ANNA UNIVERSITY, CHENNAI
NON- AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
M.E.INDUSTRIAL ENGINEERING
REGULATIONS 2021
CHOICEBASEDCREDITSYSTEM
I TO IV SEMESTERS CURRICULA & SYLLABI

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs): (3)

I.	To prepare the students with scientific, mathematical and engineering fundamentals required to excel in the field of industrial engineering.
II.	To prepare the students to excel in research in India/abroad through global, rigorous post graduate education.
III.	To provide the students with in depth research based knowledge in Industrial engineering to recognize, comprehend, analyze and to solve complex real life problems.

2. PROGRAMMEOUTCOMES POs):

PO#	PROGRAMME OUTCOMES
1	An ability to independently carry out research/investigation and development work to solve practical problems
2	An ability to write and present a substantial technical report/document
3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
4	Graduates will demonstrate the knowledge of professional and ethical responsibility.
5	Graduates will demonstrate an ability to function effectively as an individual member or a leader in diverse teams, and in multidisciplinary activities.
6	Graduates will engage in independent and life-long learning for personal and societal development.

Note: Program may add up to three additional Pos.

4. PEO/PO MAPPING:

PEO	PO					
	1	2	3	4	5	6
I.	2	3	1		3	2
II.			3		1	1
III.	2	1	1	2		1

Every programme objectives must be mapped with 1,2,3,-, scale against the correlation PO's

MAPPING–PG- M.E.INDUSTRIAL ENGINEERING

		COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6
YEAR I	SEMESTER I	Statistical Methods for Engineers	3	2	-	-	2	2
		Work System Design and Ergonomics	-	1	-	-	3	2
		Operations Research	2	3	1	-	1	1
		Research Methodology and IPR	3	2.5	3	-	-	-
		Work System Design and Ergonomics Laboratory	3	1.3	1.6	-	1	3
		Optimization Laboratory	2	1.3	1	3	1	-
	SEMESTER II	Multi-Variate Data Analysis	2	1	-	3	-	-
		Applied Quality Engineering	3	-	1	-	-	-
		System Simulation	2	3	-	1	1	1
		Operations Management	2	3	1	3	1	-
		Data Analytics Laboratory	-	3	1	1	-	-
		Simulation Laboratory	1.3	1	-	1	1	2
YEAR II	SEMESTER III	Project Work I						
		Technical Seminar						
	SEMESTER IV	Project Work II						

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CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND 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

FOUNDATION COURSES (FC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	MA4159	Statistical Methods for Engineers	3	1	0	4	1

PROGRAM CORE COURSES (PCC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.		Work System Design and Ergonomics	3	0	0	4	1
2.		Operations Research	3	1	0	4	1
3.		Work System Design and Ergonomics Laboratory	0	0	4	2	1
4.		Optimization Laboratory	0	0	4	2	1
5.		Multi-Variate Data Analysis	3	0	0	3	2
6.		Applied Quality Engineering	3	1	0	4	2
7.		System Simulation	3	1	0	4	2
8.		Operations Management	3	0	0	4	2
9		Data Analytics Laboratory	0	0	4	2	2
10		Simulation Laboratory	0	0	4	2	2

RESEARCH METHODOLOGY AND IPR COURSES (RMC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			Lecture	Tutorial	Practical		
1.	RM4151	Research Methodology and IPR	2	0	0	2	1

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

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SL. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1	IL4311	Technical Seminar	0	0	4	2	2
2	IL4312	Project Work I	0	0	12	6	3
3	IL4411	Project Work II	0	0	24	12	4

SUMMARY

	NAME OF THE PROGRAMME					
	SUBJECT AREA	CREDITS PER SEMESTER				CREDITS TOTAL
		I	II	III	IV	
1.	FC	4	-	-	-	4
2.	PCC	12	19	-	-	31
3.	PEC	3	6	6	-	15
4.	RMC	2	-	-	-	2
5.	OEC	-	-	3	-	3
6.	EEC	-	-	7	12	19
7.	Non Credit/Audit Courses	0	0	-	-	0
	Total Credit	**21**	**25**	**16**	**12**	**74**

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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**-**	**1**	-	-	3	-
CO2	**-**	**-**	-	-	-	-
CO3	**-**	**-**	-	-	-	-
CO4	**-**	**-**	-	-	3	2
CO5	**-**	**-**	-	-	-	2
Avg.	-	1/1=1	-	-	(3+3)/2=3	(2+2)/2=2

1 - low, 2-medium, 3-high, '-"- no correlation

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.

