Department of Applied Mathematics

BOS:7.4.18
2018-19

Course Number and Title	:	**AMO-3510, Numerical Techniques**
Credits	:	04
Class/Year/Semester	:	**B.Tech./III & IV Year/Autumn**
Course Category	:	Open Elective
Pre-requisite(s)	:	NIL
Contact Hours (L-T-P)	:	3-1-0
Type of Course	:	Theory
Course Assessment	:	Course Work (Home Assignment) (15%) Mid Semester Examination (1 hour) (25%) End Semester Examination (2 hour) (60%)

Course Objectives:

To learn advanced numerical methods in system of equations, interpolation, approximation and study oflinear programming problem.

Course Outcomes:After completing this course the students should be able to:

1. solve linear equations and eigen value problems.
2. understand the interpolation techniques of different kind.
3. approximate data, functions by least squares method.
4. formulate linear programming problem and solve it.

Syllabus:

Units	Contents	Contact Hours
Unit-1	**Linear Systems & Eigen Value Problems:** Matrices and linear equations:LU factorization & pivoting, singular value decompositions. Numerical approach to eigen value problems.	12
Unit-2	**Interpolation:**Lagrange's, Newton's divided difference,Polynomial, Rational function & spline interpolation with error analysis.	12
Unit-3	**Approximation**: Least square approximations for discrete and continuous data. Mini-max techniques for approximations. Random number generations.	12
Unit-4	**Linear Programming**: Formulation of linear programming problem. Solution by graphical and simplex methods Duality. Introduction to nonlinear programming.	12
	Total:	**48**

Text Books:

1. Jain, M.K, Jain, R.K and Iyenger, S.R.K.: "Numerical Methods for Scientific and Engineering Computations", New Age International Publication Pvt. Ltd.
2. Sastry, S.S: "Introductory Methods of Numerical Analysis"., Prentice Hall, India.

Reference Books:

3. Kreyszig, Erwin: Advanced Engineering Mathematics, John Wiley & Sons, INC.
4. Venkataraman, M.K:"NumericalMethods in Science &Engineering", National Pub. Co, Madras.

Appendix-II

NANOPHYSICS AND NANOTECHNOLOGY
APO3090

Course Outcomes:

1. To understand the history, background and nature of nanoscience and nanotechnology as well as the quantum and nanosized scale effects on materials.
2. To acquire theoretical understanding of different types of materials and their application in nanotechnology.
3. To learn the methods of synthesis & characterization of graphene and graphene oxide.
4. To understand the physics behind the unusual properties displayed by graphene and its applications.

1. Introduction to Nanotechnology

Scientific revolutions –Time and length scale in structures – Definition of a nanosystem – Dimensionality and size dependent phenomena – Surface to volume ratio -Fraction of surface atoms – Surface energy and surface stress- surface defects-Properties at nanoscale (optical, mechanical, electronic and magnetic).

2. Different classes of Nanomaterials

Classification based on dimensionality-Quantum Dots,Wells and Wires, prepration of quantum nanostructures, size effects, conduction electrons and dimensionality, Fermi gas and density of states, potential wells, partial confinement, properties dependent on density of states, exitons, single electron tunneling.

3. Nanostructured Ferromagnetism

Basics of Ferromagnetism, Effect of Bulk Nanostructuring of Magnetic Properties, Dynamics of Nanomagnets, Nanopore Containment of Magnetic Particles, Nanocarbon Ferromagnets, Giant and Colossal Magnetoresistance, Ferrofluids.

4. Synthesis and applications of Graphene

Graphene – a wonder material, brief history of graphene, structure of graphene, Types of graphene, synthesis methods of graphene and graphene oxide, applications of graphene.

Books:

1. *Introduction to Nanotechnology by C.P. Poole Jr. and F.J. Owens, Wiley Interscience*
2. *Nano-Technology by Gregory Timp (Editor), AIP Press, Springer*
3. *Pradeep T., "A Textbook of Nanoscience and Nanotechnology", Tata McGraw Hill Education Pvt. Ltd.*
4. *Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press*
5. *Graphene: Synthesis and applications, edited by Wonbong Choi and Jo-won Lee)*

Department	Course No.	Course Title	Course Designation	Pre-Requisites	Course Type	Credit Hours	Contact Hours			Total Contact Hours
							L	T	P	
Civil Engineering	CEO4710	Disaster Management	OE	None	Theory	4	3	1	0	4

Course Assessment Method

1. Assignments and Oral Quizzes (15%)
2. Mid-Semester Examination (25%)- 1 Hour
3. End Semester Examination (60%)- 2 Hour

Course Objective

To create awareness amongst students the basic issues of natural and manmade disasters. This will help to ensure understanding relationship amongst vulnerability, preparedness, prevention and mitigation. It shall invoke sensitivity amongst students to respond to disasters in their area towards formulation of strategies and implementation of disaster mitigation.It will built capacity and basic approaches to be adopted in disaster risk reduction and will help in developing institutional mechanism to be adopted in country towards creating resilient society.

