Post Graduate
Academic Programme
M. Tech. (Chemical Engineering) in
Process Modelling & Simulation (2010-11)

Department of Chemical Engineering
Zakir Husain College of Engineering and Technology
Aligarh Muslim University, Aligarh-202002
ABOUT THE UNIVERSITY

Aligarh Muslim University (AMU) is an institution of national importance and one of the oldest premier Central Universities of India with a unique and rich culture of its own. It owes its existence to the selfless and untiring efforts of the great visionary SIR SYED AHMAD KHAN. Deeply moved by the socio-economic and educational plight of his community after the First War of Independence of 1857, he was quick to realize that the panacea for these ills lay in inculcating the spirit of free enquiry and modernism in the community. His exposure to the British Universities, particularly those at Oxford and Cambridge, and their public schools, inspired him with a new vision of a harmonious pattern of culture, combining the best elements in the cultures of the East with the arts and sciences of the West. In 1875 he founded a school at Aligarh, which, within three years, was raised to a college known as Mohammedan Anglo Oriental College which metamorphosed into the Aligarh Muslim University in 1920.

ABOUT THE COLLEGE AND THE DEPARTMENT

The University also maintains a number of Colleges, Institutes, Centres and Schools. Zakir Husain College of Engineering & Technology, being one of them, is one of the oldest engineering colleges of the country and was established in 1935. It started with bachelor's degree program in Civil, Mechanical and Electrical Engineering. To recognize the remarkable contributions, made by Dr. Zakir Husain the College was named as the Zakir Husain College of Engineering and Technology.

The idea of the creation of the Department of Chemical Engineering at A.M.U. was born with the visit of His Highness Sheikh Zaid Bin Sultan Al-Nahyan of the UAE in 1975. The approval of the UGC was obtained for the creation of the Department in the fifth Five Year Plan and it came into existence in 1978, when the first undergraduate course in Chemical Engineering started with an intake of thirty students.

A Post-graduate Diploma in Petroleum Processing was started in the Department in 1987, which was upgraded to full-fledged degree, M.Sc. Engg. (Petroleum Processing) in 1988. A Masters programme of M. Tech. (Chemical Engineering) was started in 1999 with specialization in ‘Process Modelling and Simulation’. Another specialization, ‘Computer Aided Design of Process Plant’ has also been approved. The Department of Chemical Engineering, ZH College of Engineering and Technology was one of the seven Institutes selected for upgradation to the level of IIT by MHRD, Government of India.

The Department also offers Ph.D. programme in Chemical Engineering in wide range of thrust areas such as heat transfer, hazardous waste management, nanotechnology, mass transfer, enhanced distillation thermodynamics, and modelling and simulation etc.
Till date five Ph.Ds. have been awarded in different areas and four are in progress.

The Department offers following programmes:

- B. Tech. (Chemical Engineering) Intake: 30+5 (NRI)
- M. Tech. (Chemical Engineering)
  - Process Modelling & Simulation (Intake: 20)
  - Computer Aided Design of Process Plant (Intake: 20)
- Ph.D. (Chemical Engineering) Intake: Variable

Thrust Area/ Core Competence of the Department:

- Boiling Heat Transfer
- Process Modelling and Simulation
- Process Optimization
- Fluid Mechanics and CFD
VISION AND MISSION OF THE DEPARTMENT

VISION
To be a world class Chemical Engineering Department that imparts high quality education to its graduates and prepares them to be leaders in chemical engineering and allied fields.

MISSION
1. To produce globally acceptable, competent, ethically strong and professional chemical engineers to serve the needs of society as engineers, technocrats, entrepreneurs and leaders.
2. To foster process engineering knowledge through collaborative research and innovation with leading academic institutions and industry.
3. To prepare the students coming from different socio-economic levels including a sizeable number from the marginalized sections of society for a successful career in chemical engineering and allied fields.
4. To create a conducive environment to attract and retain the best faculty.

Following are the Programme Educational Objectives (PEOs) & Programme Outcomes (POs) of the PG programme: M. Tech. (Chemical Engineering):

Programme Educational Objectives (PEOs)
1. To prepare students for successful career in industry and academia that meets the needs of national and global organizations by imparting state of the art knowledge of tools and techniques for analysis and design of chemical engineering systems.
2. To provide opportunity for students to work as part of team on multidisciplinary projects by imparting training of research methodologies, modern tools emphasizing theoretical, experimental and computational approaches.
3. To develop communication, decision making, motivational human relations and ethical attitude in students.
4. To provide students a familiarity with professional issues in chemical engineering related to the global economy and to emerging technologies and thereby promoting student awareness of life-long learning.

Programme Outcomes (POs)
a) Ability to apply knowledge of mathematics, science, engineering fundamentals and core engineering subjects to define, analyze and design chemical engineering systems.
b) Ability to judiciously employ state of the art research tools and methods for solving contemporary chemical engineering problems.
c) Ability to identify and formulate broadly-defined chemical engineering problems by critically evaluating the literature.
d) Capability to apply knowledge, skills to carry out cutting edge research in new emerging interdisciplinary fields.
e) Select and apply appropriate techniques, resources, and modern engineering and IT tools.
f) Ability to function effectively in multidisciplinary teams.
g) Ability to include social, professional and ethical attitude considering health & safety and environmental factors in technological solutions.
h) Capability to communicate effectively and professionally.
i) Development of self-critical thinking in evaluating technical solutions.
j) Providing suitable motivation for research activities and entrepreneurship.
## Course Structure of M. Tech. (Chemical Engineering) in Process Modelling and Simulation

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
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**List of Electives**

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**Course Number and Title**: CH 611 Advanced Transport Analysis

**Credits**: 04

**Course Category**: Departmental Core (DC)

**Pre-requisite(s)**: Nil

**Contact Hours (L-P-G)**: 3-0-1

**Type of Course**: Theory

**Course Assessment**: Course Work (Home assignments, tutorials and quizzes) (15%)  
Mid-Semester Examination (1 hour) (25%)  
End-Semester Examination (3 hour) (60%)

### Course Objectives:

1. To provide a sufficient background to be able to understand the fundamental principles of momentum, heat and mass transfer; similarities and differences between them.
2. To understand the development of 'equations of change' in terms of fluxes and vectorial notation.
3. Develop physical understanding of, and the ability to apply these equations.

### Course Outcomes:

At the end of the semester the student should be able to:

1. Understand the actual physical situation and conceive the simplified problem.
2. Apply the list of simplifications to reduce the appropriate 'equations of change' for specific applications and solve them to obtain desired profiles for velocity, temperature or concentration.
3. Utilize information obtained from solutions of the balance equation to obtain engineering quantities of interest.
4. Solve simple linear partial differential equations arising in transport process. Also, recognize and apply analogies among momentum, mass and heat transfer;
5. Recognize relevance of transport principles in diverse application.