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3	-	-	-	-
CO2	-	3	-	-	-	-
CO3	-	-	1	-	-	-
CO4	-	-	-	-	1	1
CO5	-	-	-	-	-	1
Avg.	2/1=2	(3+3)/2=3	1/1=1	-	1/1=1	(1+1)/2=1

1 - low, 2-medium, 3-high, ‘-“- no correlation

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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1		2	3		1	
CO2		1				
CO3	3		1		1	
CO4	3	1	1			
CO5						3
Avg.	(3+3)/2=3	(2+1+1)/3=1.3	(3+1+1)/3=1.6	-	(1+1)/2=1	3/1=3

1 - low, 2-medium, 3-high, '-"- no correlation

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.

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	1	-	-	-
CO2	-	2	-	-	-	-
CO3	3	1	-	-	-	-
CO4	-	-	-	3	1	-
CO5	1	2	-	-	-	-
Avg.	(3+1)/2=2	(2+1+1)/3=1.3	1/1=1	3/1=3	1/1=1	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4201 MULTI-VARIATE DATA ANALYSIS L T P C
3 0 0 3

OBJECTIVES:

- Understanding the basic overview on multi variate data analysis
- Predicting the values of one or more variables on the basis of observations on the other variables.
- Formulating the specific statistical hypotheses, in terms of the parameters of multi variate populations
- Data reduction or structural simplification as simply as possible without sacrificing valuable information and will make interpretation easier.
- Sorting and Grouping "similar" objects or variables are created, based upon measured characteristics.

UNIT I REGRESSION 9

Simple Regression and Correlation – Estimation using the regression line, Correlation analysis, Multiple regression and Correlation analysis – Finding the Multiple Regression equation, Modelling techniques, Making inferences about the population parameters.

UNIT II MULTIVARIATE METHODS 9

An overview of Multivariate methods, Multivariate Normal distribution, Eigen values and Eigen vectors.

UNIT III FACTOR ANALYSIS 9

Principal Component Analysis – Objectives, Estimation of principal components, Testing for independence of variables, Factor analysis model – Factor analysis equations and solution – Exploratory Factor analysis – Confirmatory Factor analysis.

UNIT IV DISCRIMINANT ANALYSIS 9

Discriminant analysis – Discrimination for two multivariate normal Populations – Discriminant functions – Structured Equation Modelling (SEM).

UNIT V CLUSTER ANALYSIS 9

Cluster analysis – Clustering methods, Multivariate analysis of Variance.

TOTAL : 45 PERIODS

OUTCOMES:

CO1: To understand the basic overview on multi variate data analysis
CO2: Predict the values of one or more variables on the basis of observations on the other variables.
CO3: Formulate the specific statistical hypotheses, in terms of the parameters of multi variate populations
CO4: Data reduction or structural simplification as simply as possible without sacrificing valuable information and will make interpretation easier.
CO5: Sorting and Grouping "similar" objects or variables are created, based upon measured characteristics.

REFERENCES:

1. Dallas E Johnson, Applied Multivariate methods for data analysis, Duxbury Press(2010).
2. Joseph F. Hair, Jr. William C. Black Barry J. Babin, Rolph E. Anderson, Multivariate Data Analysis, Pearson Edition, (2010).
3. Richard I Levin, Statistics for Management, PHI (2011).