Course Outcomes

Upon successful completion of this course the students will be able to:

1. Understand genesis and causes of natural and manmade disasters within the framework of fundamental concepts of basic sciences and engineering.
2. Perceive the vulnerability of their living and working places and level of preparedness within the concept of disaster management.
3. Setup priorities to develop coherent and adaptable disaster management plan by preparing technical reports and database for effective communication amongst stakeholders.
4. Analyze and critically examine the build capacity to use specialized problem solving skills, methodologies and devise improved technologies for future interventions.

Topics Covered

Unit 1 Natural and Anthropogenic Disasters: Definitions and classification of natural and anthropogenic disasters. Pollution and environmental degradation. Climatic change and extreme climate. Global warming, Sea level rise, ozone depletion.
Transportation related disasters, Nuclear disasters, Industrial disasters, Biological disasters and epidemics, Fire related hazards.

Unit 2 Earthquake and Cyclone: Understanding dynamics of earth's interior and plate tectonics. Causes and classification of earthquakes. Seismology and methods of earthquake measurement. Concept of seismic zonation and micro-zonation. Earthquake and associated hazards, tsunami and liquefaction. Preparedness, mitigations and engineering interventions.
Climatology, Cyclones and tropical cyclones, Naming and categories of cyclones, Monitoring of cyclone, Causes of disaster during cyclone, damage and vulnerability assessment due to cyclone.

Unit 3 Volcanism,Landslide, Flood and Drought: Understanding volcanology and related disasters and mitigation. Mass wasting and movement and classification of landslides. Landslide monitoring and mitigation by landslide hazard zonation and stabilization methods.
Understanding hydrosphere and hydrologic cycle. Causes and classification of floods and droughts. Preparedness, mitigations and civil engineering interventions.

Unit 4 Disaster Preparedness and Mitigation: Human behavior and response. International and National Strategies for disaster reduction. National disaster management framework. Central, state, district and local administration; Armed forces, police, NDRF in disaster response, rescue and relief. Role of NGOs, community based organizations and media.
Role of different engineering disciplines in preparedness, response, rescue, rehabilitation recovery, prevention and mitigation.

Text Books and/or Reference Materials

1. Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.
2. Carter, W. Nick (1991): Disaster Management – A Disaster Manager's Handbook, A.D.B., Manila.
3. Goel, S.L. (2006): Encyclopedia of Disaster Management, Deep & Deep Publications, New Delhi.

4. Government of India (2009): National Disaster Management Policy, New Delhi.
5. Gupta et. al. (2001): Manual of Natural Disaster Management, IIPA, New Delhi.
6. Harsh Gupta (2003): Disaster Management, Universities Press.
7. Kapur, Anu (2010): Vulnerable India: A Geographical Study of Disasters, Sage Publishers, New Delhi.
8. Monappa, K.C. (2004): Disaster Preparedness, Akshay Public Agencies, New Delhi.
9. Narayan, B. (2000): Disaster Management, Asia Publishing House, New Delhi.
10. Sahni, Pardeepet. al(2002): Disaster Mitigation Experiences and Reflections, Prentice Hall of India, New Delhi.
11. Turner, B. &Andnick, F. (1997): Man Made Disasters, Betterworth Heinemann, Oxford.
12. Vinod K. Sharma (ed.) (2010): Disaster Management, IIPA, New Delhi.

Additional Learning Source

1. https://www.ndma.gov.in
2. https://www.nidm.gov.in
3. https://www.nicee.org
4. http://nptel.iitk.ac.in/

Department	Course No	Course Title	Course Type	Pre-Requisites	Course Nature	Credit Hours	Contact Hours L T P	Total Contact Hours
Civil Engineering	CEO4750	Project Management	OE	None	Theory	4	3 1 0	4

Course Assessment Method

1. Assignments and Oral Quizzes (15%)
2. Mid-Semester Examination (25%)- 1 Hour
3. End Semester Examination (60%)- 2 Hour

Course Objective

To make the student familiar with project, non-project activity and various types of project, diversified application of project management knowledge and interlinking of technological and managerial knowledge. To make the student conversant with fundamentals of management knowledge and various frontiers of management knowledge with especial reference to project management knowledge. To make the student conversant with notion of cost, cost accounting, various types of cost, cost optimization techniques, technical as well as managerial. To make the student conversant with the phrase estimate is an opinion price is policy and cost is a fact. To make the student conversant with work break down structure, the realm of network analysis, concept a usage, statistical analysis and basic research methodology. To make the student conversant with principles of purchasing, pricing policy, value analysis and specification writing. To make the student conversant with the importance of human capital, wage concepts, human resource planning , development and management.