### Syllabus:

Basic transport equations for isothermal, non-isothermal and multicomponent systems. Velocity, temperature and concentration distributions with more than one independent variable. Velocity, temperature and concentration distributions in turbulent flow. Macroscopic balances for isothermal, non-isothermal and multicomponent systems. Simulation momentum, heat and mass transfer without and with chemical reaction.

**Textbook**:


**Reference Book(s)**:

To learn and to gain an insight in various aspects of mathematical methods and its application in Chemical Engineering.

After completing this course the students shall be able to:
1. Understand the need of mathematics in chemical engineering.
2. Learn and apply the concept of vectors, matrices, orthogonal functions in chemical engineering problems.
3. Learn and apply mathematical concepts of calculus of variation to chemical engineering problems.
4. Learn and apply mathematical concepts of various order of ordinary differential equations to chemical engineering problems.
5. Learn and apply the mathematical concept of partial differential equations to chemical engineering problems.

Vector spaces, matrices and linear operators, orthogonal functions, ordinary differential equations their types, order and solution methods, partial differential equations their types order and methods of solution, mathematics of variation.

**Course Objectives:**
Students should learn various advanced portions of reaction engineering such as design, and analysis of unsteady-state non-isothermal reactors, mechanisms of heterogeneous reactions and their rate laws, design and analysis of multiphase reactors.

**Course Outcomes:**
After completing this course the students shall be able:

1. To learn and apply various aspects associated with the design and operation of steady and unsteady-state non-isothermal reactors.
2. To know and learn about different types of heterogeneous catalytic and non-catalytic reactions and their mechanisms.
3. To analyze and interpret the kinetics data from laboratory experiments for proposing the rate-law and use it for the design and sizing of industrial reactor.
4. To learn external and internal mass transfer effects associated with the heterogeneous reactions while designing and analyzing multiphase reactors.

**Syllabus:**

**References:**
Course Objectives:

1. To get adequate understanding of the basics and applications of modes of heat transfer in process industries.
2. To gain an insight of various new technologies and its application in Indian chemical industries.
3. To study various efficient methods for conservation and management studies besides conventional methods of heat transfer.
4. To investigate the compact design of heat transfer equipments.
5. To have more depth and feel of knowledge related to transfer operations than under graduate level.

Course Outcomes:

After completing this course the students shall be able to:

1. Understand the scope and challenges of heat transfer consumption, management in process industries in present scenario and some ideas of about Future pattern of India.
2. Learn and apply Engineering Principles in analyzing the qualitative and quantitative aspects in chemical and allied sectors.
3. Understand and analyze the application of waste heat to convert into some useful thermal energy (low & medium heat flux duties).
4. Identify various design parameters of heat transfer equipments in order to enhance the rate of heat transfer.
5. Determine the efficiency, performance and calculation of heat transfer coefficients of various heat transfer equipment (e.g. Heat exchangers, evaporator, Boilers, Condensers including packed bed, and fluidized bed etc.)

Syllabus:


Unit 2: Various types of Heat Exchanger, Design of Heat Exchanger (Kern and Bell’s Method), Selection of Heat Exchanger for Industrial purposes, Compact Heat Exchangers (Plate and Frame, Finned, Spiral tube etc.), Evaporation, Types of feed, Types and applications of Evaporators, Efficiency and design of Evaporator.

Unit 3: Boiling and Condensation (with Change of Phase) Heat Transfer, Boiling Curve, Mechanism of Boiling, Enhancement Techniques for boiling and condensation, and Correlations for Calculation of their Heat Transfer Coefficients.

Unit 4: Heat transfer Studies in Packed and Fluidized Beds (calculation of Pressure drop and heat transfer coefficient), and emerging topics. Some advanced topics of Mass Transfer and numerical problems based on transfer Operations.

Textbook(s)/Reference Book(s):

**Course Objectives:**
Students should learn and understand the basic principles of process modelling and simulation, and effectively apply them to develop the models of various chemical engineering systems.

**Course Outcomes:**
After completing this course the students shall be able:

1. To know and learn about the basic definitions and fundamental principles related to process modelling and simulation.
2. To know and understand about different types of models and their hierarchy as well as the general steps followed in developing a process model.
3. To develop appropriate mathematical models of varying complexities for different chemical engineering systems.
4. To know and learn about the commonly available mathematical tools and techniques as used in the simulation of developed models.

**Syllabus:**
Process analysis and its basic principles. Description of systems, subsystems, scientific methods, system parameters, process analysis and simulation.

Different types of Models and their classifications. Model hierarchy and general steps followed in a model building process. Advantages and limitations of process modelling and simulation.

Mathematical Models and their classifications: Transport phenomena based models, empirical models, and probabilistic models. Different levels of details of transport phenomena models.

Development of mathematical models of different chemical engineering systems. Mathematical representations of fundamental conservation laws, constitutive equations, rate equations and equilibrium relations. A brief description of mathematical techniques commonly employed for the simulation of developed models.

**Reference Book(s):**
department of chemical engineering

Summary Table:

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<tr>
<th>Course Number and Title</th>
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<td>End-Semester Examination (3 hour) (60%)</td>
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Course Objectives:
1. To introduce students to the fundamental principles and practical methodologies of process integration.
2. Train student the skills of applying the principles and methodologies to practical applications.
3. Introduce the state of the art development in the general areas of process engineering.
4. Prepare students with the background knowledge for employment in the process industries as well as for postgraduate studies and research.

Course Outcomes:
At the completion of this course, students should be able to:
1. Understand the concept of pinch in mass and energy exchange network and be able to calculate targets.
2. Design and analyse a heat exchange network.
3. Apply process integration techniques in various heat and mass transfer processes.

Syllabus:
Introduction to process integration, role of thermodynamics in process design, Concept of pinch technology and its application. Heat Exchange Network, Composite curves, Problem Table Algorithm. Targeting of energy, area, number of units, shell, and cost. Super targeting. Continuous targeting, topology traps and sensitivity threshold.
Maximum Energy Recovery (MER) network design, balanced grid networks, fast matching algorithm, network evolution and evaluation, multiple utilities and multiple pinches.
Heat and power integration, total site targeting, emission targeting. Energy and resource analysis of various processes. Mass Exchange Network synthesis, waste and waste water targeting and system design.

Textbook:

Reference Book(s):
**Course Objectives:**
To impart the students knowledge on development and analysis of models for physical systems and to understand advanced control schemes and computer control methods used in petroleum and chemical industries.

