ANNA UNIVERSITY, CHENNAI
NON- AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
M.E. INDUSTRIAL ENGINEERING
REGULATIONS 2021
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND I SEMESTER SYLLABUS
SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA4159	Statistical Methods for Engineers	FC	4	0	0	4	4
2.	IL4101	Work System Design and Ergonomics	PCC	3	0	0	3	3
3.	IL4102	Operations Research	PCC	3	1	0	4	4
4.	RM4151	Research Methodology and IPR	RMC	2	0	0	2	2
5.		Professional Elective - I	PEC	3	0	0	3	3
6.		Audit Course – I*	AC	2	0	0	2	0
PRACTICAL								
7.	IL4111	Work System Design and Ergonomics Laboratory	PCC	0	0	4	4	2
8.	IL4112	Optimization Laboratory	PCC	0	0	4	4	2
			TOTAL	**17**	**1**	**8**	**26**	**20**

* Audit Course is optional.

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	IL4201	Multi-Variate Data Analysis	PCC	3	0	0	3	3
2.	IL4202	Applied Quality Engineering	PCC	3	1	0	4	4
3.	IL4203	System Simulation	PCC	3	1	0	4	4
4.	IL4204	Operations Management	PCC	3	0	0	3	4
5.		Professional Elective - II	PEC	3	0	0	3	3
6.		Professional Elective - III	PEC	3	0	0	3	3
7.		Audit Course – II*	AC	2	0	0	2	0
PRACTICAL								
8.	IL4211	Data Analytics Laboratory	PCC	0	0	4	4	2
9.	IL4212	Simulation Laboratory	PCC	0	0	4	4	2
			TOTAL	**20**	**2**	**8**	**30**	**25**

* Audit Course is optional.

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Professional Elective - IV	PEC	3	0	0	3	3
2.		Professional Elective - V	PEC	3	0	0	3	3
3.		Open Elective	OEC	3	0	0	3	3
PRACTICAL								
4.	IL4311	Technical Seminar	EEC	0	0	2	2	1
5.	IL4312	Project Work I	EEC	0	0	12	12	6
			TOTAL	**9**	**0**	**14**	**23**	**16**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICAL								
1.	IL4411	Project Work II	EEC	0	0	24	24	12
			TOTAL	**0**	**0**	**24**	**24**	**12**

TOTAL NO. OF CREDITS : 73

PROFESSIONAL ELECTIVE COURSES [PEC]

SEMESTER I, ELECTIVE I

SL. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IL4001	Applied Object Oriented programming	PEC	3	0	0	3	3
2.	IL4002	Engineering Economics and Cost Estimation	PEC	3	0	0	3	3
3.	IL4003	Industrial Automation and Robotics	PEC	3	0	0	3	3
4.	IL4004	Management Accounting and Financial Management	PEC	3	0	0	3	3
5.	IL4005	Total Quality Management	PEC	3	0	0	3	3

SEMESTER II, ELECTIVE II

SL. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IL4006	Design and Analysis of Algorithms	PEC	3	0	0	3	3
2.	IL4075	Lean Manufacturing and Six Sigma	PEC	3	0	0	3	3
3.	IL4071	Advanced Optimization Techniques	PEC	3	0	0	3	3
4.	IL4007	Logistics and Distribution Management	PEC	3	0	0	3	3
5.	IL4078	Supply Chain Management	PEC	3	0	0	3	3
6.	IL4008	Machine Learning	PEC	3	0	0	3	3