Course Outcomes

Upon successful completion of this course, it is expected that students will be able to

1. Distinguish between project and non-projectactivity, identify need specific project estimate and should be able to prepare Work Break-Down Structure of simple projects
2. Identify, analyse and record various types of cost involved in a project
3. Apply cardinal principle principles of Research Methodology and Theory of Knowledge viz. Observation, contemplation, experimentation and documentation of knowledge
4. Apply basic principles of Purchase Management and Pricing Theory to the real world Apply cardinal principles of human behaviour , wage policy and Human Resource Management

Topics

Unit-1Management Fundamentals: Introduction to realm of management and concept of project and project managements, definition of project and epistemology of project management knowledge, inherent characteristic of project, project life cycle and various phases of project in detail, classification of projects , introduction of cost , classification of cost and its application, uses of cost data ,recording of cost and its importance ,types of estimates and accuracy , concept of Ceiling Limit, case studies and professional practice.

Unit-2 Network Analysis: Introduction to pictorial presentation of data, merits and demerits of various techniques, work breakdown structure, network analysis like CPM and PERT, critical path and crashing, over-view of statistics, application of statistics in management, model buildingand uses of model in management, theory of knowledge and research methodology in management, case studies and professional practice.

Unit-3 Materials Management: Introduction to purchase management, objectives of purchasing activity, specification, fundamentals of materials management, pricing theory and general economic considerations, principles of negotiations, discounts and quality assurance, different types of purchasing, make or buy decision, value analysis, process of standardization and patenting, BS and ISO standards, case studies and professional practice.

Unit-4 Human Resource Management: Introduction and importance of human capital, dynamics and

dualism in the labour market in India, labour supply, participation rates, and working hours, wage concept, various types of wages, wage fixation, punishment, rewards and benefits for human resource, history of HR in India, HRP role and effectiveness, HR planning, HRM Information system, performance measurements and employee carrier, strategic HRP in project management, case studies and professional practice.

Suggested Books

1 Antill, James M., Woodhead, Ronald W**,** "Critical Path Methods In Construction Practice", John Wiley, NY, USA [**ISBN: 0471866121**]

2 *Peurifoy*, Schexnayder and Shapira, "Construction Planning, EquipmentsAnd Methods", McGraw Hill, Tokyo, JAPAN [**ISBN:13: 978-. 0130426727.]**

3 B. Sengupta and H. Guha, "Construction Management And Planning", Tata McGraw Hill, New Delhi, INDIA [**ISBN : 0074623982**]

4 Patil B.S., "Civil Engineering Contracts And Estimates (Vol-1 and Vol-2)", Orient Longman Limited, New Delhi, INDIA **[ISBN: 10:8173715599, ISBN: 13:9788173715594]**

5 P.K.Joy, "Hand Book Of Construction Management", Macmillan India Limited, New Delhi, INDIA **[ISBN: 0333926935]**

6 Mark Saunders, "Research Methods For Business Students", Pearson Education Limited [ISBN: **978-81-317-0115-7]**

7 Donald Dobler, LaMar Lee and David N. Burt, "Purchasing And Supply Management", McGraw Hill **[ISBN-13: 978-0070370890, ISBN-10: 0070370893]**

8 Harold R. Kerzner, "Project Management: A Systems Approach To Planning, Scheduling And Controlling", Wiley Publications **[ISBN: 978-1-118-02227-6]**

9 Kenneth K. Humphreys, "Jelen's Cost Optimization Engineering", McGraw-Hill Science/Engineering/Math, 1991**[ISBN 10: 0070536465 ISBN 13: 9780070536463]**

10 Harold Koontz, "Essentials Of Management Mcgraw-Hill Series In Management", Tata McGraw-Hill Education, 2015**[ISBN: 0070144958, ISBN: 9780070144958]**

11 James Arthur Finch Stoner, R. Edward Freeman, Daniel R., Jr. Gilbert, "Management", Prentice Hall, 1995**[ISBN 10: 0131087479, ISBN 13: 9780131087477]**