**Course Outcomes:**
At the completion of this course, students should be able:

1. To develop and understand dynamics models for physical systems.
2. To analyse the response of lumped and distributed parameter systems (industrial systems) using mathematical techniques as transfer function and state models.
3. To understand classical control methods, stability and optimum controller settings.
4. To understand and develop advanced control techniques.
5. To understand and apply computer control in chemical process industries.

**Syllabus:**


**Reference Book(s):**
**Course Objectives:**
At the end of the semester the student should be able to (Course Educational Objective, CEOs):
1. Formulate simple optimization problems; write down objective function, equality and inequality constraints and bounds.
2. Understand relevant properties of functions – unimodal and multimodal functions, convex and concave functions, necessary and sufficient conditions for minimization.
4. Solve simple constrained optimization problems using Lagrange multiplier technique, simplex methods, NLP and GRG methods.
5. Formulate and solve simple Linear Programming and Integer Programming problems with their applications.
6. Appreciate the application of optimization in chemical process engineering.

**Course Outcomes:**
After taking this course students should be able to:
1. Classify process models and formulate verbal optimization problem into a mathematical expression in the form of objective function. Identify constraints and bounds.
2. Apply the appropriate constrained/ unconstrained optimization method to solve the problem.
3. Formulate and solve large class of LP and NLP optimization problems encountered in process industries.
4. Aware about commercial optimization problem solvers and will be able to apply principles of optimization in chemical engineering process design/operation improvement.

**Syllabus:**

**Review** of basic concepts of optimization. Objective Function, Model fitting, Regression Analysis.


**Constrained Optimization:** Linear programming (LP) and application: Graphical solution for solving LP problem, simplex method, duality in LP. Nonlinear programming (NLP) problem: the Lagrange multiplier methods, quadratic programming, generalized reduced gradient, successive linear programming.

**Optimization of Staged and Discrete Processes:** Dynamic programming. Integer and mixed integer programming.

**Introduction to Global Optimization:** Branch and bound methods, Evolutionary algorithms. Applications of Optimization.

**Textbook:**

**Reference Book(s):**


Course Objectives:
At the end of the semester the student should be able (Course Educational Objective, CEOs):

1. Analyze the problems and choose the appropriate numerical procedure.
2. Solve the simultaneous linear and non-linear equations.
3. Solve the Ordinary Differential Equation, Initial Value Problem.
4. Solve the Boundary Value Problem.
5. Solve the Partial Differential Equation developed by the modeling of the Chemical Engineering Problems.

Course Outcomes:
After taking this course students should be able to:

1. Classify process models and formulate verbal optimization problem into a mathematical expression in the form of objective function. Identify constraints and bounds.
2. Choose suitable procedure to solve linear and non-linear systems of equations.
3. Have developed appropriate understanding of Functions Approximation.
4. Formulate the problems of ordinary differential equations to be solved by multi steps methods, explicit and implicit both.
5. Apply finite difference and finite element approach to tackle the problems of ODE (boundary value) and Partial Differential Equations.

Syllabus:
Review of basic concepts of numerical methods, linear and non-linear equations, function approximations.

Ordinary Differential Equations multistep methods, Adams-Basforth and Adams-Moulton techniques, RungeKutta, Explicit and Implicit, Stability analysis


Partial Differential Equations—(PDEs) Introduction, Finite Difference technique, Alternate Direction Implicit method ADI, Orthogonal Collocation (OC), Orthogonal Collocation on Finite Elements (OCFE), Galerkin Finite Element (GFE) technique, Calculus of Variations

Textbook:

Reference Book(s):
DEPARTMENT OF CHEMICAL ENGINEERING

Course Number and Title | CH 624 Process Modelling & Simulation II
--- | ---
Credits | 04
Course Category | Departmental Core (DC)
Pre-requisite(s) | Nil
Contact Hours (L-P-G) | 3-0-1
Type of Course | Theory
Course Assessment | Course Work (Home assignments, tutorials and quizzes) (15%)
 | Mid-Semester Examination (1 hour) (25%)
 | End-Semester Examination (3 hour) (60%)

COURSE OBJECTIVES:
To learn and to gain an insight in various aspects of process modelling and its application in Chemical Engineering.

COURSE OUTCOMES:
After completing this course the students shall be able to:

1. Understand the scope and challenges of process modelling and simulation in Chemical Engineering.
2. Learn and apply various types and procedure of process modelling and simulation in Chemical Engineering.
3. Learn and understand the orientation of design and simulation.
4. Understand and analyse various models for Chemical Engineering Systems.
5. Learn and apply advance modelling methods for research.

SYLLABUS:
Models, its type and procedure of development, controlling factors in a model, models for various chemical engineering processes, functionality matrix and its application in design and simulation, Unsteady state and multidimensional models and its procedures of solution.

Textbook(s)/Reference Book(s):
**Department of Chemical Engineering**

**Course Number and Title**: CH 655 Process Flowsheeting

<table>
<thead>
<tr>
<th>Credits</th>
<th>04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Category</td>
<td>Departmental Core (DC)</td>
</tr>
<tr>
<td>Pre-requisite(s)</td>
<td>Nil</td>
</tr>
<tr>
<td>Contact Hours (L-P-G)</td>
<td>3-0-1</td>
</tr>
<tr>
<td>Type of Course</td>
<td>Theory</td>
</tr>
<tr>
<td>Course Assessment</td>
<td>Course Work (Home assignments, tutorials and quizzes) (15%) Mid-Semester Examination (1 hour) (25%) End-Semester Examination (3 hour) (60%)</td>
</tr>
</tbody>
</table>

**Course Objectives:**

The course is designed to give basic concepts behind steady state simulation, selection of design variables and computerized property estimation and also the approaches involved behind the commercial simulation softwares.

**Course Outcomes:**

After completing this course students should be able to:

1. Students will be able to learn the basic techniques of computerized material balance.
2. Students will be able to understand the concepts of steady state simulation.
3. Students will be able to learn various commercial simulation software and their merits and demerits along with the techniques of simulation behind these software.
4. Students will be able to learn the concepts of design variable and computerized physical properties estimation.
5. Students will be able to analyze various approaches of simulation.

**Syllabus:**


**Textbook:**


**Reference Book(s):**

**Course Objectives:**
To provide the basic concepts of modeling and simulation of separation processes

**Course Outcomes:**
After completing the course, students will have
1. Knowledge of various thermodynamic property models and ability to use them.
2. Ability to apply mass and energy balance to model single and multistage separation units.
3. Ability to model the various simple and enhanced separation processes and solve them.
4. Ability to use the simulation software like AspenPlus, ChemCAD, and ChemSep to simulate the various separation operations

**Syllabus:**
**Thermodynamics of separation processes:** Energy, entropy and availability balance. Phase equilibria. Ideal and non-ideal thermodynamic property models. Property calculation using various models.