SEMESTER II, ELECTIVE III

SL. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IL4009	Manufacturing Systems and Models	PEC	3	0	0	3	3
2.	IL4077	Project Management	PEC	3	0	0	3	3
3.	IL4072	Design of Experiments	PEC	3	0	0	3	3
4.	IL4010	Product Innovation and Development	PEC	3	0	0	3	3
5.	IL4011	Services Operations Management	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IL4012	Scheduling Algorithms	PEC	3	0	0	3	3
2.	IL4013	Maintenance Engineering and Management	PEC	3	0	0	3	3
3.	IL4014	Productivity Management and Re-Engineering	PEC	3	0	0	3	3
4.	IL4076	Plant Layout and Material Handling	PEC	3	0	0	3	3
5.	IL4015	Software Quality Engineering	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IS4351	Reliability Engineering	PEC	3	0	0	3	3
2.	IL4074	Human Factors in Engineering	PEC	3	0	0	3	3
3.	IL4016	Human Industrial Safety and Hygiene	PEC	3	0	0	3	3
4.	IL4017	Decision Support Systems	PEC	3	0	0	3	3
5.	IL4073	Enterprise Resource Planning	PEC	3	0	0	3	3

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.	AX4091	English for Research Paper Writing	2	0	0	0
2.	AX4092	Disaster Management	2	0	0	0
3.	AX4093	Constitution of India	2	0	0	0
4.	AX4094	நற்றமிழ் இலக்கியம்	2	0	0	0

MA4159 STATISTICAL METHODS FOR ENGINEERS

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To provide the most appropriate estimator of the parameter in statistical inference.
- To decide whether to accept or reject a specific value of a parameter.
- To establish relationships that makes it possible to predict one or more variables in terms of others.
- To avoid or at least to minimize the problems of estimating the effects of the independent variables by experimental designs.
- To understand many real world problems fall naturally within the framework of multivariate normal theory.

UNIT I ESTIMATION THEORY 12

Estimators : Unbiasedness, Consistency, Efficiency and sufficiency – Maximum likelihood estimation – Method of moments.

UNIT II TESTING OF HYPOTHESIS 12

Sampling distributions - Small and large samples -Tests based on Normal, t, Chi square, and F distributions for testing of means, variance and proportions – Analysis of r x c tables – Goodness of fit.

UNIT III CORRELATION AND REGRESSION 12

Multiple and partial correlation – Method of least squares – Plane of regression – Properties of residuals – Coefficient of multiple correlation – Coefficient of partial correlation – Multiple correlation with total and partial correlations – Regression and partial correlations in terms of lower order co - efficient.

UNIT IV DESIGN OF EXPERIMENTS 12

Analysis of variance – One way and two way classifications – Completely randomized design – Randomized block design – Latin square design - 2^2 Factorial design.

UNIT V MULTIVARIATE ANALYSIS 12

Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components: Population principal components – Principal components from standardized variables.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After completing this course, students should demonstrate competency in the following topics:

- Consistency, efficiency and unbiasedness of estimators, method of maximum likelihood estimation and Central Limit Theorem.
- Use statistical tests in testing hypotheses on data.
- Concept of linear regression, correlation, and its applications.
- List the guidelines for designing experiments and recognize the key historical figures in Design of Experiments.
- Perform exploratory analysis of multivariate data, such as multivariate normal density, calculating descriptive statistics, testing for multivariate normality.

REFERENCES :

1. Gupta.S.C., and Kapoor, V.K., “Fundamentals of Mathematical Statistics”, 12th Edition, Sultan Chand and Sons, 2020.
2. Jay L. Devore, “Probability and statistics for Engineering and the Sciences”, 8th Edition, Cengage Learning, 2014.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund’s Probability and Statistics for Engineers", 9th Edition, Pearson Education, Asia, 2016.
4. Johnson, R.A. and Wichern, D. W. “Applied Multivariate Statistical Analysis”, 6th Edition, Pearson Education, Asia, 2012.
5. Rice, J.A. "Mathematical Statistics and Data Analysis", 3rd Edition, Cengage Learning, 2015.

IL4101 WORK SYSTEM DESIGN AND ERGONOMICS L T P C
3 0 0 3

COURSE OBJECTIVES:

- Impart knowledge in the area of method study
- Train the students in stop watch time study
- Summarize time standards using predetermined motion time systems.
- Explain the anthropometry measures and its use in the work place design
- Articulate the effect of environmental factors on human performance.

UNIT I METHOD STUDY 9

Work design and Productivity – Productivity measurement - Total work content, Developing methods – operation analysis, motion & micro motion study, graphic tools.

