POWER PLANT ERECTION, COMMISSIONING AND OPERATION

(Elective-I)

UNIT- I

Preparation of commissioning, trial run of various equipments, commissioning of valves, air and gas tightness test of boiler. Chemical cleaning boiler, preparation for boiler light up, thermal flow test of water walls and economizers, steam blowing.

UNIT- II

Safety valves setting, reliable run of boiler. Hydraulic test of boiler. Alkaline flushing and commissioning of regenerative system, acid cleaning of oil pipe lines, oil flushing procedure of lubricating oil and governing system.

Turbine Lubricating oil flow testing steam blowing, reheater safety valve, vacuum tightness test, ejector testing.

UNIT- III

Commissioning of governing system and ATRS & ATT, and TSE. Commissioning of generator and auxiliaries (Generator testing, rotor and stator cooling system, excitation system) Commissioning of electrical system (Circuit breakers, isolators, CT and PT, rectifiers, switchgear, DC System).

C&I Commissioning activities (Minimum instrumentations required for major C&I commissioning, commissioning of control valve, tuning of control valves). Discussion/Appraisal.

UNIT- IV

Power Plant Operation: Availability of electrical supply to the equipment (source feeder of each equipment, points of isolation of the equipment, locking during isolation, permit to work system). Boiler pre light up checks. (Meaning of light up, shut down, tripping, starting etc., No pending permits, local checks). Operation of service auxiliaries (cooling water pump, compressors, auxiliary steam, fuel oil pump). Operation of air-pre heater and ID fan)(Rechecks, flow path line up, permissives, interlocks).

UNIT- V

Operation of FD & PA Fans (pre checks, flow path line up permissives, interlocks). Mill operation (pre checks, flow path line up, permissives, interlocks). FSSS (Secondary air, burner tilt, fuel and air control).

Drum level control, Super Heater, Re-Heater, temperature control and their interlocks. Operation of turbine lubricating system and barring gear. Operation of condensate and feed water system (BFP, Heaters CEP). HP/LP Bypass operation and turbine heating. Turbine rolling and synchronization. Operation of generator cooling system (stator and hydrogen cooling). Operation of Generator excitation system AVR. Operation of Turbine governing system. Integrated operation of unit (unit loading and shut down sequence) Operational difference between cold start up, warm start up and hot start up. Load dispatching and coordination with load dispatch center.

REFERENCE:

1. Power plant operation/ NPTI Publication.
2. Power Plant Engineering/P.K.Nag/TMH.
3. BHEL manual.
4. CEGB Manual on power Plant Operation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

ADVANCED TESTING METHODS

(Elective-I)

UNIT- I:

Ultra Sonic Hardness Testing: Flaw Detection Using Dye Penetrates. Magnetic Particle Inspection introduction to electrical impedance, Principles of Eddy Current testing, Flaw detection using eddy currents.

UNIT- II:

Introduction to X-ray Radiography: The Radiographic process, X-Ray and Gamma-ray sources, Geometric Principles, Factors Governing Exposure, Radio graphic screens, Scattered radiation, Arithmetic of exposure, Radiographic image quality and detail visibility, Industrial X-Ray films,

X-Ray Radiography Processes: Fundamentals of processing techniques, Process control, The processing Room, Special Processing techniques, Paper Radiography, Sensitometric characteristics of x-ray films, Film graininess signal to noise ratio in radiographs, The photographic latent image, Radiation Protection,

UNIT- III:

Introduction to Ultrasonic Testing: Generation of ultrasonic waves, Horizontal and shear waves, Near field and far field acoustic wave description, Ultrasonic probes straight beam, direct contact type, Angle beam, Transmission/reflection type, and delay line transducers, acoustic coupling and media

UNIT- IV:

Ultrasonic Tests: Transmission and pulse echo methods, A-scan, B-scan, C-scan, F-scan and P-scan modes, Flaw sizing in ultrasonic inspection: AVG, Amplitude, Transmission, TOFD, Satellite pulse, Multi-modal transducer, Zonal method using focused beam. Flow location methods, Signal processing in Ultrasonic NDT; Mimics, spurious echos and noise. Ultrasonic flaw evaluation.

UNIT- V:

Holography: Principles and practices of Optical holography, acoustical, microwave, x-ray and electron beam holography techniques.