**Modeling of single and multistage separation processes:** Single equilibrium stage and flash separation calculations. Modeling of separation cascades.

**Advance topics in multicomponent staged separation processes:** Approximate (short cut) methods, rigorous methods. Equilibrium based methods for multicomponent separation. Rate based models for distillation. Batch distillation. Enhanced distillation and supercritical extraction. Membrane separation.

**Textbook:**

**Reference Book(s):**
COURSE OBJECTIVES:
To make the students aware to use the commercial simulation and other software in the simulation and design of chemical engineering equipment

COURSE OUTCOMES:
At the completion of this course, students should be able to:
1. Acquire the engineering knowledge and experience to use chemical engineering commercial simulators.
2. Calculate physical and equilibrium properties of components and apply balances on equipment and plant.
3. Size and simulate chemical engineering equipment, and use calculator, controller and optimizer in simulator.
4. Generate process flow diagram and design a chemical plant using simulator.

SYLLABUS:
Design Simulation and Optimization; Optimization of Chemical Processing Equipment’s using Chemical Engg. Simulation software such as HYSYS, Optimization using other software’s.

Reference Book:
1. Bruce A. Finlayson, Introduction to Chemical Engineering Computing, John Wiley & Sons
COURSE OBJECTIVES:
This course is designed to trained the students in the field of applications of CAD in process plant.

COURSE OUTCOMES:
Students will be able to
1. Learn about the hardware and software tools required in CAD.
2. Perform mass balance and energy balance with the help of computer.
3. Learn the concept of DBMS and its application in process industries.
4. Learn the basic concept involved in graphics.
5. Learn about expert system and its application in process design of equipment and plant.

COURSE OUTLINE: The course covers the basic hardware and software tools such as Computer Graphics and DBMS Expert System and their application in process plants.

SYLLABUS:
Review of computer hardware, Requirement of hardware with reference to CAD. Computer Aided Mass Balance using the concept of split fraction coefficient.
Basic software tools of CAD Hardware requirements for graphics, basic concepts of graphics Line drawing and circle drawing Algorithms Concepts of GKS and its application.
Introduction to DBMS Basic DBMS Models Application of models to Plants fundamentals of SQL programming in SQL.
AI and Expert System Basic concepts Applications of expert system for chemical equipments and in process plants.

Reference Book(s):
2. M.E. Leesley, Computer Aided Plant Design, Gulf Publication
3. Groover, CAD/CAM, Prentice Hall
4. Coulson and Richardson, Chemical Engineering Vol 6
5. Proceeding of Workshop on Computer Aided Process Engineering and Control', at IIT Bombay
6. Proceeding of Refresher course on ‘CAD for Chemical Engineers’, IIT KGP
**Course Objectives:**

1. To develop an understanding of the basics of data-driven modelling.
2. To gain an insight into the application of the different techniques of data-driven modelling to real-world problems in Chemical Engineering and allied fields.

**Course Outcomes:**

After completing this course the students shall be able:

1. To know the different types of models and the general approach to develop data-driven models.
2. To have a fair knowledge and understanding of the various data-driven modelling techniques.
3. To apply the various data-driven modelling techniques to develop data-driven models using real world data.

**Syllabus:**

**Unit 1:** Introduction: Types of models, model selection, general approach to develop a data-driven model, basic statistics, cleansing of data.

**Unit 2:** Regression based modelling, Principal Component Analysis, Time Series Modelling.

**Unit 3:** Artificial Neural Networks (ANNs): fundamentals, strengths and limitations of ANNs, different architectures, ANN-based modelling, tuning and optimization of ANN model. Support Vector Machines: Basic idea of a support vector machine, theory of support vector machines, establishment of a support vector machine model for regression/classification.

**Unit 4:** Some applications of data-driven techniques to real-world problems from Chemical Engineering and allied fields.

**Textbook:**


**Reference Book(s):**

**Course Objectives:**
1. Get an opportunity to read, and understand published research articles relating to chemical engineering and allied fields.
2. To be aware about emerging trends in chemical engineering and related fields.
3. To critically evaluate and analyze published scientific and technical literature.
5. Acquire good oral and written communication skills.

**Course Outcomes:**
1. Ability to read and understand technical papers in chemical / process engineering.
2. Ability to identify and formulate broadly defined chemical engineering problems by critically evaluating the published literature.
3. Ability to communicate effectively and professionally.
4. Ability to employ state of the art research tools and methods for solving contemporary chemical engineering problems.

**Syllabus:**

**Course Description:** The general seminar course is focused on developing student’s ability to study scientific literature, understand the underlying theory, experimental methods and interpretations, and critically evaluate and analyze the same. It also aims at developing communication skills, both soft and written in the form of preparing effective power point presentations. It also covers new developments / contents beyond syllabus.

**Seminar:** The student will be required to search scientific /technical literature in the emerging areas of chemical engineering / process engineering and allied fields in Journals and periodicals (both hard copies and e-journals) and select two research papers of his/her interest. He/she shall study/comprehend the paper and present the same orally to the gathering of staff and students using multimedia / lecture aids. Seminar presentation guidelines shall be provided to the students. The seminars shall be evaluated by the associated faculty based on the understanding, presentation, content, and quality of the PPT.

**Reference Book(s):**

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**Course Number and Title**
- CH 780P General Seminar

**Credits**
2

**Course Category**
Departmental Core (DC)

**Pre-requisite(s)**
NIL

**Contact Hours (L-P-G)**
0-0-2

**Type of Course**
Seminar

**Course Assessment**
- Course Work (Presentation) (60%)
- End Sem. Examination (Viva voce) (40%)
COURSE OBJECTIVES:
1. Get an opportunity to read, and understand published research articles relating to chemical engineering and allied fields.
2. To be aware about emerging trends in chemical engineering and related fields.
3. To critically evaluate and analyse published scientific and technical literature and define a research problem.
4. To formulate objective and set scope for a research work.

COURSE OUTCOMES:
1. Ability to read and understand technical papers related to his research work in the area of chemical engineering.
2. Ability to identify and formulate problem by critically evaluating the published literature and select a topic for his own research based on his interest.
3. Ability to identify the appropriate research tools and methods for solving the selected research problem.
4. Ability to present his/her future research plan effectively and professionally.

SYLLABUS:
Course Description/Outline: The Preliminary Dissertation Seminar course is focused on developing students’ ability to search /study scientific literature pertaining to the area of his/her interest, critically evaluate it and be able to define the objective and scope of his/her dissertation. The student proposes the methodology of the research and a plan of the work to be continued and completed in the following semester. The student shall submit a report in a prescribed format and present it (using PPT) to the audience consisting of the teachers of the department.