UNIT II WORK MEASUREMENT 9

Stop watch time study, Performance rating, allowances, standard data-machining times for basic operations, learning effect.

UNIT III APPLIED WORK MEASUREMENT 9

Methods time measurement (MTM), Introduction to MOST standards, Work sampling, organization and methods (O & M), Wage incentive plans.

UNIT IV PHYSICAL ERGONOMICS 9

Physical work load and energy expenditure, Anthropometry – measures – design procedure, Work postures-sitting, standing - measurement – ergonomic implications. Design of displays and controls.

UNIT V ENVIRONMENTAL FACTORS 9

Sources & effects of Noise, Vibration, lighting, temperature, humidity & atmosphere. Measures for monitoring control & mitigation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Understand the purpose of method study and its method.
CO2: Understand the work measurement methods.
CO3: Know about Work sampling
CO4: Know the better working postures for better working.
CO5: Know about the environmental factors which affect the working condition.

REFERENCES:

1. Benjamin W.Niebel, Motion and Time Study, Richard, D. Irwin Inc., Seventh Edition, 2002
2. Barnes, R.M. Motion and Time Study, John Wiley, 2002.
3. Introduction to work study, ILO, 3rd edition, Oxford & IBH publishing,2001
4. Martin Helander, A Guide to human factors and Ergonomics, Taylor and Francis,2006.

IL4102 OPERATION RESEARCH

L	T	P	C
3	1	0	4

COURSE OBJECTIVES

- To provide students the knowledge of optimization techniques and approaches. Formulate a real-world problem as a mathematical model and finding solutions
- To enable the students to learn about revised simplex method and sensitivity analysis of LPP.
- To solve networking problems like transportation, Assignment, Maximal flow , Minimum spanning tree and shortest path problems
- To learn about Decision making under uncertainty and certainty conditions,.
- To learn various Queuing models

UNIT I LINEAR PROGRAMMING 9+3

Introduction to Operations Research – assumptions of Linear Programming Problems - Formulations of linear programming problem – Graphical method. Solutions to LPP using simplex algorithm – Two phase method – Big M method

UNIT II ADVANCES IN LINEAR PROGRAMMING 9+3

Revised simplex method - primal dual relationships – Dual simplex algorithm – Sensitivity analysis –changes in RHS value – changes in Coefficient of constraint – Adding new constraint – Adding new variable.

UNIT III NETWORK ANALYSIS 9+3

Transportation problems : Northwest corner rule , Least cost method , Vogel's approximation method - stepping stone method - MODI method – Unbalanced transportation – Assignment problem – Hungarian algorithm – Travelling salesman problem – project management. Minimum spanning tree problem: prim's algorithm, Kruskal's algorithm - Shortest path problem: Dijkstra's algorithms, Floyds algorithm - maximal flow problem: Maximal-flow minimum-cut theorem - Maximal flow algorithm

UNIT IV DECISION AND GAME THEORY 9+3

Decision making under certainty – Decision making under risk – Decision making under uncertainty – Decision tree analysis –Introduction to MCDM; AHP. Game Theory – Two person zero sum games, pure and mixed strategies – Theory of dominance - Graphical Solution – Solving by LP

UNIT V QUEUING THEORY 9+3

Queuing theory terminology – Single server, multi server- limited and unlimited queue capacity-limited and unlimited population.- Dynamic Programming

TOTAL: 60 PERIODS

COURSE OUTCOMES

CO1: Learned how to translate a real-world problem, given in words, into a mathematical Formulation

CO2: Learn to apply simplex algorithm for LPP.

CO3: Be able to build and solve Transportation Models and Assignment Models, maximal flow problem, minimum spanning tree and shortest path problem.

CO4: The students will be able to handle issues in Decision making under various conditions.

CO5: The students acquire capability in applying and using of queuing models for day today problems.