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	-	3	-	-
CO2	1	-	-	-	-	-
CO3	-	1	-	-	-	-
CO4	-	-	-	-	-	-
CO5	-	1	-	-	-	-
Avg.	1/1=2	(1+1)/2=1	-	3/1=3	-	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4202 **APPLIED QUALITY ENGINEERING** **L T P C**
3 1 0 4

OBJECTIVES:

- Developing a clear knowledge in the basics of various quality concepts.
- Facilitating the students in understanding the application of control charts and its techniques.
- Developing the special control procedures for service and process oriented industries.
- Analyzing and understanding the process capability study.
- Developing the acceptance sampling procedures for incoming raw material.

UNIT I INTRODUCTION **12**

Quality Dimensions – Quality definitions – Inspection - Quality control – Quality Assurance – Quality planning - Quality costs – Economics of quality – Quality loss function

UNIT II QUALITY CONTROL CHARTS **12**

Chance and assignable causes of process variation, statistical basis of the control chart, control charts for variables- $\bar{X}$, R and S charts, attribute control charts - p, np, c and u- Construction and application.

UNIT III SPECIAL CONTROL PROCEDURES **12**

Warning and modified control limits, control chart for individual measurements, multi-vari chart, $\bar{X}$ chart with a linear trend, chart for moving averages and ranges, cumulative-sum and exponentially weighted moving average control charts.

UNIT IV STATISTICAL PROCESS CONTROL **12**

Process stability, process capability analysis using a Histogram or probability plots and control chart. Gauge capability studies, setting specification limits.

UNIT V ACCEPTANCE SAMPLING **12**

The acceptance sampling fundamental, OC curve, sampling plans for attributes, simple, double, multiple and sequential, sampling plans for variables, MIL-STD-105D and MIL-STD-414E & IS2500 standards.

TOTAL: 60 PERIODS

OUTCOMES:

Students will be able to:

CO1: Control the quality of processes using control charts for variables in manufacturing industries.
CO2: Control the occurrence of defective product and the defects in manufacturing companies.
CO3: Control the occurrence of defects in services.
CO4: Analyzing and understanding the process capability study.
CO5: Developing the acceptance sampling procedures for incoming raw material.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	-	-	-	-	-
CO2	-	-	1	-	-	-
CO3	-	-	1	-	-	-
CO4	3	-	-	-	-	-
CO5	-	-	-	-	-	-
Avg.	(3+3)/2=3	-	(1+1)/2=1	-	-	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4203 **SYSTEM SIMULATION** **L T P C**
3 1 0 4

OBJECTIVES:

- To learn about generating of random numbers and random variates.
- To learn how to test the random numbers and random variates.
- To learn how to design the simulation experiment.
- To be trained in simulation software packages.
- To apply simulation techniques for various optimization problems.

UNIT I INTRODUCTION AND RANDOM NUMBERS 12

Systems – Modelling – Types – Systems components – Simulation basics- Random numbers – Methods of generation : Manual, table, algorithms – mid square, multiplier, constant multiplier, additive and multiplicative congruential algorithms

UNIT II RANDOM VARIATES GENERATION AND TESTING 12

Random variates for standard distributions like uniform, exponential, poisson, binomial, normal etc – Testing of Random variates – Input Data Modeling - Monte Carlo Simulation.

UNIT III DESIGN OF SIMULATION EXPERIMENTS 12

Steps on Design of Simulation Experiments – Development of models using of High level language for systems like Queing, Inventory, Replacement, Production etc., - Model validation and verification, Output analysis. Use of DOE tools.

UNIT IV SIMULATION LANGUAGES 12

Need for simulation Languages – Study of various simulation software packages.

UNIT V CASE STUDIES USING SIMULATION LANGUAGES 12

Waiting line models, inventory models, and production models.

TOTAL: 60 PERIODS

OUTCOMES:

CO1: Able to generate random numbers and random variates.
CO2: Able to test the statistical stability of random variates.
CO3: Able to develop simulation models for real life systems.
CO4: How to use simulation language to simulate and analyze various problems.
CO5: Able to solve waiting line model, inventory models and production models problems using simulation software.