Seminar: The student will be required to thoroughly search scientific/technical literature in the chosen area (of chemical engineering / process engineering and allied field) in Journals and periodicals (both hard copies and e-journals). He/she shall critically study/comprehend the papers and compile them chronologically in the Chapter on ‘Literature Survey’. This shall form his/her ‘Preliminary Dissertation’ The compiled report including Objectives and Scope, methodology, future work and expected results, shall be presented orally to the gathering of staff and students using multimedia / lecture aids. Seminar presentation guidelines shall be provided to the students. The seminars shall be evaluated by a committee based on the understanding, objective & scope, quality, content and presentation.
**Course Objectives:**
The student is required to present his/her dissertation research work carried out during final semester. The presentation will be made before his/her supervisor and two internal examiners who will then judge the completeness and suitability of the work before his/her thesis is accepted for final submission.

**Course Outcomes:**

1. Ability to study and understand technical papers related to his research work in the area of chemical engineering.
2. Ability to apply the concepts and principles involved in the courses related to mathematical analysis, optimization, modelling & simulation and core chemical engineering subjects.
3. Ability to employ state of the art research tools and methods for solving the selected problem.
4. Ability to present his research work effectively and professionally.

**Syllabus:**

**Course Description/Outline:** This course is mandatory for the final submission of M. Tech. dissertation of a student and is designed not only to judge the sufficiency and adequacy of dissertation work carried out by the student during the final semester but also to highlight the improvements needed in the thesis before its submission.
Course Number and Title | CH 791P Lab/Project
--- | ---
Credits | 2
Course Category | Departmental Core (DC)
Pre-requisite(s) | NIL
Contact Hours (L-P-G) | 0-3-0
Type of Course | Project
Course Assessment | Report Preparation and Submission 40 Marks
 | Viva-voce 20 Marks
 | Sessional 60 Marks
 | End Semester Examination: Viva-voce 40 Marks
 | Grand Total 100 Marks

**Course Objectives:**
At the end of the semester the student should be able to (Course Educational Objective, CEOs):
1. Develop a preliminary process model of a small bench-scale system, based on simplified theoretical model and process analysis.
2. Develop data interpretation and process analysis skill
3. Prepare written reports to a specified style
4. Achieve deeper understanding of chemical engineering through relating theory to practice
5. Develop communication and interpersonal skills
6. Plan and carry out activities in way which makes use of available time and other resources
7. Make an oral presentation

**Course Outcomes:**
After taking this course student should be able to:
1. Student will be able to identify, formulate and solve engineering problems
2. Have an ability to use the techniques, skills and modern engineering tools necessary for solving the selected problem.
3. Develop interpretation and process analysis skill
4. Write a technical project report in a clear and well thought manner and communicate the same effectively.

**Syllabus:**
Approach
1. **Introduction:** The faculty incharge of the course will brief about the basic concept of the process modeling project, background of the project, motivation for work and need of the simulation.
2. **Project Topics:** The faculty incharge of the course beside with student will identify project topics to the students in the areas of process modeling simulation. The faculty will suggest the plan and carry out activities in way which makes use of available time and other resources.
3. **Literature survey:** The student will be required to collect information relating to the allotted topic from the library (Journals, periodicals, magazines), research organizations, chemical industry, reference books, and bibliographies. Select the present techniques for upgrading of project.
4. **Numerical modeling:** The faculty incharge of the course will guide in the selection of the appropriate software tools to solve the problem. And make used of the in house tool available in the department such as ASPEN, MATHEMATICA and MATLAB.
5. **Simulation result:** Perform simulation using the in-house tools and analysis of the result with theoretical and experimental data. The faculty incharge of the course will checked the result suggest if any modification is required.
6. **Report:** The faculty incharge of the course will provide the format of the report and tips in technical writing. Student will submit a comprehensive technical report in a uniform format. The faculty incharge of course will structure the report in a clear and well thought manner. Each student is motivated to present the topic orally to a gathering of staff and students using Microsoft PPT.
### Course Objectives:
The student is required to present his/her dissertation research work. The presentation will be made before his/her supervisor and an external examiner who will then judge the completeness and suitability of the work before his/her thesis is accepted for final submission.

### Course Outcomes:

1. Ability to read and understand technical papers related to his research work in the area of chemical engineering.
2. Ability to apply the concepts and principles involved in the courses related to mathematical analysis, optimization, modelling & simulation and core chemical engineering subjects.
3. Ability to employ state of the art research tools and methods for solving the selected problem.
4. Ability to present his research work effectively and professionally.

### Syllabus:

**Course Description:** This course is focused on the application of IT, basic research tools and some experimentation for the problem selected after critically evaluating the literature in that area under the supervision of faculty member assigned by BOS.

**Seminar:** The student will be required to search scientific/technical literature in the emerging areas of chemical engineering / process engineering and allied fields in Journals and periodicals (both hard copies and e-journals) and select two research papers of his/her interest. He/she shall study/comprehend the paper and present the same orally to the gathering of staff and students using multimedia / lecture aids. Seminar presentation guidelines shall be provided to the students. The seminars shall be evaluated by the associated faculty based on the understanding, presentation, content, and quality of the PPT.
1. Introduction
(a) The Faculty of Engineering & Technology, Aligarh Muslim University offers full-time program leading to the Master of Technology (M. Tech.) degree in Chemical Engineering, Civil Engineering, Computer Science and Engineering, Electrical Engineering, Electronics Engineering, Mechanical Engineering, Petroleum Processing and Petrochemical Engineering, and Nanotechnology, with further specializations, if any.

(b) The medium of instruction in M. Tech. Program is English.

2. Eligibility
(a) A candidate will be eligible for admission to M. Tech. program if he/she has obtained the Bachelor of Technology degree or its equivalent recognized by the University in the relevant branch of engineering with not less than 60% marks in the aggregate or its equivalent CPI/CGPA/NAG. For M. Tech. program in Nanotechnology, candidates who have obtained Master of Science degree or its equivalent recognized by the University in the relevant subject with not less than 60% marks in the aggregate or its equivalent CPI/CGPA/NAG will also be eligible. All eligibility requirements are subject to such other conditions as laid down by the University from time to time.

(b) Local professionally employed personnel such as working engineers, scientists and teachers may also be admitted as part-time students to the M. Tech. program in the relevant branch, over and above the sanctioned intake.

3. Admission
(a) The admissions to the M. Tech. programs will be made normally in the autumn semester as per the admission policy approved by the Academic Council of the University from time to time. The admission of each student will be made in a particular branch.