REFERENCES:

1. Hamdy A Taha, “Operations Research – An Introduction”, Pearson, 2017.
2. Panneerselvam .R, “Operations Research”, PHI, 2009 .
3. Philips, Ravindran and Solberg, “Operations Research principles and practices”, John Wiley, 2007.
4. Ronald L Rardin, “Optimisation in Operations Research”, Pearson, 2018.
5. Srinivasan.. G, “Operations Research Principles and Applications”, PHI, 2017.

RM4151	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2

UNIT I RESEARCH DESIGN **6**

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES **6**

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING **6**

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS **6**

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS **6**

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL : 30 PERIODS

REFERENCES
1. Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets”, Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2007.
4. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, “Professional Programme Intellectual Property Rights, Law and practice”, September 2013.

IL4111 WORK SYSTEM DESIGN AND ERGONOMICS LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:
- Develop the graphical tools of method study.
- Prioritize the alternate, modify and propose the new methods.
- Infer the work measurement tools.
- Relate the software products in work measurement and set time standards.
- Collaborate the students in physical fitness test.

LIST OF EXPERIMENTS
1. Graphic tools for method study.
2. Performance rating exercise.
3. Stop watch and Video time study.
4. Peg board experiment.
5. Work sampling.
6. MTM practice.
7. Study of physical performance using tread mill and Ergo cycle.
8. Physical fitness testing of individuals.
9. Experiments using sound level and lux meters.
10. Experiments using Ergonomics software

TOTAL: 60 PERIODS

LABORATORY EQUIPMENTS REQUIREMENTS
1. Time study Trainer.
2. Peg board.
3. Stop watches.
4. Tread mill.
5. Ergo cycle.
6. Any one Ergonomics software (Eg.: Ergomaster, Human CAD)

COURSE OUTCOMES:

CO1: Apply the method study tools to record the existing methodology.
CO2: Design a better work place using method study tools.
CO3: Set time standards using work measurement techniques.
CO4: Develop time standards using software’s.
CO5: Conduct experiments for physical fitness using appropriate equipment.

IL4112 **OPTIMIZATION LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- Provide adequate exposure to applications of a optimization software packages for solving Operations Research problems.
- Learn to solve Linear programming problems using Excel
- Summarize the problem solving techniques writing algorithms and procedures.
- Illustrate the syntax and semantics for C programming language
- Develop the C code for simple logic

LABORATORY EXPERIMENTS

1. LP Models formulation and solving using optimization software
2. Formulation of Transportation Problem and solving using optimization software
3. Formulation of Assignment Problems and solving using optimization software
4. Solving Maximal Flow problem using optimization software
5. Solving Minimal Spanning Tree problems using optimization software
6. Solving shortest route problems using optimization software
7. Solving Project Management problems using optimization software
8. Solving Waiting line problems using optimization software
9. Solving two players zero sum game using optimization software
10. Solving LPP using Microsoft EXCEL

TOTAL: 60 PERIODS

SOFTWARE REQUIREMENTS:
Optimization software

COURSE OUTCOMES:
CO1: Acquire knowledge in using Optimization software Package
CO2: Acquired knowledge using excel to solve LPP
CO3: Ability to write the algorithms for optimization problems.
CO4: Learned various syntax of C programme.
CO5: Ability to develop C ++programming for solving optimization problem.

IL4001 **APPLIED OBJECT ORIENTED PROGRAMMING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- Explain the fundamentals of C++
- To introduce the object oriented programming
- To learn how to create a class in C++
- Articulate how to derive a class
- Design the object oriented programming for Industrial Problems

UNIT I C++ BASICS 9

Expression and statements, operators, precedence, type conversion, control statements, loops, Arrays structures, functions, argument passing, reference argument, overloaded function.

UNIT II FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING 9

Elements of OOP, classes, subjects, messaging, inheritance, polymorphism, OOP paradigm versus procedural paradigm, object-oriented design.

UNIT III C++ CLASS 9

Definition, class objects, member functions, class argument, operator overloading, user defined conversions.

UNIT IV CLASS DERIVATION 9

Derivation specification, public and private base classes, standard conversions under derivation, classscope, initialization and assignment under derivation.