13 BiswajeetPattanayak ,"Human Resource Management",PHI Learning, 2010 **[ISBN: 978-81-203-4962-9]**

14 "Quantitative Aptitude", The Publication Department on behalf of the Institute of Chartered Accountants of India, A94/4 Sector-58, Noida-201 301, INDIA **[ISBN: 978-81-8441-036-5]**

Suggested Additional Learning Resource

1	Publication of Construction Industry Institute , CII, www.construction-institue.org
2	Publication of RIBA, England https://www.architecture.com/
3	Publication of FIDIC, France https://en.wikipedia.org/wiki/**FIDIC**
4	Publication of AGC, Americahttps://www.agc.org/
5	Publication of PMI, America www.**pmi**.org
6	Publication of NIDM, New Delhi **nidm**.gov.in/books.asphttp://www.abebooks.com/book-search/isbn/0471866121/
7	http://as.wiley.com/WileyCDA/WileyTitle/productCd-1118022270.htmlhttp://phindia.com/printversion.php?isbn=978-81-203-4962-9&title=Human-Resource-Management
8	http://www.scribd.com/doc/70767342/20900014-2-ICAI-Quantitative-Aptitude-Text#scribd
9	The Institute of Chartered Accountants of India, www.icai.org

To be effective from Session 2020-21

DEPARTMENT OF CHEMICAL ENGINEERING

Course Number and Title	**CHO 4310 Hazardous Waste Management**
Credits	04
Course Category	Open Elective (OC)
Pre-requisite(s)	Environmental Studies
Contact Hours (L-T-P)	3-1-0
Type of Course	Theory
Course Assessment	Course Work (Home assignment/tutorial/Quiz) (15%) Mid-Semester Examination (1 hour) (25%) End-Semester Examination (2 hour) (60%)

Course Objectives:

1. To understand the sources and characteristics of industrial hazardous waste.
2. To gain an insight into the existing Indian legislation on hazardous waste management.
3. To know various physico-chemical treatment methods for hazardous wastes.
4. To understand biological treatment of hazardous wastes and remediation of a contaminated site.

Course Outcomes:

1. Aptitude to quantify and characterize an industrial hazardous waste.
2. Develop an understanding of Indian legislation pertaining to hazardous waste.
3. Ability to select suitable physico-chemical hazardous waste treatment technologies.
4. Application of biological treatment on hazardous waste and remediation of contaminated site.

Syllabus:

Unit 1: Introduction to Hazardous Waste – Industrial process generating hazardous waste, Global and national problems due to indiscriminate disposal of industrial hazardous waste, Industrial hazardous waste characterization - Corrosivity, ignitability, reactivity and toxicity.

Unit 2: Hazardous Waste Legislation – Salient features of existing Hazardous Waste Rules of 2016. Hazardous waste collection, labelling, transport, storage and manifest system.

Unit 3: Hazardous Waste Treatment – Compatibility studies and chart for hazardous waste treatment. Physical and chemical treatment of industrial hazardous waste.

Unit 4: Hazardous Waste Remediation – Biological treatment of hazardous waste. Remediation of a typical hazardous waste contaminated site.

Reference Books

1. Gilbert.Masters and Ela., (2005) Introduction to Environmental Engineering & Science, PHI.
2. Davis and Cornwell. (2006) Introduction to Environmental Engineering, 4th edn, Mc Graw Hill.
3. MoEF (2016) Hazardous and Other Wastes (Management & Transboundary Movement) Rules.
4. La Grega, Buckingham. and Evans. (1994) Hazardous Waste Management., 2nd edn, Mc.Graw Hill.
5. Vesilind and Morgan (2003) Introduction to Environmental Engineering, 1st edn, Thomson/Brooke.
6. Wentz. (1995) Hazardous Waste Management, 2nd edn, McGraw-Hill.
7. Nazaroff. and Cohen. (2004) Environmental Engineering Science, 1st edn, John Wiley & Sons.

2017-2018
DEPARTMENT OF COMPUTER ENGINEERING
B. Tech. (for all branches)

Course Title — SELECTED TOPICS IN COMPUTER ENGINEERING-I

Course Number	**:**	COO4460/CO446N
Credits	**:**	4
Course Category	**:**	OE (Open Elective)
Pre-requisite(s)	**:**	
Contact Hours (L-T-P)	**:**	4 (3-1-0)
Type of Course	**:**	Theory

Course Objective

The course discusses few important topics from Data Structures and Operating System Concepts. The objective of this course is to familiarize students, of different branches of engineering, with the basics of Data structures and their use in fundamental algorithms for common problems like sorting, searching etc. The another objective of the course is to familiarize the students with the functions of operating systems and the basic operating system concepts like process, resource scheduling and memory management techniques.