(b) The admission of a candidate will be made either as a full-time student or as a part-time student.

4. Academic Session
The academic session is divided into two regular semesters – autumn and winter, each of which shall be of approximately 20 weeks duration. The autumn semester will normally commence in the month of July/August every year, and the winter in the month of December/January. In the beginning of every session the Dean, in consultation with the Chairmen of the departments concerned, shall notify a detailed academic calendar indicating the schedule of teaching, examination, and other activities.

5. Duration of the Program
5.1 Minimum Duration
The minimum duration of the program for a full-time student shall be four consecutive semesters after admission. The minimum duration of the program for a part-time student shall be six consecutive semesters after admission.

5.2 Maximum Duration
The maximum duration of the program for a full-time student shall be eight consecutive semesters after admission. The maximum duration of the program for a part-time student shall be ten consecutive semesters after admission.
5.3 Minimum and Maximum Duration in case of change of student status
A full-time student can convert his/her admission to part-time subject to his/her fulfilling the eligibility conditions as provided in these ordinances for part-time candidates by applying to the Dean of the Faculty through the Chairman of the concerned department. Such conversion will be allowed at the end of a semester only and not in the middle of the semester. The minimum and maximum durations for such a student shall remain unchanged if such conversion is done after spending two semesters after admission to the program. However, if such conversion is done before spending two semesters after admission, the minimum and maximum durations shall become as specified for part-time students.

6. Curriculum and Credit System
6.1 Credit System
Each M. Tech. program will have a curriculum in which every course will be assigned certain credits reflecting its weight and contact periods per week, as given below:

1 Lecture period (L) per week = 1 Credit
1 Practical period (P) per week = 1 Credit
1 General period (G) per week = 1 Credit

In addition to theory and laboratory courses there may be other courses such as seminar, colloquium, project, dissertation etc., which will be assigned credits as per their contribution in the program without regard to contact periods. The general period may be used for lecture, presentation, field work, literature search, discussions, software development, or for such other purposes as may be decided by the teacher(s) concerned.

6.2 Coordinators and Curriculum Development Committee
There shall be a Chief Coordinator, M. Tech. Programs, to be nominated by the Dean, and a Coordinator, M. Tech. Program in each department, to be nominated by the Chairman of the department concerned. Normally the Chief Tabulator will be the Chief Coordinator, M. Tech. Programs. There shall also be a standing Curriculum Development Committee (CDC), to be constituted by the Faculty. The Chief Coordinator, M. Tech. Programs will be the Convener of the CDC.

6.3 The Curriculum Structure
The curriculum for each branch/specialization will contain a listing of all courses, with each course having a course number, course title, number of contact periods per week, number of credits assigned, and the marks assigned to various components of evaluation. It will also have a list of alternative courses in the new curriculum for the old curriculum courses and filler courses to compensate for the shortfall in credits earned by taking alternative courses in any category, if needed. It will also specify all other conditions required for the award of degree.

6.4 Approval of the Curriculum
The curriculum for each branch/specialization of M. Tech. program will be prepared by the department concerned and will be approved by the Board of Studies of the department. It will then be vetted by the CDC and will then be placed in the Faculty along with the recommendations of the CDC for approval. Once approved by the Faculty, the Curriculum will be implemented. The same procedure shall be used for any modification in the Curriculum.

7. Registration
(a) Every student is required to register, in each semester, for the courses that he/she wants to pursue in that semester. The registration schedule will be announced by the Dean/Chairman for every semester. The registration process involves:
(i) Submitting a registration form in the office of the Chairman and obtaining a registration card signed by the Chairman
(ii) Paying the required fees.
(b) A student will normally register for higher semester courses only if he has also registered for uncleared courses of previous semesters.
(c) A student will have the option to add/delete/alter the courses in his/her registration within a week of the registration subject to such conditions as may be imposed by the department concerned from time to time.
(d) A student can drop a course from his/her registration by submitting a request to his/her department coordinator up to a date specified on his/her registration card. A registered course will be counted as an attempt even if the student remains absent in the Examination(s).
(e) A student may be denied registration in a course due to reasons of paucity of staff or space or other facilities, especially in case the student is registering a course for improving the grade in a passed course.
(f) If a student fails to register in two consecutive semesters without specific permission from the Dean, his/her name may be removed from the rolls of the faculty. Such a student may apply to the Dean for re-admission stating the reasons for not being able to register for two consecutive semesters and the Dean will take suitable decision on the merit of the case.
(g) No student will be allowed to register for more than 28 credits in a semester.

8. Attendance (In lieu of Chapter XVII of the Academic Ordinances)
Attendance in each course separately is compulsory at least once. Students who have put in 75% or more attendance in a course in a semester will be eligible to appear in the End-Semester Examination of that course. Students who have put in 65% or more but less than 75% attendance in a course may be considered for condonation of shortage of attendance in that course by the condonation committee. Students whose attendance in a course is less than 65% or whose shortage in attendance has not been condoned will not be eligible to appear in the End-Semester Examination of that course and will be awarded grade ‘F’ in that course and all marks obtained in any component of the course evaluation will stand cancelled. However, in case a student is repeating a course and the student has already fulfilled the attendance requirement in that course, he/she will not be detained due to shortage of attendance in that course during the repeating semester.

9. Examination and Evaluation
9.1 Components of Evaluation
Each course will be evaluated out of 100 marks. The courses will normally have the following components of evaluation:
(a) Theory courses:
   Course work = 15 marks
   Mid-Semester Examination = 25 marks
   End-Semester Examination = 60 marks
(b) Laboratory courses including Seminar, Colloquium, Project, dissertation etc.
   Course work = 60 marks
   End-Semester Examination = 40 marks
However, for special academic reasons, some courses may have different weight for different components of evaluation from that given above. Such special reasons will be spelt out clearly in the curriculum.

9.2 Grading System
The combined marks obtained by a student in various components of evaluation of a course shall be converted into regular letter grades with their equivalent grade points as specified below:
<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>Outstanding</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>Very good</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>Good</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>Satisfactory (Minimum Pass Grade)</td>
</tr>
<tr>
<td>E</td>
<td>2</td>
<td>Unsatisfactory (Fail)</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>Detained due to shortage of attendance</td>
</tr>
<tr>
<td>I</td>
<td>0</td>
<td>Incomplete/Absent in the End-Semester Examination</td>
</tr>
<tr>
<td>Z</td>
<td>0</td>
<td>Cancelled due to other reasons</td>
</tr>
</tbody>
</table>

The following marks ranges may ordinarily be used for the award of grades to the students in a course.