Applications - I: NDT in flaw analysis of Pressure vessels, Piping: Applications - II: NDT in Castings, Welded constructions, etc., Case studies.

REFERENCE:

1. Ultrasonic testing/Krautkramer and Krautkramer /Springer-verlag.
2. Ultrasonic inspection & Training for NDT/E. A. Gingle/Prometheus Press.
3. ASTM Standards/Vol 3.01/Metals and alloys.
4. Industrial Radiology:Theory & Practice/R HalmShaw/ Chapman & Hall Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

ENERGY OPTIMIZATION TECHNIQUES

(Elective-I)

UNIT – I

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

UNIT – II

Classical Optimization Techniques : Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum –multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT – III

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT – IV

Unconstrained Nonlinear Programming: One – dimensional minimization methods: classification, Fibonacci method and Quadratic interpolation method. Unconstrained Optimization Techniques: Univariate method, Powell's method and steepest descent method. Constrained Nonlinear Programming: Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem.

UNIT – V

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

REFERENCE:

1. Engineering optimization: Theory and practice/ S. S.Rao/ New Age International (P) Limited/3rd edition/1998.
2. Introductory Operations Research/H.S. Kasene & K.D. Kumar/Springer(India), Pvt .Ltd.
3. Operations Research /S.D.Sharma/ Kedarath, Ramnath & Co.
4. Linear Programming/ G. Hadley / Addison-Wesley Pub. Co.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -I Sem. M.Tech. (PPE&EM)

POWER PLANT ENGINEERING LAB-I

Computer implementation – modeling and problems of Solving power plant Engineering problems using available packages such as T K Solver, ANSYS, CFX, STARCD, MATLAB, FLUENT, LAB VIEW etc...

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

ADVANCED POWER PLANT ENGINEERING

UNIT-I

Introduction, Types of Turbo machines, Applications of Turbo machines, Performance Characteristics, Methods of Analysis: Dimensional Analysis: Dimensions and Dimensional Homogeneity, Buckingham Pi Theorem, Other Non-dimensional Parameters for Turbo machines, Similarity Laws:

Energy Transfer in Turbo Machines: Review on Fluid Mechanics Related to Turbo machinery, Energy in Flowing Fluids, Euler Equations, Equations for Axial Flow Machines, Equations for Mixed and Radial Flow Machines. Degree of Reaction

UNIT-II

Centrifugal Pumps: Basic Construction and Classification, Basic Working Principles, Performance Characteristics, Cavitation, Performance Modifications, Preliminary Design Procedure, Pump Performance Tests Axial Flow Pumps and Fans: Introduction, Flow over Isolated Airfoils, Axial Flow Cascade, Preliminary Design Procedure, Propellers

UNIT- III

Centrifugal Fans Blowers and Compressors: Classification Performance Parameters and Characteristics, Change of Performance, Polytropic Efficiency, Preliminary Design of Centrifugal Compressors

Axial Flow Compressors: Introduction. Basic Theory, Preliminary Design of Compressor Stage, Determination of Stage Efficiency, Axial Flow Compressor Performance, Surge and Stall in Compressor and the Remedies

UNIT- IV

GAS TURBINES: Introduction, Thermodynamics of Axial Flow Turbine, Degree of Reaction, Preliminary Design Procedure for Turbine Stage, Determination of Turbine Stage Efficiency, Axial Flow Turbine Performance, Compressor, Turbine Matching, Radial Inflow Gas Turbine, Thermodynamic Processes in Radial Inflow Gas Turbine.

UNIT- V

Wind Turbines: Introduction to Wind Power, Actuator Theory, Types of Wind Turbines, Wind Turbines Characteristics and Preliminary Design Analysis, Variable Speed Performance of Wind Turbines, Wind Turbine Applications.

REFERENCE:

1. Fundamentals of Turbo machinery/William W Perg/John Wiley & Sons, Inc.
2. Principles of Turbo Machinery/D. G. Shepherd/The Macmillan Company.
3. Mechanics and thermodynamics of Propulsion/Philip Hill and Carl Peterson /Prentice Hall.
4. Gas Turbines/Ganesan/V Tata McGraw-Hill Pub.Co.Ltd./New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

POWER PLANT INSTRUMENTATION

UNIT I

Introduction, Fundamentals of generation of Electricity, its transmission and Distribution. Concept of regional and national power grid. Concept of distance protections and Island types of power plant , introduction and comparison of thermal Power plant, Hydro Electric Power Plant, Nuclear Power Plant, Solar Power Plant. Flow sheet of thermal power plant.