Course Outcome

Students will be able to:

1. Learn how the choice of data structures and algorithm design methods impact the performance of programs.
2. Analyze the importance and use of Abstract Data Types (ADTs)
3. Design and implement elementary Data Structures such as arrays, trees, Stacks, Queues, and Hash Tables.
4. Explain the process concept and various process scheduling algorithms in operating system.
5. Explain the concept of memory management like swapping, paging, segmentation, page replacement algorithms etc in a given constraints.

SYLLABUS:

UNIT I **INTRODUCTION**

Concept of Data Structures, Basic Terminologies related to data structures, linear and non-linear data structure. Concept and properties of algorithms, How to develop an algorithm, Complexity, Time-Space Tradeoff, Algorithm analysis, Rate of growth: Big Oh notation, other asymptotic notations for complexity of algorithms.

UNIT II **ARRAYS**

Arrays, one-dimensional arrays: traversal, selection, searching, insertion and deletion. Sorting: Bubble sort, selection sort, insertion sort, merge sort, quicksort, other sorting methods and their analysis. Multi-dimensional arrays, Representation of arrays in physical memory, Application of arrays.

UNIT III **ABSTRACT DATA TYPES (ADTs)**

Abstract Data Types, Stacks, Applications of Stacks - prefix and postfix notations, Queue, Circular Queue, Priority Queue, Dequeue, Linked Lists, Operations on Linked Lists, Binary Tree, representation and traversal of binary tree.

UNIT IV **OPERATING SYSTEM & MEMORY MANAGEMENT**

Introduction, Process Concept, Process States, Process Control Block, Process Scheduling, Scheduling Algorithms, Memory management: swapping, paging, segmentation, virtual memory, page replacements algorithms.

Books:

*1. Aho, Hopcroft, Ullman, "Data Structures and Algorithms", Pearson Education

*2. Lipschutz, "Data structures" Tata McGraw Hill.

*3. Silberschatz, Galvin "Operating System Concepts", 7th ed, Addisson Wesley, 2006

4. A.K.Sharma, "Data Structure using C", Pearson, 2011

5. Goodrich M. Tamassia R., "Data Structures and Algorithms in Java", 3rd ed. Wiley

* Text Books

Course Outcomes	Program Outcomes (POs)										
	a	b	c	d	e	f	g	h	i	j	k
1	x						x				
2	x				x		x				
3	x				x		x				
4							x	x			
5							x		x		

EEO4210 Renewable Energy Sources

Category: OE **Credits: 4** **LTP: 3 1 0**

(Not for EED students)

Energy Science and Technology: Classification of energy sources and reserves, energy growth and its planning, environmental aspects of energy, green house effect and global warming, energy conservation and energy audit, cogeneration and energy storage.

Solar Energy Conversion: Historical background of solar energy, solar energy radiations and its propagation through atmosphere, beam diffuse and global radiation, definitions and calculations, solar thermal energy conversion and solar collectors, thermal energy applications, solar photovoltaic energy conversion and solar cells, solar PV applications.

Fuel Cells and Biomass Energy conversion: Fuel Cell operation and classifications, fuel cell power packs and power plants, space and other applications, Biomass energy processes, applications, biogas plants

MHD and energy: MHD conversion principles, classifications, environmental aspects and pollution control, coal saving and efficiency enhancement, Power in the wind and wind power generation, wind energy system integration, wind turbines and control systems, wind energy programmers in India.

New and Alternate Energy Sources/Technologies: Hydrogen energy conversion, Ocean wave, ocean thermal and tidal Energy conversion, Piezoelectic conversion, Geothermal, small hydro resources

Books:

1 *B. H. Khan, Non Conventional Energy Resources, TMH, 2009 edition.
2. G.D. Rai Non ConventionalEnergy Sources, Khanna Publishers, New Delhi.
3. Godfrey Boyle Renewable Energy, Oxford, 2nd edition 2010.

Effective From: **2020-21**

Artificial Intelligence and Neural Network

Course No	**:**	**ELO4310**
Credits	:	4
Course Category	:	Open Elective
Pre-requisite(s)	:	
Contact Hours (L-T-P)	:	3-1-0
Type of Course	:	Theory

Course Outcomes

1. Understand the basics of AI and ANN.
2. Solve basic AI problems using different search techniques.
3. Learn and apply logic systems for automated reasoning.
4. Learn basic ANN architectures and design ANN for solution of some simple computational problems.
5. Describe how ANN can be applied in various fields of technology including bioinformatics, communication etc.