REFERENCES:

1. David Kelton, Rondall P Sadowski and David T Sturrock, “Simulation with Arena”, McGraw Hill, 2004.
2. Jerry Banks, John S Corson, Barry.L. Nelson, David M.Nicol and P.Shahabudeen, Discrete Event Systems Simulation, Pearson education, Fourth edition, 2007.
3. Law A M and Kelton W D, Simulation Modelling and analysis, Tata McGraw Hill, 2003.Thomas J Schriber, “Simulation Using GPSS”, John Wiley, 2002.

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	3	-	-	-	-
CO2	-	3	-	1	-	-
CO3	-	-	-	-	-	1
CO4	2	-	-	-	-	-
CO5	-	-	-	-	1	-
Avg.	2/1=2	(3+3)/2=3	-	1/1=1	1/1=1	1/1=1

1 - low, 2-medium, 3-high, '-"- no correlation

IL4204 OPERATIONS MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- Summarize the operations, its strategy and design.
- Identify the future demand with accuracy.
- Plan the production and its resources.
- Illustrate the Inventory and its control.
- Interpret the control of production.

UNIT I UNDERSTANDING OPERATIONS AND ITS DESIGN 9

Introduction to Operations Management, Manufacturing trends in India, Systems Perspective, Functions of Operations Management, Challenges and current priories for operations management; The Relevance of Operations Strategy, Formulation of Strategy, World Class Manufacturing Process and Emerging Trends and Implications for Operations; Designing Operations – Design of Manufacturing Process and Design of Services Systems.

UNIT II DEMAND FORECASTING 9

Forecasting as a planning tool, need for forecast, forecasting time horizon, Design of forecasting system, Developing the forecasting Logic, Sources of data, Models for forecasting, Explorative Methods using Time Series - Moving averages, The exponential smoothing method, Extracting the components of time series, Estimating the trend using linear regression and Extracting the seasonal component; Causal Methods of forecasting, Accuracy of Forecasts and using the Forecasting System.

UNIT III PRODUCTION PLANNING 9

Aggregate Production Planning and Master Production Scheduling; Resources Planning – Dependent demand attributes, the basic building blocks of a planning frame work, MRP logic, Using the MRP system, Capacity Requirements (CRP), Distribution Requirement Planning (DRP), and Resources Planning; Manufacturing Resources Planning (MRP II), Enterprise Resource Planning (ERP) and Resources Planning in Services.

UNIT IV INVENTORY PLANNING AND CONTROL 9

Inventory planning for independent Demand items, Types of inventory, Inventory Costs, Inventory Control for Deterministic Demand items, Handling Uncertainty in Demand, Inventory Control Systems, Selective Control of Inventory, Inventory Planning for Single - Period Demand and other issues in Inventory Planning and Control.

UNIT V CAPACITY ANALYSIS AND OPERATIONAL CONTROL 9

Defining capacity, Measures of capacity, The time horizon in capacity planning, The capacity planning framework, Alternatives for capacity augmentation, Decision tree for capacity planning; Operational control – Input - Output Control, Operational Control issues in mass production systems and Operations planning and control based on the theory of constraints; Elements of JIT Manufacturing and Production planning and Control in JIT.

TOTAL: 45 PERIODS

OUTCOMES

CO1: The students will be able to understand what is operations management, itsstrategies and design of operations.

CO2: The students will be able to apply various techniques in forecasting the future Demand with accuracy.

CO3: The students will be able to plan the production schedule and apply techniques like Aggregate plan, MRP, MRP II, DRP and ERP.

CO4: The students will be able determine the lot size and understand the inventory systems. Also will be able to classify the inventories for a better control.

CO5: The students will be able to understand capacity planning and exercise control on production. Also understand JIT implementation and control.

REFERENCES:

1. Lee J.Krajewski, Larry P.Ritzman, “Operations Management”, Pearson Education, 2012.
2. Mahadevan,B. Operations- Theory & Practice, Pearson Education, 2015.
3. Panneerselvam,R. Production and operations management, PHI, 2012.
4. SeetharamaL.Narasimhan, Dennis W.McLeavey, Peter J.Billington,“Production Planning and Inventory Control” , PHI, 2002.

