Category of Course	Course Title	Course Code	Credits-			Theory Papers
			L	T	P	
	ADVANCED MATHEMATICS	MEIC-101	3	-	-	Max. Marks-100 Min. Marks-40 Duration: 3 hrs.

UNIT I

Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabola) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

UNIT II

Probability, compound probability and discrete random variable. Binomial, Normal and Poisson's distributions, Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.

UNIT III

Stochastic process, Markov process transition probability transition probability matrix, just and higher order Markov process, Markov chain. Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC FS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS)

UNIT IV

Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics. MATLAB introduction, programming in MATLAB scripts, functions and their application.

UNIT V

Introduction and definition of reliability, derivation of reliability functions, Failure rate, Hazard rate, mean time t future & their relations, concepts of fault tolerant analysis, Elementary idea about decision theory and goal programming.

Reference Books:

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.
4. Introductory Methods of Numerical Analysis by S.S. Shastry,
5. Introduction of Numerical Analysis by Forberg
6. Numerical Solution of Differential Equation by M. K. Jain
7. Numerical Mathematical Analysis By James B. Scarborogh
8. Fourier Transforms by J. N. Sheddon
9. Fuzzy Logic in Engineering by T. J. Ross
10. Fuzzy Sets Theory & its Applications by H. J. Zimmersoms

Category of Course	Course Title	Course Code	Credits-			Theory Papers
			L	T	P	
	LINEAR CONTROL SYSTEMS	MEIC-102	3	-	-	Max. Marks-100 Min. Marks-40 Duration: 3 hrs.

Unit 1
State transition matrix and solution of state equations, continuos and discsrete systems.

Unit 2
Controllability and Observability, stability analysis, Liapunov stability, generation of Liapunov function, Liapunov Stability for discrete systems.

Unit 3
State and output formulation of state variable equations for distributed and discrete time systems,

Unit 4
Stability of distributed parameter systems.

BOOK RECOMMENDED:
1. Ogata- State Space Analysis of Control Systems: Prentice Hall
2. C.T. Chan, Linear Systems Theory
3. Schults and Melsa~ System Theory, Mc Graw Hill.
4. Zadeh and Polok, System Theory, Mc Graw Hill.

Category of Course	Course Title	Course Code	Credits-			Theory Papers
			L	T	P	
	DISCRETE DATA AND NON LINEAR CONTROL	MEIC-103	3	-	-	Max. Marks-100 Min. Marks-40 Duration: 3 hrs.

Unit 1 SAMPLING PROCESSES:
Reconstruction of sampled-data system and modified transformation, frequency and time response analysis of sampled data system.

Unit 2
Design and optimization of digital controllers, multirate and sampling, design and compensation of sampled data systems.

Unit 3
CLASSIFICATION OF NONLINEAR PHENOMENA:
Linearization harmonic, piecewise, point transformation method, Describing function analysis, phase plane method, singular points, Poi care and Bendixsou' s theorem.

Unit 4
Various methods of stability, Second method of Liapunov Canonical forins of Lure, Zubov method, popovs stability criterion.

BOOKS RECOMMENDED:
1. B C Kuo, "Discrete Data Control Systems, Prentice Hall
2. HJ.E. Gibson, Non Linear Automatic Control" Mc Graw Hill
3. Hayashi, "Non linear oscillations, Mc Graw Hill
4. Leendes (Ed) "Modem Control Theory Mc Graw Hill
5. Lasalle and Lafachets, "Stability by Lyapunovs Direct Method Ac.ademic Press.
6. Hahn Theory and Application of Liapunovs direct method Prentice IlaJI

Category of Course	Course Title	Course Code	Credits-			Theory Papers
			L	T	P	
	OPERATIONS RESEARCH AND OPTIMIZATION	MEIC-104	3	-	-	Max. Marks-100 Min. Marks-40 Duration: 3 hrs.

Unit 1 LINEAR PROGRAMMING
Inequality constraints, general definition of linear programming, graphical solution of two variable linear programming, simplex method, revised simplex method duality and degeneracy, application of the linear programming formulations to the problems like transportations, assignments and production planning. Non existing a feasible solution in the simplex tableau.

Unit 2 DISCSRETE DYNAMIC PROGRAMMING
Optimality principle, concept of multistage decision process, general approach to recursive optimization, forward and backward computations, problem of dimensionality.

Unit 3 NON -LINEAR PROGRAMMING
Optimization with a nonlinear objective function, method of steepest descrent, direct linearization, maximizing convex objective function, large step approaches, simplex method optimization with nonlinear constraints, method of feasible direction, Kuhn- Tucker conditions.

Unit 4 QUADRATIC PROGRAMMING:
Simplex algorithm decomposition of linear programing

Unit 5 INTEGER PROGRAMM1NG:
Integer programming formulations, integer linear programming, branch and bound algorithm. .

BOOKS RECOMMENDED:
1. T.Au and T.E. Stelson, Introduction to Systems Engineering, Deterministic models Addison Wesley Publication.
2. H.M. Salkin "Integer Programming, Addison Wesley Publication.
3. H.M. Wagner, Principles of Operations, Research with Applications to Managerial Decisions Prentice Hall of India
4. S.S. Rao, Optimization Theory, and Applications Wiley Eastern Ltd.

Category of Course	Course Title	Course Code	Credits-			Theory Papers
			L	T	P	
	INDUSTRIAL & PROCESS INSTRUMENTATION	MEIC-105	3	-	-	Max. Marks-100 Min. Marks-40 Duration: 3 hrs.

Unit 1

TRANSDUCER FUNDAMENTALS**.** Review of transducers for non-electrical quantities their characteristics and classification.

Unit 2

TRANSDUCERS FOR INDUSTRIAL MEASUREMENT

Working principle and characteristics of transducers used for measuring weight, density, vibration, distance, thickness, opacity etc. Working principle of pneumatics, electrical optical magnetic and nucleonic transducers used for measuring pressure, level, temperature, flow, moisture, humidity and pH value.

Unit 3

PROCESS CONTROLLERS

Introduction to different control concepts like feedback, feed forward cascade etc. steady state analysis dynamic response of linear and nonlinear elements, transient and frequency response analysis of processes with controllers PID controller design (pneumatic and electrical) comparative study of pneumatic and electric controllers.

Unit 4

FINAL CONTROL ELEMENTS

Selection of instruments for a given process and their placement in the loop instrumentation diagram with standard symbols.

Unit 5

Case studies of Design of Instrumentation schemes used in Thermal and Nuclear Power Plants, Pulp and paper plants, Distillation Plants.

BOOKS:

1. Electrical Meaurement & Instrumentation By A.K.Sawney
2. Indusrial Instrumentation By M.S.Berde
3. Control System By Nagrath, Gopal

Control System By B.S.Manake