Syllabus

Unit I: Introduction to AI and Search Techniques

Foundation of AI, Rational Agents, Problem Solving Agents: Search Strategies – Breadth-First Search, Depth-First Search, Depth-limited Search, Iterative Deepening Depth-first Search, Bidirectional Search, Greedy Best-first Search, A* Search, Hill Climbing, Simulated Annealing, Alpha-Beta Pruning, Minimax Algorithm.

Unit II: Knowledge and Reasoning

Prepositional Logic; First Order Predicate Logic (FOPL); Inference Rules; Resolution, Rule Based Systems – Forward Reasoning, Conflict Resolution, Backward Reasoning; Logic Programming, Introduction to Logic Programming Language (PROLOG).

Unit III: Fundamentals of ANN

Biological Neuron; Introduction to ANN; Artificial Neuron, Activation Functions. Single Layer Perceptron, Limitations of Single Layer Network, Linearly Separable Problems. Multi Layer Perceptron, Learning and Back-propagation; Radial Basis Function Networks; Feedback Neural Networks.

Unit IV: ANN Applications

Applications of ANN in Bioinformatics, Forecasting, Healthcare, Intrusion Detection, Communication, Robotics, Image Processing and Compression, Control, Pattern Recognition, Optimization.

Books:

1. Stuart J. Russel & Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, PHI, 2009.
2. Elaine Rich & Kevin Knight, "Artificial Intelligence", TMH, 2005.
3. Jacek M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishing House, 2012.
4. Sivanandam, S. N. Deepa, "Introduction to Neural Networks Using Matlab 6.0", TMH, 2006.

DEPARTMENT OF MECHANICAL ENGINEERING
Aligarh Muslim University, Aligarh

Course Title	:	Fault Diagnosis and Health monitoring
Course Number	:	MEO4110/ME466
Credits	:	4
Course Category	:	OE
Pre-Requisites (s)	:	None
Contact hours	:	3-1-0
Type of Course	:	Theory
Course Assessment	:	Course Work 15% Mid Semester Examination (1 Hour) 25% End Semester Examination (2 Hours) 60%

Course Objectives

1. Impart basic understanding and importance of health monitoring of a critical component in any plant or structure.
2. Impart basic understanding of the maintenance principles and highlight the importance of condition based maintenance.
3. To be conversant with different monitoring techniques and apply the same depending on application.
4. To be capable to detect common electrical, mechanical and structural faults.
5. To be capable to boost research in the developing and interdisciplinary area of condition monitoring and fault diagnostic.

Course Outcomes

After taking this course the students should be able to

1. Understand different maintenance principles and appreciate the importance of condition based maintenance.
2. Understand different health monitoring techniques.
3. Apply various condition monitoring techniques suitable to application.
4. Detect and diagnose faults in electrical machinery, common mechanical faults and structural faults using the latest technology.

Syllabus

Unit – I: Introduction, Principles of maintenance, Failure Mode Effects and Criticality Analysis, An Overview of Structural Health Monitoring (SHM), Application and economic benefits, Fault diagnostics and Prognostics.

Unit – II: Various Condition Monitoring (CM) techniques, Vibration monitoring, Defect diagnosis, Spectral maps, Envelope detection technique, Cepstrum analysis, Shock Pulse Method, Noise monitoring, Acoustic Emission (AE), Oil monitoring, Temperature monitoring, Non-destructive techniques.

Unit – III: Electrical machinery faults, Motor current signature analysis, Detection of common machine faults: Unbalance detection, Misalignment detection, Cracked shaft detection, Looseness and rub detection, Fault detection in ball and journal bearings, Gear fault detection, Fans, blowers & compressors, Pumps and turbines.

Unit – IV: Structural Health Monitoring and Smart Materials, Structural Health Monitoring versus Non Destructive Evaluation, Smart Materials, Emerging SHM Technologies using Piezo Sensors, and Magnetostrictive Sensors, SHM using Optical Fibres and other sensors, Lamb wave method.

Books:

1. R. Mohanty, “Machinery Condition Monitoring: Principles and Practices”, CRC Press, 2014.
2. R. B. Randall, “Vibration-based Condition Monitoring”, John Wiley & Sons Ltd., 2011.
3. P. Gauenzi, “Smart Structures”, Wiley, 2009.