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	-	-	-	-	-
CO2	-	3	1	3	1	-
CO3	-	-	-	-		-
CO4	-	-	-	-	-	-
CO5	-	-	-	-	-	-
Avg.	2/1=2	2/1=3	1/1=1	3/1=3	1/1=1	**-**

1 - low, 2-medium, 3-high, ‘-“- no correlation

IL4211 DATA ANALYTICS LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- Training and Exposure on Correction Analysis, Simple and Multiple Regression.
- Training and Exposure on Factor Analysis, Discriminant and Cluster Analysis.
- Training and Exposure on Control Charts for Variable and Attributes.
- Training and Exposure on Predicting Reliability Parameters.
- Training and Exposure on Analysis of Variance.

LABORATORY EXPERIMENTS

1. Determine the linear regression model for fitting a straight line and calculate the least squares estimates, the residuals and the residual sum of squares.
2. Determine the multivariate regression model for fitting the straight line.
3. Perform the Correlation analysis to determine the relationships among the variables.
4. Perform the factor analysis for the given set of model data using both Exploratory and Confirmatory methods and evaluate the model adequacy.
5. Determine which continuous variable discriminate among the given group and determine which variable is the best predictor.
6. Determine the groups using Cluster Analysis
7. Determine the process is within the control or not by developing the control charts for attributesand variables and estimate the process capability.
8. Estimate the parameters (MTTF, MTBF, failure rate, bathtub curve etc) of components and systems to predict its reliability.
9. Develop the single factor and two factor design of experiment model to predict the significance factor.
10. Develop 2^K factorial and 2^{k-p} fractional factorial experiment to determine the parameters which affect the system.

TOTAL : 60 PERIODS

OUTCOMES:

CO1: Ability to independently formulate, perform and assess hypothesis
CO2: Ability to select appropriate technique
CO3: Ability to apply selected data analysis techniques
CO4: Ability to interpret the results
CO5: Ability to present the results properly to extract meaningful information from data sets for effective decision making.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	-	1	-	-
CO2	-	3	-	-	-	-
CO3	-	-	1	-	-	-
CO4	-	3	-	-	-	-
CO5	-	-	-	-	-	-
Avg.	-	(3+3)/3=3	1/1=1	1/1=1	-	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4212 SIMULATION LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- Develop C program to generate random number and random variates.
- Develop C program to fest random number and random variates.
- Apply Monte carlo simulation for random walk problem and paper vendor problem
- Develop simulation model using simulation software for different queuing models.
- Develop simulation model using simulation software for Inventory models.

LIST OF EXPERIMENTS:

1. Generate Random Number by Mid Square, Midpoint and Congruential method using 'C' program.
2. Generate Poisson random Variate, uniform random Variate using 'C' program.
3. Generate Normal random Variate, Binomial random Variate using 'C' program.
4. Testing random numbers and random variates for their uniformity.
5. Testing random numbers and random variates for their independence.
6. Solve random walk problem using Monte Carlo simulation.
7. Solve paper vendor problem using Monte Carlo simulation.
8. Solve single server queuing model using simulation software package.
9. Solve multi server queuing model using simulation software package.
10. Solve inventory model using simulation software package.

SOFTWARES REQUIREMENTS:

Simulation software package

TOTAL :30 PERIODS

OUTCOMES:

CO1: Know to generate random number and random variates.
CO2: Learn to test the random number and random variates.
CO3: Able to apply Monte Carlo simulations to random walk and paper vendor problems.
CO4: Able to apply simulation software to various queuing models.
CO5: Know to use simulation software to various inventory models.