UNIT II

Thermal Power Plant : Unit overview,air and fuel path, boiler instrumentation, Combustion control, air to fuel ratio control, 3-element drum level control, steam temperature and pressure control, oxygen/CO₂ in flue gases, furnace draft, boiler interlocks, Start-up and shut-down procedures Boiler load calculation, boiler efficiency calculation. Boiler safety standard.

UNIT III

Non-conventional Energy Sources: Concept of power generation from non-conventional sources of energy like wind power, Solar Power and Tidal waves. Photovoltaic cells, Hydrogen cells. Criterion for selection of Instrumentation system for wind and solar and tidal wave plant.

UNIT IV

Hydro Power Plant: Overview on units, Types of water turbine. Regulation of speed and voltage. Surge tank level control.

Nuclear Power Plant: Overview on units, Concept of energy generated from atomic fission. Block diagram of an Atomic power station. Types of coolants. Control of chain reaction. Radio activity and safety measures. Layout of control rooms.

Criterion for selection of Instrumentation system / DCS system for nuclear and hydro power plant.

UNIT V

Turbine Instrumentation and Control: Elements Of Control Systems Introduction, Importance – Classification – Open and closed systems Servomechanisms–Examples with block diagrams–Temperature, speed & position control systems, Hydraulically controlled speed governing and turbine steam inlet control valve actuation system. Condenser vacuum control- gland steam exhaust pressure control speed, vibration, shell temperature monitoring-lubricating oil temperature control hydrogen generator. Start-up and shut-down, thermal stress control, condition monitoring and power distribution instrumentation. Synchronous, Induction generators cooling system.

REFERENCE:

1. Handbook of Instrumentation and Control/H. Kallen/McGraw-Hill Education.
2. Power plant Engineering/F. Morse/Khanna Publishers.
3. Modern Power Plant Engineering/J. Balasubramaniam and R. Jain/Khanna Publishers.
4. O & M manuals of power plant/Bharat Heavy Electricals Ltd.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

POWER PLANT MAINTENANCE

UNIT-I

Boiler and its accessories, Boiler structure steel work – Importance, Inspection and maintenance aspects, Problems in structure works & hanging arrangements.

Boiler pressure parts

Economizer: Tube size, material, spacing and their alignment; Causes and effects of erosion & corrosion on tubes; Causes for failure of economizer tubes; Inspection for damage of tubes and their repair /replacement methods.

Boiler Drum & Drum Internals: Different connections to boiler drum & their Maintenance, Instrumentation tapings, Safety valves and air vents Problems, Causes and Remedies.

UNIT -II

Water Wall Tube Arrangement: Tube materials, spacing and connections, Expansion & Sealing of boiler bottom and prevention of dust accumulation in seal chamber, Effect of water, erosion & corrosion on water wall tubes, Inspections of water valve tubes, Causes of tube failures, Repair/Replacement Procedures of punctured / damaged tubes, Procedure for alkali boil out & acid cleaning, preservation & flushing, Hydraulic statics test.

Superheaters - Causes of tube failures, Pattern of tube punctures and their repair / welding / replacement procedures, Different types of welding utilized. **Re-heaters** -Inspections of tubes for erosion and corrosion & failures.

Boiler draught system

Draught Fans – ID Fan, FD Fan, PA Fan and their ducts, Causes of erosion and corrosion, Remedial action, Vibration analysis, Bearing/ coupling Maintenance and Shaft Alignment.

Air Pre-Heater - Seal arrangement settings & replacement, Cold end corrosion in Air heaters, Causes & remedies, Driving Unit and its maintenance. SCAPH - Inspection of tubes for erosion and corrosion.

UNIT -III

Soot Blower Maintenance, Pulverisers & Raw Coal Feeders: Pulverisers -Setting of spring assembly, Fitting of bearings and rollers on journals shaft, Mounting worm gear and shaft, Lubrication system of mills, Setting of classifier vanes, Repair of discharge dampers, Major problems encountered in coal mills & their causes and remedies, Constructional details working and maintenance aspect of driving units and PIV gearbox, Maintenance of coal flow indicators & inlet gate of coal, Maintenance of coal carrying system, i.e. drag link chain / conveyers / rotating blades.