PO's		a	b	c	d	e	f	g	h	i	j	k
CO's	1	M		M		M	M		M		H	M
	2	M				H		L	M			
	3	H	M	L	M	H		L	H			L
	4	H	H	H	H	M		H	H			H

DEPARTMENT OF MECHANICAL ENGINEERING
Aligarh Muslim University, Aligarh

Course Title	:	Heating Ventilation and Air Conditioning
Course Number	:	MEO4210/ME461
Credits	:	4
Course Category	:	OE
Pre- Requisites	:	None
Contact Hours	:	3-1-0
Type Course	:	Theory
Course Assessment	:	Course Work 15% Mid Semester Examination (1 Hour) 25% End Semester Examination (2 Hours) 60 %

Course Objectives

1. Will understand the importance of maintaining thermal environment for human comfort in different ambient conditions.
2. Will become fully aware of the techniques for controlling the contamination of environment related to modern A C systems.

Course Outcomes

After taking this course, the student shall be able to

1. Define the need, importance and handling of different HVAC systems.
2. Estimation of Building Load for thermal comfort.
3. Interpret ventilation impact on human health and productivity. Explain air and water/refrigerant flow in ducts, pipes and their design.
4. Paraphrase control of HVAC systems: automatic and manual.

Syllabus

Unit – I **:** Human Comfort, factors and charts applied to various psychrometric processes of air conditioning systems. A.C. Systems: classification, components and applications.

Unit – II **:** Heat transmission in buildings, building survey and location of equipment, considerations for heating and cooling loads, load estimation procedures.

Unit – III **:** Air Transmission and distribution systems, design of duct systems, Natural and mechanical ventilation systems and their combinations. Air Cleaners and Scrubbers. Fluid distribution Systems: pipe sizing and layout, Hot water and Steam Heating Systems.

Unit – IV **:** A.C. system Controls: Elements of basic control system, open & close loop systems, pneumatic, electric and electronic control systems, Thermostats and humidistats, Dampers, Green Building and Energy saving techniques.

Books:

1. C.P. Arora; Refrigeration and Air Conditioning, Tata McGraw Hill, New Delhi
2. W.F. Stocker & J.w. Jones; Refrigeration & Air Conditioning, McGraw Hills Inc. Intl. Student's Edition.
3. F.C. Quiston & Jerald J. Parker; HVAC Analysis & Design, John Wiley & Sons.
4. HVAC Systems & Equipment, 1992, ASHRAE Handbook.
5. HVAC Fundamentals, 1993, ASHRAE Handbook.

PO & CO Mapping

CO's	PO's										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
1	H	H	H	H	M		M				L
2	H	H	H	H	H	M	M	L			L
3	H	H	H	H	M	M	M	L			
4			M	M					L		

DEPARTMENT OF MECHANICAL ENGINEERING
Aligarh Muslim University, Aligarh

Course Title	:	Air Pollution Technology
Course Number	:	MEO4230/ME425
Credits	:	4
Course Category	:	OE
Pre-Requisites(s)	:	None
Contact Hours	:	3-1-0
Type of Course	:	Theory
Course Assessment	:	Course Work 15% Mid-Sem. Examination (1 Hour) 25% End-Sem. Examination (2 hours) 60%

Course Objectives

1. To impart complete knowledge of causes and effects of Air Pollution due to combustion systems.
2. To develop an understanding of basic meteorological processes and their effect on air pollution.
3. To explain the pollutants formation mechanism, monitoring techniques and control strategies.
4. To discuss automotive emissions, their reduction technologies and emission standards.

Course Outcomes

After taking this course students should be able to

1. Understand and explain the global consequences of air pollution, its severity level and the effect of meteorological conditions on pollutants dispersion.
2. Understand the formation mechanism and control strategies of combustion generated pollutants particularly from I.C. engines.
3. Carry out sampling and analysis of combustion generated pollutants using modern on-line techniques/instruments.
4. Select and design pollutant control devices for various applications.

Syllabus

Unit – I : Introduction to Air Pollution, Global consequences of Air Pollution, Effect of atmospheric and meteorological conditions, Atmospheric stability considerations, Stack plume behaviour, Atmospheric dispersion models, Assessment of Air Pollution severity

Unit – II : General considerations of Combustion Generated Pollutants, Formation mechanism and source control of NO_X , SO_X , CO, UHC and Particulates/soot, Photochemical smog, Emissions from I C engines, Emission reduction technologies, Emission standards for Automobiles

Unit – III : Methodology for sampling and analysis of Combustion Generated Pollutants, Sampling considerations for Particulates and gaseous pollutants, Sampling probes, Principles of operation of instrumentation used for NO_X , CO, SO_X, CO_2, UHC and O_2 analysis.