UNIT V APPLICATION 9

OOP's applications in Industrial Engineering.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Able to and write and execute C++ programs,

CO2: Able to understand the need for object oriented programming

CO3: Able to create class in C++ program

CO4: Able to derive a class from the basic class

CO5: Able to write a program for solving the industrial problem.

REFERENCES:

1. E.Balagurusamy, Object oriented programming with C ++,Tata Mc Graw Hill,2020
2. NabajyotiBarkakati,Object Oriented Programming in C++, Prentice Hall of India, 2001
3. Robert Lafore, "Object oriented programming in C++", Sam Publishing, 2002.
4. R.S.Salaria, Mastering Object Oriented Programming with C++, Khanna Publishers; 6th revised edition,2016
5. Stanley B.Lippman, C++ Printer, Addison – Wesley Pub.Co., 2003.

IL4002 ENGINEERING ECONOMICS AND COST ESTIMATION L T P C
3 0 0 3

COURSE OBJECTIVES:

- To study and understand the concept of Engineering Economics and apply in the real world.
- To gain knowledge in the field of cost estimation to enable the students to estimate the cost of various manufacturing processes.

UNIT I INTRODUCTION TO MANAGERIAL ECONOMICS AND DEMAND ANALYSIS 9

Definition of Managerial Economics - Nature and scope of Managerial Economics - Managerial Economics and other disciplines. Objectives of the firm - Factors influencing Managerial decisions - Basic concepts of Managerial Economics. Demand Analysis – Defining demand, Types of demand and Determinants of demand, Elasticity of demand and demand forecasting.

UNIT II PRODUCTION AND COST ANALYSIS 9

Production Analysis – Production function, Returns to a factor, Returns to scale, ISO quants and Least cost combination of inputs. Cost Analysis – Cost concepts, Determinants of cost, Short-run cost-output Relationship, Long-run cost output relationship, Economies and Diseconomies of scale and Estimating cost – Output Relationship.

UNIT III PRICING 9

Determinants of price – Pricing under different objectives – Pricing under different market structures – Price discrimination – Pricing of Joint products – Pricing methods in practice.

UNIT IV ESTIMATION OF MATERIAL AND LABOUR COSTS 9

Introduction to Estimation and Costing – Elements of costs – Allocation of overheads – Estimation of Material cost – Estimation of Labour cost, Indirect Expenses and Depreciation.

UNIT V ESTIMATION OF OPERATIONAL COST 9

Estimation in Machine shop – Estimation in Forging shop –Estimation in welding shop.

TOTAL: 45 PERIODS

COURSE OUTCOME:

Students will be able to estimate cost of products, analyze product cost and suggest cost reduction measure.

TEXT BOOKS:

1. V.L.Mote, Samuel Paul and G.S.Gupta, " Managerial Economics – concepts and cases", McGraw Hill Education (India), 2017.
2. Yogesh Maheshwari, "Managerial Economics", Third edition, PHI 2012.
3. T.R.Banga and S.C.Sharma, "Mechanical Estimating and Costing", 16th Edition, Khanna Publishers, 2012.

REFERENCES:

1. A.Ramachandra Aryasri and V.V.Ramana Murthy, "Engineering Economics and Financial Accounting", McGraw Hill Education (India), New Delhi, 2004.
2. R.Paneerselvam, "Engineering Economics", PHI, 2013.

IL4003 INDUSTRIAL AUTOMATION AND ROBOTICS L T P C
3 0 0 3

COURSE OBJECTIVES:

- Justify the high cost of investment in automation through production economics concepts.
- Summarize the fundamental concepts and elements of computer-integrated manufacturing.
- Articulate various aspects of automated manufacturing such as fixed automation and programmable automation.
- Familiarize the automated material handling and storage systems
- Discover computerized planning, lean and agile systems.

UNIT I AUTOMATION 9

Types of production – Functions – Automation strategies – Production economics – Costs in manufacturing – Break-even analysis.