Coal handling plant & ash handling plants maintenance - Coal handling machines –their working and maintenance aspects, Bunker & Chutes- Effect of erosion and corrosion due to coal and their rectification, Coal crusher- Maintenance problems and repairs.

UNIT- IV

Turbine Maintenance: Pre-checks & dismantling sequence of Turbine Measurement of clearances, Checking the conditions of babbit metal for score pitting, chipping of or lack of bondage between the babbit and the shell, Checking of turbo supervisory instrument for total expansion & differential expansion, Checking of turbine cylinders for cracks/ deformation, Turbine support arrangements, Cleaning inspection and NDT, Centering of shafts, Alignment of rotors of HP, IP & LP rotors w.r.t. generator, Turbine generating system &

control valves and governors, Inspection of barring gears, Vibration analysis, Turbine insulation inspection.

Turbine Auxiliaries Maintenance: Boiler feed pump, C.W. pump, Feed Heaters- LP & HP Heater, Condensers- Inspection cleaning & repair of tubes, Chemical dosing pumps- reciprocating pumps, Condensate extraction pump, Construction & function of each part and maintenance problems of all equipments, Removal of complete cartridge of boiler feed pump, Inspection of shaft, bearings, seals, glands, balancing arrangements and ever rings, Dismantling & mounting of bearings, Maintenance of Hydraulic coupling, Alignment of pumps, Trouble shooting of pumps.

UNIT- V

Generator Maintenance: Stator & Rotor maintenance, Vibration monitoring, Hydrogen leakage, Rotor earth fault detection, Excitation system maintenance.

Electrical Plant & Auxiliary Equipment Maintenance –Switchgears, Isolators, Motors, Transformers, Batteries, Cable & earthing Actuators. Major Maintenance aspects of Hydro-electric/Gas Power Stations.

REFERENCE:

1. Modern Power Station Practice/C.E.G.B./ Vol-III.
2. Operator's hand book/CEGB.
3. NPTI Manual on Power Plant Maintenance.
4. BHEL Operation & Maintenance Manual.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

ENERGY CONSERVATION

UNIT-I

General Aspects: Need for energy conservation and management, first and second law of thermodynamics of energy transfer, availability analysis of various thermodynamics processes/devices/cycles.

UNIT-II

Thermodynamics of Energy Conservation: Basic principle Irreversibility in combustion, first and second law of combustion, efficiency analysis of systems, Primary energy sources, optimum use of prime-movers, energy efficient housekeeping, thermal insulation, economic thickness of insulation.

UNIT-III

Waste Heat Recovery Techniques: Sources of waste heat and its potential applications, Waste heat survey and measurements, Data collection, Limitations and affecting factors Heat recovery equipment and systems;

Heat Exchangers-Shell & Tube compact, Regenerators and Recuperators.

Waste Heat boilers. System Integration.

UNIT-IV

Load Curve Analysis & Load Management: Energy storage for power systems (Mechanical, Thermal, Electrical & Magnetic) Restructuring of electric tariff from energy conservation consideration, Economic analysis depreciation method, time value of money, Evaluation method of projects, replacement analysis, special problems inflation risk analysis. Pay back period, Energy economics, Cost Benefit Risk analysis.

Energy Efficient Electric Drives: Energy efficient motors V.S.D. power factor improvement in power system, Energy Conservation in transportation system especially in electric vehicle. Energy flow networks, Simulation & modeling, formulation & Objective & constraints, alternative option, Matrix chart.

UNIT-V

Energy Conservation In Industry: Energy conservation equipments, Co-generation, Energy Conservation in Sugar, Textiles, Cement, Process Industry. Electrical Energy Conservation in building, heating, lighting, domestic gadgets.