<table>
<thead>
<tr>
<th>Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 and above</td>
<td>A</td>
</tr>
<tr>
<td>60 and above but less than 75</td>
<td>B</td>
</tr>
<tr>
<td>45 and above but less than 60</td>
<td>C</td>
</tr>
<tr>
<td>35 and above but less than 45</td>
<td>D</td>
</tr>
<tr>
<td>Less than 35</td>
<td>E</td>
</tr>
</tbody>
</table>

Two grace marks may be awarded by the examiner for passing a course and one grace mark may be awarded by the examiner to elevate the grade. Any fraction in any component of evaluation should be rounded off to the next whole number. The examiner(s) may propose higher or lower grade ranges depending upon the nature of the course and general performance of the students in the course, but the final decision rests with the Result Moderation Committee. However, the minimum passing grade `D` should never be awarded if a student secures below 35 marks (including 2 grace marks) in a course.

9.3 Earned Credits (EC)
If a student passes a course by obtaining grade D or above he/she earns the credits assigned to that course.

9.4 Performance Indices
At the end of every semester a student's performance will be indicated by Earned Credits (EC), a Semester Performance Index (SPI), and a Cumulative Performance Index (CPI). The SPI is the credit-weighted average of grade points of all courses registered during a semester and is computed as follows:

$$SPI = \frac{(C1G1 + C2G2 + \ldots)}{(C1 + C2 + \ldots)}$$

Where C1, C2...are the credits assigned to courses and G1, G2 ... are the grade points earned in those courses. The CPI is the credit-weighted average of grade points of all courses passed in all the semesters since admission.

9.5 Repetition of a Failed Course
If a student fails in a course his/her marks of all components of evaluation in that course will be cancelled. The student will have to register the course again or it’s alternative and will be required to appear in all components of evaluation afresh. No previous marks shall be used in any case.

9.6 Repetition of a Passed Course
A student may repeat a course to try to improve his/her grade in that course only once, provided that he/she has passed that course in a single attempt. In such case the student will have to register the course again and will be required appear in all components of evaluation afresh. No previous marks shall be used in any case.
purpose of calculating the SPI the recently obtained grade will be considered while for CPI the better of the two grades will be counted.

9.7 Conduct of Examinations
(a) The examiners for the End-Semester Examination of all theory courses will normally be the teacher(s) associated with the course. The Seminar, Colloquium courses will be examined by the teacher(s) associated with the course and one or more examiners from among the teachers of the department to be recommended by the BOS of the department concerned. The laboratory and project courses will be examined by the teacher(s) associated with the course and an external examiner not in the service of the university at the time of examination. In case the external examiner does not turn up for the examination, the Chairman of the department concerned, in consultation with the course incharge, shall call another person to act as the external examiner, even from within the University, if necessary.

(b) The dissertation will be submitted after all other components of the M. Tech. Programme completed. The dissertation will be examined by the supervisor(s) and an external examiner not in the service of the university at the time of examination.

9.8 Moderation Committees
(a) Question Paper Moderation Committee: There shall be a Moderation Committee of the concerned Department consisting of the following members to moderate the Question Papers of the End-Semester Examination.
(i) Chairman of the Department concerned – (Convener)
(ii) One senior teacher of the Department in each broad area of specialization (to be appointed by the BOS).
(Note: The Paper Setter(s) may be invited, if necessary, to clarify the necessary details of the question paper.)

(b) Result Moderation Committee: There shall be a Result Moderation Committee of the concerned Department consisting of the following members to moderate course-wise results of the End-Semester Examinations.
(i) Chairman of the Department concerned - (Convener)
(ii) One senior teacher of the Department in each broad area of specialization (to be appointed by the BOS).
(iii) Examiner(s) concerned.
The Result Moderation Committee will examine the result of each theory course and in case of an abnormal situation; it may take suitable corrective measures in consultation with the examiner(s). The examiner(s) will place the evaluated answer scripts along with the brief solution and marking scheme before the Committee. In case of difference of opinion among the members of the Committee, the majority decision will prevail, in which the examiner(s) will not participate.

10. Degree Requirement
(a) A student who earns 72 credits and fulfils such other conditions as may be mentioned in the curriculum will be awarded the degree of Master of Technology. He/she must also pay all University dues as per rules. Moreover, there should be no case of indiscipline pending against him/her.

(b) If a student earns more credits than the minimum required for the award of degree, his/her CPI will be calculated by considering the best grades subject to fulfilling the criteria of required credits as specified in the curriculum.

11. Name Removal from the Rolls of the University and Mercy Appeal
11.1 Name Removal
The earned credits (EC) of every student will be checked at the end of even number of semesters and if the total credits earned by the student are less than the minimum required as given below, his/her admission to the M.
Tech. program will be cancelled and his/her name will be removed from the rolls of the University.

<table>
<thead>
<tr>
<th>Check Point (No. of semesters after admission)</th>
<th>Minimum EC requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 semesters</td>
<td>0</td>
</tr>
<tr>
<td>4 semesters</td>
<td>25</td>
</tr>
<tr>
<td>6 semesters</td>
<td>50</td>
</tr>
<tr>
<td>8 semesters</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Check Point (No. of semesters after admission)</th>
<th>Minimum EC requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 semesters</td>
<td>0</td>
</tr>
<tr>
<td>4 semesters</td>
<td>15</td>
</tr>
<tr>
<td>6 semesters</td>
<td>30</td>
</tr>
<tr>
<td>8 semesters</td>
<td>52</td>
</tr>
<tr>
<td>10 semesters</td>
<td>72</td>
</tr>
</tbody>
</table>

11.2 Mercy Appeal
If the name of a student is removed from the rolls of the University as per provisions of clause 11.1 of these ordinances, he/she may appeal to the Vice-Chancellor stating the reasons for not being able to earn the required credits and the Vice-Chancellor, if he is satisfied with the reasons, may allow the continuation of admission of the student only once during the tenure of the program, extending the total duration of the program by one year, at the maximum, if required. Under any circumstances no full-time student will be allowed to complete the program after the lapse of 10 semesters after admission; and no part-time student will be allowed to complete the program after the lapse of 12 semesters after admission.