Unit – IV : Types of Air Pollution Control Equipment & Source Correction methods, Gravity Settling chambers, Cyclone separators, Fabric Filters, Wet Scrubbers, Electrostatic Precipitators, Gas absorption and adsorption devices, Afterburners / Incinerators, Catalytic Combustion, Flare System

Text Book:

1. "Air Pollution Control Engineering " by *Noel de Nevers*. *Mc Graw Hill Int. Edition*

Reference Books:

1. "Air Pollution", by Wark & Warner, Harper & Collins Publishers
2. "Air Pollution", by Rao and Rao, Tata Mc Graw Hill
3. "Air Pollution Control Theory", by Crawford , Tata Mc Graw Hill

PO & CO Mapping

CO's	PO's										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
1	M	L		L		H		M	L		
2	M	L				L	M				L
3	M	L		H	H						M
4	M		M	L	H		H	L		L	L

DEPARTMENT OF MECHANICAL ENGINEERING
Aligarh Muslim University, Aligarh

Course Title	:	Total Quality Management
Course Number	:	MEO4420/ME442
Credits	:	4
Course Category	:	OE
Pre-requisites(s)	:	None
Contact Hours	:	3-1-0
Type of Course	:	Theory
Course Assessment	:	Course Work 15% Mid Semester Examination (1 Hour) 25% End Semester Examination (2 Hours) 60%

Course Objectives:

1. To understand the concept of quality, quality cost and quality control tools and their measurement.
2. To understand the application of control charts and TQM tools and practices in the organizations for improved performance.
3. To generate an idea of sampling plans and methods of improvement of quality of products and services along with knowledge of reliability and maintainability in the production system.
4. To understand the principles, policies and procedures of quality systems implementation and quality certifications in the organization along with the knowledge of service quality and SQ models.

Course Outcomes (COs):

After successfully completing the course, students should be able to:

1. Gain knowledge and skills to use QM/TQM models, quality control tools and techniques.
2. Design, use and interpret various process control charts and to apply state of art of production and quality management techniques.
3. Understand sampling schemes to be applied to different production systems and to perform reliability engineering analysis and TPM throughout the product life cycle.
4. Understand the importance of quality system certification and procedures as well as concept of service quality.

Syllabus:

Unit 1 : Fundamentals of quality and TQM, Components, benefits, and obstacles of TQM, Frame work & paradigms of quality, Costs of Quality; PDCA Cycle, 5S Principle, Seven basic quality control tools, Management tools, Quality Philosophy of various Quality Gurus.

Unit 2 : Variable and attribute control charts ($\bar{X}$-R, p, c.etc.) and their interpretation, Process Capability and its Indices, Taguchi's concept of Quality, Kaizen (CQI), JIT and its application, Benchmarking, Teams and Empowerment.

Unit 3 : Acceptance sampling, Lot formation process, Concept of Sampling Plans, Operating Characteristic (OC) Curve, Quality Function Deployment (QFD), Reliability Engineering and its measurement, Introduction to Total Productive Maintenance (TPM).

Unit 4 : Introduction to Quality Management Systems (QMS), Quality System (QS) procedure and structure, QMS requirements and implementation, Introduction to EMS standards, HRM & its framework, Service Quality concept, Quality Circles and Quality Awards.

Reference Books:

1. Total Quality Management by Besterfield Dale H., Pearson Publication, 5the Ed.
2. Total Quality Management by Subburaj Ramasamy, McGraw Hill Education (India) Pvt. Ltd., Chennai, 8th ed., 2017.
3. Introduction to Statistical Quality Control (Third Edition) by Douglas C. Montgomery, John Willey and Sons.
4. Service Marketing-Concepts, Applications and Cases by M.K. Rampal and S.L. Gupta, Galgotia Publishing Company, New Delhi.

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Contents Beyond Syllabus:

1. Introduction to QM/TQM tools like Six Sigma etc. and their applications.
2. Case study of any industry (manufacturing or service) using QM/TQM tools and techniques and control chart development.
3. Introduction to SERVQUAL Model.

CO's and PO's Mapping

CO's	PO's										
	a	b	c	d	e	f	g	h	i	j	k
1	H	M				L	H	M			
2	M	H				H					
3	H	M	L	L	M	H					
4	H	H	L	L		M	H	M		L	M