UNIT II AUTOMATED FLOW LINES 9

Transfer mechanism - Buffer storage – Analysis of transfer lines - Automated assembly systems.

UNIT III NUMERICAL CONTROL AND ROBOTICS 9

NC-CNC – Part programming – DNC – Adaptive control – Robot anatomy – Specifications – End effectors – Sensors - Robot cell design – CAD/CAM.

UNIT IV AUTOMATED HANDLING AND STORAGE 9

Automated material handling systems – AGV- AS/RS – carousel storage – Automatic data capture – bar code technology- RFID

UNIT V MANUFACTURING SUPPORT SYSTEMS 9

Product design and CAD, CAD/CAM and CIM, Computer aided process planning- variant and generative approaches, Concurrent engineering and design for manufacture, Lean production, Agile manufacturing.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Select automated equipment based on break-even quantity and compute cost per component.

CO2: Analyze an automated flow line without and with buffer for its performance measures.

CO3: Acquire knowledge in Numerical control programming.

CO4: Identify the elements of manufacturing automation; these include CNC, Robotics, automated assembly and material handling.

CO5: Understand manufacturing planning and control systems.

REFERENCES:

1. Mikell P.Groover, “Automation, Production Systems and Computer Integrated Manufacturing” PHI, 2003. 24
2. Weatherall, “Computer Integrated Manufacturing – A total company strategy”, 2nd edition, 1995.

IL4004 MANAGEMENT ACCOUNTING AND FINANCIAL MANAGEMENT L T P C
3 0 0 3

COURSE OBJECTIVE:

- To enable students to understand accounting mechanism and interpretation of financial statements and to comprehend nuances involved in costing, preparation of budgets and making investment decisions.

UNIT I INTRODUCTION 9

Basics of accounting – Management Accounting – Financial accounting – cost accounting – comparison of Financial accounting, cost accounting and management Accounting – generally accepted Accounting principles – Accounting standards – Accounting cycle.

UNIT II FINANCIAL ACCOUNTING 9

Salient features of Balance Sheet and Profit and Loss statement, cash flow and Fund flow analysis (Elementary), working capital management, ratio analysis – Depreciation.

UNT III COST ACCOUNTING 9

Cost accounting systems : Job Costing, process costing, allocation of overheads, Activity based costing, variance analysis – marginal costing – Break even analysis.

UNTI IV BUDGETING 9

Requirements for a sound budget, fixed budget – preparation of sales and production budget, flexible budgets, zero based budgets and budgetary control.

UNIT V FINANCIAL MANAGEMENT 9

Investment decisions – Investment appraisal techniques – payback period method, accounting rate of return, net present value method, internal rate of return and profitability index method-cost of capital.

TOTAL: 45 PERIODS

COURSE OUTCOME:

- Upon successful completion of the course, students will acquire the ability to prepare and interpret financial statements, draft budgets and make sound investment decisions.

TEXT BOOKS:

1. Khan. M.Y. & P.J. Jain, "Management Accounting", Tata McGraw Hill, 2011.
2. Narayanaswamy. R., "Financial Accounting – A Managerial Perspective", PHI Learning, New Delhi, 2011.
3. James, C. Van Horne, “Fundamental of Financial Management”, Pearson Education, 2012

REFERENCES:

1. Jan Williams, "Financial and Managerial Accounting –The basis for business decisions", Tata McGraw Hill, 2010.
2. Horngren, Surdem, Stratton, Burgstahler, Schatzberg, "Introduction to Management Accounting", PHI Learning, 2011.