REFERENCE:

1. Energy Management/W.R.Murphy, G.Mckay/Butterworths.
2. Energy Management Principles/C.B.Smith/ Pergamon Press.
3. Energy Economics/A.V.Desai/Wieley Eastern.
4. Industrial Energy Management and Utilization/L.C. Witte, P.S. Schmidt, D.R. Brown/ Hemisphere Publication/Washington.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

EQUIPMENT DESIGN FOR THERMAL SYSTEMS

UNIT -I

Classification of Heat Exchangers: Introduction, Recuperation & regeneration, Tabular heat exchangers, Double pipe, shell & tube heat exchanger, Plate heat Exchangers, Gasketed plate heat exchanger. Spiral plate heat exchanger, Lamella heat exchanger, Extended surface heat exchanger, Plate fin and Tabular fin.

Basic Design Methods of Heat Exchanger: Introduction, Basic equations in design, Overall heat transfer coefficient, LMTD method for heat exchanger analysis, Parallel flow, Counter flow. Multipass, cross flow heat exchanger design calculations:

UNIT-II

Double Pipe Heat Exchanger: Film coefficient for fluids in annulus, fouling factors, Calorific temperature, Average fluid temperature, The calculation of double pipe exchanger, Double pipe exchangers in series parallel arrangements.

Shell & Tube Heat Exchangers: Tube layouts for exchangers, Baffle heat exchangers, Calculation of shell and tube heat exchangers, Shell side film coefficients, Shell side equivalent diameter, The true temperature difference in a 1-2 heat exchanger. Influence of approach temperature on correction factor. Shell side pressure drop, Tube side pressure drop, Analysis of performance of 1-2 heat exchanger and design of shell & tube heat exchangers, Flow arrangements for increased heat recovery, the calculation of 2-4 exchangers.

UNIT-III

Condensation of Single Vapours: Calculation of horizontal condenser, Vertical condenser, De-Super heater condenser, Vertical condenser-sub-Cooler, Horizontal Condenser-Sub cooler, Vertical reflux type condenser. Condensation of steam.

UNIT-IV

Vaporizers, Evaporators and Reboilers: Vaporizing processes, Forced circulation vaporizing exchanger, Natural circulation vaporizing exchangers, Calculations of a reboiler. Extended Surfaces: Longitudinal fins. Weighted fin efficiency curve, Calculation of a Double pipe fin efficiency curve. Calculation of a double pipe finned exchanger, Calculation of a longitudinal fin shell and tube exchanger.

UNIT-V

Direct Contact Heat Exchanger: Cooling towers, relation between wet bulb & dew point temperatures, The Lewis number and Classification of cooling towers, Cooling tower internals and the roll of fill, Heat Balance. Heat Transfer by simultaneous diffusion and convection, Analysis of cooling tower requirements, Design of cooling towers, Determination of the number of diffusion units, Calculation of cooling tower performance.

REFERENCES:

1. Process Heat Transfer/D.Q.Kern/ TMH.
2. Heat Exchanger Design/ A.P.Fraas and M.N.Oziscij/ John Wiely & sons, New York.
3. Cooling Towers/ J.D.Gurney.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

ENVIRONMENTAL AND SAFETY ENGINEERING

(Elective-II)

UNIT-I

Pollution: Air Pollution Standards; Effects of Air Pollutants on Materials, Vegetation and Health Origin and Fate of Pollutants (Carbon monoxide, Hazardous Air Pollutants, Lead, Nitrogen Dioxide, Photochemical Oxidants, Sulphur Oxides, Particulates) Acid Rain, Ozone depletion & Greenhouse effect.

Waste Water Treatment : Waste water Microbiology, Characteristics of Waste Water, Municipal and Industrial waste water treatment, Unit operation of Pretreatment, Primary Treatment, Unit processes of Secondary treatment, disinfections, Land treatment, Sludge treatment and disposal.

UNIT- II

Solid Waste Management: Waste characteristics, Disposal by Sanitary landfill, thermal conversion; combustion or incineration system, Pyrolysis, Gasification, Pelletization. Waste to Energy, Resource conservation and recovery, Biological processing of Solid wastes.

Hazardous Wastes Management : Characteristics of Hazardous Waste, Management of Hazardous Waste; Chemical. Oxidation, vitrification, Hazardous wastes landfills, Radioactive waste; Detection and analysis, classification and disposal of Radioactive Wastes, Fly ash characteristics and disposal, Site remediation techniques.

UNIT -III

Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

UNIT- IV

Industrial Safety: Accidents (Causes & Factors, Cost of Accidents, Accident Prevention, Investigation of Accidents, Reporting and Recording Systems for Accidents. First Aid (Basics of First Aid, How injuries are caused in lifting, falls etc.)