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	-	-	-	-	-
CO2	1	-	-	1	-	-
CO3	-	-	-	-	-	3
CO4	2	1	-	-	-	-
CO5	-	-	-	-	1	-
Avg.	(1+1+2)/3=1.3	1/1=1	-	1/1=1	1/1=1	2/1=2

1 - low, 2-medium, 3-high, '-"- no correlation

IL4311 TECHNICAL SEMINAR L T P C
0 0 2 1

OBJECTIVES:

- To develop journal paper reading and understanding skill.
- To improve communication and presentation skill of students

GUIDELINES:

- The students are expected to make a presentation on the state of research on a particular topic based on current journal publications in that topic.
- A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
- Students are encouraged to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

TOTAL: 30 PERIODS

OUTCOMES:

The students will be able to 1. Select the method, analysis and optimize the given problem for the given field applications.

IL4312	PROJECT WORK I	L T P C 0 0 12 6

COURSE OBJECTIVES:

To impart knowledge on

- To develop the skill of students for analysing safety problems to control the hazard.
- To expose the students to identify and evaluate the hazards in an industry under study.
- To expose the students to assess the Compliance level of safety norms and procedures.

The Student will identify and select a problem based on comprehensive literature survey. The student should submit a proposal and get it approved by the Head of the department.

Three reviews will be conducted by Project review committee. Students will be evaluated by the committee during the review and suggestions will be offered by members.

The report for PHASE -I should be submitted by the students at the end of course

COURSE OUTCOMES:

At the end of the course, the students will be able to

- This course would make students to train themselves to conduct hazard analysis and suggest solutions to control risks.
- Course would be helpful for the students to know the norms and standards for an Industry.
- Students can recognise hazards and assess or evaluate them by using various techniques.
- Students would be able to suggest suitable measures to prevent hazards by referring the literature and comprehensive hazard analysis.

IL4411	PROJECT WORK II	L T P C 0 0 24 12

COURSE OBJECTIVES:

To impart knowledge on

- To develop the skill of students for analysing safety problems to control the hazard.
- To expose the students to identify and evaluate the hazards in an industry under study.
- To expose the students to assess the Compliance level of safety norms and procedures.

It is the continuation of Phase I project Three reviews will conducted by Project review committee. Students will be evaluated by the committee during the review and suggestions will be offered by members.

At least one paper should be published by the student in international / national conference.

The report should be submitted by the students at the end of course.

COURSE OUTCOMES:

At the end of the course, the students will be able to

- This course would make students to train themselves to conduct hazard analysis and suggest solutions to control risks
- Course would be helpful for the students to know the norms and standards for an Industry.
- Students can recognise hazards and assess or evaluate them by using various techniques.
- Students would be able to suggest suitable measures to prevent hazards by referring the literature and comprehensive hazard analysis.

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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	1	-	-	-
CO2	-	2	-	-	-	-
CO3	2	1	-	-	-	-
CO4	-	-	-	1	1	-
CO5	2	1	-	-	-	
Avg.	(2+2)/2=2	(2+1+1)/3=1.3	1/1=1	1/1=1	1/1=1	-

1 - low, 2-medium, 3-high, '-"- no correlation

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 OUTCOMES:

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

CO1: know about method to Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
CO2: able to Calculate payback period and capitalized cost on one or more economic alternatives.
CO3: know about method to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives
CO4: Students able to Prepare the cost estimation report for any project.
CO5: Learn about cost accounting, replacement analysis.

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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**2**	-	-	2	-	2
CO2	**2**	-	-	-	-	2
CO3	**-**	-	-	1	-	-
CO4	**-**	2	-	-	-	-
CO5	**-**	-	-	-	-	-
Avg.	(2+2)/2=2	2/1=2	-	(2+1)/2=1.5	-	(2+2)/2=2

1 - low, 2-medium, 3-high, '-"- no correlation

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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**2**	-	-	-	-	-
CO2	**-**	-	-	-	-	-
CO3	**-**	2	2	-	-	-
CO4	**2**	-	-	-	-	-
CO5	**1**	-	-	-	-	-
Avg.	(2+2+1)/3=1.6	2/1=2	2/1=2	-	-	-

1 - low, 2-medium, 3-high, '-"- no correlation

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

COURSE OBJECTIVEs:

- 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 OUTCOMES:

- Ability to prepare and interpret financial statements,
- Understand the basic principles of Accounting.
- Understand the cost Accounting and costing techniques.
- Ability to prepare draft budgets and make sound investment decisions.
- Understand the process of financial management, method of investment.