12. Result
(a) If a student passes all the examinations and fulfils all the requirements for the award of degree his/her result will be shown as “Pass”.
(b) The Division awarded to “Pass” students will be based on CPI as given below:
   - First Division (Honours): CPI ≥ 8.5
   - First Division: 6.5 ≤ CPI ≤ 8.5
   - Second Division: CPI < 6.5
There shall be no formula for conversion of CPI or SPI into equivalent percentage of marks during the program. However, once the program is completed by a student and he/she is graduated, his/her final CPI will be converted into equivalent percentage of marks by the following formula:

\[ y = \frac{(20x^3 - 380x^2 + 2725x - 1690)}{84} \]

where, \( y \) is the percentage of marks and \( x \) is the CPI.
(c) If a student earns more credits than the minimum required as given in the table in clause 11.1 before fulfilling the degree requirements, his/her result will be shown as “Continued”.
(d) If the name of a student is removed from the rolls of the University as per provisions of clause 11.1 of these ordinances his/her result will be shown as “Name Removed”.
(e) Ranks/Positions will be determined at the end of even semesters. Only those full-time students who fulfil the following conditions will be eligible for ranks/positions:
(i) They do not have any break in their studies;
(ii) They have passed every scheduled course in first attempt;
(iii) They have passed every course on time as per the curriculum;
(iv) They have earned credits as per the schedule given in the curriculum;
(v) They have not improved grade in any course after passing the course;
(vi) They have obtained a “Pass” result in four semesters by a date determined as 14 days after opening of the university after the summer vacation. The students who violate any of the above conditions will not be awarded any rank/position. The ranks/positions will be determined on the basis of CPI.
(f) Students who obtain a “Pass” result in a Calendar year shall be awarded Degree for that year.

13. Transitory Ordinance
Candidates admitted prior to the implementation of these Ordinances shall be governed by the Ordinances (Academic) under which they were admitted. Students who fail in the courses that are no more offered in these new ordinances and new curriculum will be allowed to pass the alternative courses, and in case there are no alternative courses, the old courses may be offered. For such candidates, any marks obtained earlier shall not be taken into account for passing the course(s) and they will have to obtain marks in all components of evaluation afresh. A student admitted previously may apply to the Dean through the Chairman concerned, to be governed by these ordinances. Such cases may be allowed on a case by case basis.
1. Explanations

1.1 Course Number
Every course has a course number consisting of 5 characters (minimum) and 6 characters (Maximum). The first two characters are alphabets indicating the department that offers or coordinates the course; the third character is a numerical digit indicating the year of offering the course in the program; the fourth character is a numerical digit indicating the type of course; the fifth character is a numerical digit that does not indicate any particular thing; and the sixth character is optional.

(a) The first two alpha characters will mean the following:
   AC = Department of Applied Chemistry
   AM = Department of Applied Mathematics
   AP = Department of Applied Physics
   AR = Department of Architecture
   CE = Department of Civil Engineering
   CH = Department of Chemical Engineering
   CO = Department of Computer Engineering
   EE = Department of Electrical Engineering
   EL = Department of Electronics Engineering
   ME = Department of Mechanical Engineering
   PK = Department of Petroleum Studies
   EZ = Departments external to Z.H. College of Engineering & Technology

(b) The third character will be 6 for First Year and 7 for Second Year of the M. Tech. program.

(c) The fourth character will be interpreted as follows:
   1-7 = Theory courses
   8 = Courses such as Seminar, Colloquium, Field work, etc.
   9 = Laboratory/Practical courses, Projects, and Dissertation.

1.2 Faculty Number
Every student has a Faculty number consisting of 9 characters. The first two characters are numerical digits indicating the year of admission; the third and fourth characters are alphabets indicating the branch of the M. Tech. program; the fifth character is an alphabet indicating the specialization; the sixth character is always “M” indicating M. Tech. program; the seventh, eighth and ninth characters are numerical digits that are for identifying a student of a particular batch.

(a) The first two characters will be the right most two digits of the year of admission. Thus students admitted in 2011 will have the first two characters as 11.

(b) The third and fourth characters will be interpreted as follows:
   AP = Applied Physics
   CE = Civil Engineering
   EE = Electrical Engineering
   KE = Chemical Engineering
   LE = Electronics Engineering
1.3 Marks
(a) The combined total marks obtained by a student in the course work and the mid-semester examination will be called Sessional Marks.

(b) The marks obtained by a student in the end-semester examination will be called Examination Marks.

2. Conduct of Teaching
2.1 Course In-charge
Every course will be taught by one or more teachers. The BOS of the concerned department will allocate the teaching load to the teacher(s) and will also designate a course in-charge for each course. If more than one department is involved in the teaching of the course, the course in-charge will be from the coordinating department. The course in-charge will coordinate all the work related to attendance, course work, examination and evaluation. It is necessary that the students are informed about the course in-charge so that they may contact him/her about any problems regarding the course.

2.2 Display of Attendance, Marks etc.
It is essential that the attendance should be displayed to the students twice in a semester, once in the middle and then at the end of a semester by the teacher(s) concerned. The mid-semester marks should be displayed to students normally within 15 days of the examination. The total Sessional marks should be displayed to the students before the beginning of the end-semester examinations. The course in-charge will ensure that the teachers associated with the course make such displays and, in case of complaints from the students in this regard, shall inform the Chairman of the concerned department about the problem.

2.3 Offering Courses
Courses will be offered by the department concerned as per the schedule given in the relevant Curriculum. Elective courses will be offered depending on the availability of the staff and other facilities and therefore any particular elective course may not be offered even though it may exist in the list of possible elective courses. Departments may also offer a course in both the semesters even though it may be shown in particular semesters.

2.4 Syllabus
Each course will have a syllabus which will be distributed to the students. The teacher(s) concerned should ensure that some portion, beyond the syllabus, should also be covered in the class.

3. Correction of Errors
In case any error is detected in the marks recorded on the award list, the examiner(s) concerned shall make a request to correct the mistake to the Dean, Faculty of Engg. & Tech. through the Chairman of the concerned department, and shall attach relevant documentary evidence. A committee consisting of the following members shall take suitable remedial measures depending upon the merit of the case.

1. Dean, Faculty of Engg. & Tech. (Chairman)
2. Principal, ZH College of Engg. & Tech.
3. Chairman of the concerned department.
4. One senior member of the Faculty, not belonging to the concerned department, to be nominated by the Dean.
4. Examinations

4.1 Mid-Semester Examination
Mid-semester examination(s) of each course will be of one hour duration and will be conducted as per norms and schedule notified by the office of the Dean in each semester.

4.2 End-Semester Examination
End-semester examination(s) of each theory course shall be of three hours duration and will be conducted as per norms and schedule notified by the Controller of Examination of the University on the advice of the Dean. The end-semester examinations of laboratory/practical courses, and other courses such as seminar, colloquium, field work, project, dissertation etc. shall be conducted as notified by the Dean/Chairman concerned.

4.3 Make-up Test
Students who miss the Mid-Semester Examination in a course due to illness or some other extra-ordinary compelling situation may contact the teacher(s) concerned of the course with the request to conduct a make-up test. The teacher(s) shall follow the guidelines in this regard approved by the Faculty from time to time. There shall be no make-up test/examination for end-semester examinations.