Fire Fighting: Fundamentals of Fire, Fire Fighting Equipments and Systems, Fire Extinguishing Methods, Demonstration of various Fire

UNIT -V

Industrial Hazards, Protective Clothing and Equipment, Safe Working Practices in Power Plant, Permit to work system, Safety in Movement and storage of Materials, House Keeping, Safety Rules.

REFERENCE:

1. Energy Management/Murphy WR, Mc Kay G/Butterworth Heinamn/2009.
2. Environmental Engg: A Design Approach / Sincereo &Arcadio P/ PHI.
3. Environmental Engineering: Water Supply, Sanitary Engineering and Pollution/ Kamala A Rao/TMH.
4. Environmental Engineering/Dean J, Horward S/McGraw Hill/1985.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

POWER PLANT PROTECTION & SWITCH GEAR

(Elective-II)

UNIT - I

Protection System : Importance of protective relaying in power systems; Fundamental requirements of a good protection scheme; Zones of protection, Primary and Back-up Relaying.

Protective Relays: Terms used in protective relaying; Classifications of Relays – Constructional, Functional; Electromagnetic Relays – attracted armature, induction disc, induction cup types relays

UNIT-II

Over current and Earth fault relays, Directional, Differential, Distance Relays etc.; Principles & Characteristics of relays; Operation, setting, testing and applications, maintenance requirements of relays; Translay relay; Negative Sequence relays; Universal Relay Torque Equation; Electronic relays; Static relays; Digital relays; Microprocessor and PC based relaying; Current & Future trends.

UNIT-III

Switchgear Circuit Interruption : Fuses - Types of fuses, Terms (Fusing factor, Breaking capacity etc.), Fuse selection, HRC fuses and their applications; Arcing phenomena, Essential properties of arc, Initiation and Maintenance of an arc, Arc voltage, Arc interruption theories, Recovery and Restriking voltages, Rate of Rise of Restriking Voltage (RRRV), Resistance Switching, Inductive current chopping, Capacitive current breaking.

Circuit Breakers : AC and DC circuit breaking, Types of Circuit Breakers - ACB, OCB, ABCB, SF6CB, VCB; Static Circuit Breakers; Comparative merits and demerits of different types of CBs, Rating of Circuit Breakers, Testing and Selection of Circuit Breakers, Auto reclosing.

UNIT-IV

Power Plant Protection:

Protection Schemes: Schemes for protection of transmission line; Merz-Price circulating current scheme, Percentage differential relay, Restricted earth fault protection, Negative Sequence protection, Translay scheme, Carrier relaying scheme, Pilot relaying scheme, Static and other relays used in transmission line protection.

Generator Protection : Neutral earthing, stator and rotor earth faults, sustained external faults, instability, protective systems.

Transformer Protection : Various transformer protections, protective systems for Generator Transformers (GTs), Unit Auxiliary Transformers (UATs) and Station Transformers (STs).

UNIT-V

Motor Protection : Faults and Protection systems.

Busbar Protection : Continuity of supply, Discrimination, Circulating current systems, special features relating to different voltage systems.

Feeder Protection : Continuity of supply discrimination, outline of protection systems – Pilot wire, carrier current, distance protection, PLCC – Telemetry Communication.

REFERENCE:

1. The Electricity Council: Power System Protection/ Vol.1, 2 & 3/Peter Peregrinus Ltd./1990.
2. Protective Relays : Their Theory and Practice/ Vol. 1 & 2/ Van, A. R., & Warrington, C / Chapman and Hall, 1969.
3. Transmission Network Protection : Theory and Practice/ Paithankar, Y. G./ Marcel Dekker, Inc./ 1998.
4. Power System Protection and Switchgear/ B.Ravindranath and M. Chander/Wiley Eastern Ltd.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

POWER DISTRIBUTION SYSTEM

(Elective-II)

UNIT-I

Distribution System Planning: Load forecasting, Power Quality parameters, Choice of systems for different consumers, Planning Criteria, Standards, System layout.

UNIT-II

Distribution Lines / Cables: Towers/Poles, Stay wires; Conductor - Types, Characteristics & selection; Underground Cables -Selection, laying, cable box and jointing; Earth wire; Insulators & hardware fittings; Distributors, Feeders, Services Mains (LV, MV, HV); Clearances; Pole-mounted sub-stations and its location; Earthing HT & LT poles/supports; Selection & fixing of control devices.