IL4005 **TOTAL QUALITY MANAGEMENT** **L T P C**
3 0 0 3

COURSE OBJECTIVE:

- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION **9**

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

UNIT II TQM PRINCIPLES **9**

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I **9**

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II **9**

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM **9**

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration**--ENVIRONMENTAL MANAGEMENT SYSTEM:** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

TOTAL: 45 PERIODS

COURSE OUTCOME:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield, Mary B.Sacre, Hemant Urdhwareshe and Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. ISO 9001-2015 standards

AUDIT COURSES

AX4091 ENGLISH FOR RESEARCH PAPER WRITING L T P C
2 0 0 0

OBJECTIVES

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING 6

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS 6

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III TITLE WRITING SKILLS 6

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission

TOTAL: 30 PERIODS

OUTCOMES

CO1 –Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES

1. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

AX4092 **DISASTER MANAGEMENT** **L T P C**
2 0 0 0

OBJECTIVES

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION **6**

Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS **6**

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III DISASTER PRONE AREAS IN INDIA **6**

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides and Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT **6**

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT **6**

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

OUTCOMES

CO1: Ability to summarize basics of disaster

CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES

1. Goel S. L., Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company,2007.
3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi,2001.

AX4093 CONSTITUTION OF INDIA L T P C
2 0 0 0

OBJECTIVES

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV ORGANS OF GOVERNANCE

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI ELECTION COMMISSION

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

OUTCOMES

Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization
- of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING

- The Constitution of India,1950(Bare Act),Government Publication.
- Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
- M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
- D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

AX4094	நற்றமிழ் இலக்கியம்	L T P C 2 0 0 0

UNIT I **சங்க இலக்கியம்** **6**

1. தமிழின் துவக்க நூல் தொல்காப்பியம்
   – எழுத்து, சொல், பொருள்
2. அகநானூறு (82)
   - இயற்கை இன்னிசை அரங்கம்
3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி
4. புறநானூறு (95,195)
   - போரை நிறுத்திய ஔவையார்

UNIT II **அறநெறித் தமிழ்** **6**

1. அறநெறி வகுத்த திருவள்ளுவர்
   - அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புறவு அறிதல், ஈகை, புகழ்
2. பிற அறநூல்கள் - இலக்கிய மருந்து
   – ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை
   (தூய்மையை வலியுறுத்தும் நூல்)

UNIT III **இரட்டைக் காப்பியங்கள்** **6**

1. கண்ணகியின் புரட்சி
   - சிலப்பதிகார வழக்குரை காதை
   சமூகசேவை இலக்கியம் மணிமேகலை
   - சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை

UNIT IV **அருள்நெறித் தமிழ்** **6**

1. சிறுபாணாற்றுப்படை
   - பாரி முல்லைக்குத் தேர் கொடுத்தது, பேகன் மயிலுக்குத் போர்வை கொடுத்தது, அதியமான் ஔவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்
2. நற்றிணை
   - அன்னைக்குரிய புன்னை சிறப்பு
3. திருமந்திரம் (617, 618)
   - இயமம் நியமம் விதிகள்
4. தர்மச்சாலையை நிறுவிய வள்ளலார்
5. புறநானூறு
   - சிறுவனே வள்ளலானான்
6. அகநானூறு (4) - வண்டு
   நற்றிணை (11) - நண்டு
   கலித்தொகை (11) - யானை, புறா
   ஐந்தினை 50 (27) - மான்
   ஆகியவை பற்றிய செய்திகள்

UNIT V **நவீன தமிழ் இலக்கியம்** **6**

1. உரைநடைத் தமிழ்,
- தமிழின் முதல் புதினம்,
- தமிழின் முதல் சிறுகதை,
- கட்டுரை இலக்கியம்,
- பயண இலக்கியம்,
- நாடகம்,
2. நாட்டு விடுதலை போராட்டமும் தமிழ் இலக்கியமும்,
3. சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,
4. பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,
5. அறிவியல் தமிழ்,
6. இணையத்தில் தமிழ்,
7. சுற்றுச்சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்.

TOTAL: 30 PERIODS

<u>தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்</u>

1. தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University) - www.tamilvu.org
2. தமிழ் விக்கிப்பீடியா (Tamil Wikipedia) -https://ta.wikipedia.org
3. தர்மபுர ஆதின வெளியீடு
4. வாழ்வியல் களஞ்சியம் - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக் களஞ்சியம் - தமிழ் வளர்ச்சித் துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம் - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்