UNIT-III

Distribution Sub-stations: Types, General Arrangement, Layout, Bus-bar arrangements; Sub-station equipment – Construction details, selection and specification of equipment (distribution transformer, Circuit Breakers, etc.); Auxiliary Systems; Earthing of sub-station equipment; Basic operational aspects of equipments/systems.

UNIT-IV

Distribution Losses And Efficient Energy Management: Classification, Causes and Calculation of power losses; Methods of reducing power losses and Anti-theft measures; Causes and cures for breakdowns, tripping and fluctuations in distribution system; System voltage drops and improvements; Distribution transformer failures – causes & remedies; Demand Side Management (DSM), HVDS, Energy efficiency monitoring and corrective measures.

UNIT-V

Meters & Metering : Meters/Indicators – Types & Function; Metering system; Location of meters; Testing & Setting of meters/indicators; Latest development in metering technologies.

Cost Economics / Commercial Aspects:

Cost Engineering, Costing & Control, Estimation, Estimate for providing service (LT/HT) connections; Tariff structure & types, Rational & Competitive tariff, Energy Accounting, Energy Billing and Revenue realization.

REFERENCE:

1. Power Distribution Engineering: Fundamentals and Applications/ Burke James, J./ Marcel Dekker Inc./1996.
2. Power Distribution Planning Reference Book/ H. Lee Willis/ Marcel Dekker, Inc.
3. Electric Power Distribution Engineering/ Turan Gonen/McGraw Hill.
4. Modern Trends and Practices in Power Sub-Transmission and Distribution Systems/Volumes I & II, / N. K. Jangalwa/ Central Board of Irrigation and Power/ 1996.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

**POWER PLANT PERFORMANCE, MONITORING & TESTING
(Elective-II)****UNIT-I**

Elementary Details in Numerical Techniques: Number system and errors, Representation of integers, Fractions, Floating point Arithmetic, loss of significance and error propagation, condition and instability, computational methods for error estimation, Convergence of Sequences.

Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices.

UNIT – II

Finite Difference Applications in Heat conduction and Convection – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT – III

Finite Differences, Discretization, Consistency, Stability, and Fundamentals of Fluid Flow Modeling: Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods. Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

UNIT – IV

Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

Steady flow, dimensionless form of Momentum and Energy equations, Stokes equation, conservative body force fields, stream function - Vorticity formulation.

UNIT –V

Finite Volume Method: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, Upwind interpolation, Linear interpolation and Quadratic interpolation.

REFERENCE:

1. Numerical heat transfer and fluid flow / Suhas V. Patankar/Butter-worth Publishers.
2. Computational fluid dynamics :Basics with applications /John. D. Anderson / Mc Graw Hill.
3. Computational Fluid Flow and Heat Transfer/ Niyogi/Pearson Publications.
4. Fundamentals of Computational Fluid Dynamics /Tapan K. Sengupta / Universities Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year -II Sem. M.Tech. (PPE&EM)

POWER PLANT ENGINEERING LAB-II

RENEWABLE ENERGY

1. Performance testing of Solar Water Collector
2. Testing of Gasifier
3. Properties of Fuels

ENERGY CONSERVATION

1. Boiler efficiency testing
2. Heat Exchangers
3. Refrigeration and Air conditioning systems

ADVANCED ENERGY SYSTEMS

1. Fuel Cell
2. Thermal Storage Systems

SIMULATION BASED ON LAB VIEW:

1. Solar control and monitoring
2. Nuclear power plant simulator
3. Wind turbine condition monitoring
4. Thermal energy monitoring

EQUIPMENTS REQUIRED

1. Solar water heater – 100 LPD
2. Bomb calorimeter
3. Junker's gas calorimeter
4. Hydrometer
5. Flash and fire point apparatus
6. Proximate analyzer (Muffle furnace and micro weigh balance)
7. Solar Radiation Meters
8. Non-IBR boiler
9. Heat Exchangers (plate, pipe-in-pipe, shell and tube)
10. Vapour Compression Refrigeration Test Rig
11. Fuel cell – Educational Kit
12. PCM based energy storage system