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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	**2**	-	-	-	-	-
CO2	**-**	-	2	-	-	-
CO3	**-**	-	-	-	-	-
CO4	**-**	-	-	-	-	-
CO5	**-**	-	-	-	2	-
Avg.	**2/1=2**	-	2/1=2	-	2/1=2	-

1 - low, 2-medium, 3-high, ‘-“- no correlation

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 OUTCOMES:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.
- Learn about customer support.
- Know about leadership and team work.
- Know about ISO standards and requirements.
- Know about environmental management system

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

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	-	-	-	-
CO2	2	-	-	-	-	-
CO3	-	-	-	-	2	-
CO4	-	-	-	2	-	-
CO5	-	-	-	-	1	-
Avg.	2/1=2	-	-	2/1=1	(2+1)/2=1.5	-

1 - low, 2-medium, 3-high, ‘-“- no correlation

IL4006 DESIGN AND ANALYSIS OF ALGORITHMS L T P C
3 0 0 3

OBJECTIVES:

- Understand the basic steps in development of an algorithm
- Learn and apply various syntax used in C++ programming language.
- Develop knowledge about Structured programming and data structure.
- Comprehend and apply methods of designs to algorithms.
- Acquire knowledge in various algorithms.

UNIT I INTRODUCTION 5

Algorithms, basic steps in development.

UNIT II REVIEW OF THE STRUCTURED LANGUAGES 10

C++ Basics, Expression, operators, control statements, structures, multi-dimensional array, functions, arguments, overload function.

UNIT III BASIC TOOLS 5

Top down, Structured programming, networks, data structure.

UNIT IV METHODS OF DESIGN 10

Sub goals, hill climbing and working backward, heuristics, back track programming, Branch and bound recursion process, program testing, documentation, Meta heuristics.

UNIT V APPLICATION 15

Development of sorting, searching, algorithms- combinatorial problems, shortest path, probabilistic algorithms.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Know about the algorithms and basic steps in development of algorithm.
CO2: Acquire knowledge in basic structured languages.
CO3: To write a structured program using appropriate data structure.
CO4: Choose and apply the appropriate methods of design in algorithms or programs.
CO5: To write programs for applications using various algorithms.

REFERENCES:

1. Dromey, “How to solve in by computers, Prentice Hall, 1982.
2. Elias Horowitz, SartajSahani, SanguthevarRajasekaran, Fundamentals of Computer Algorithms, Galgotia Publications, 2003
3. Goodman S.F. &Headtruemu, S.T.,Introduction to the design and analysis of algorithms, Mcgraw Gill, 2000.
4. John R Hubbard, Fundamentals of Computing with C++, Tata Mc Graw Hill, 2000.
5. Panneerselvam.R. “Design and Analysis of Algorithms”, Prentice Hall of India,2008.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	-	-	-	-	-
CO2	-	-	-	1	-	-
CO3	-	1	-	-	-	-
CO4	-	-	1	-	-	-
CO5	-	1	-	-	-	-
Avg.	1/1=1	(1+1)/2=1	1/1=1	1/1=1	-	-

1 - low, 2-medium, 3-high, ‘-“- no correlation

IL4075 LEAN MANUFACTURING AND SIX SIGMA L T P C
3 0 0 3

OBJECTIVES:

- Summarize the basics of Lean and Six Sigma.
- Describe the need and the process of integrating Lean and Six sigma.
- Identify and select the resources required for LSS Projects and selection of projects including Team building.
- Infer the DMAIC process and study the various tools for undertaking LSS projects.
- Relate how to institutionalize the LSS efforts.

UNIT I INTRODUCTION TO LEAN AND SIX SIGMA 9

Introduction to Lean- Definition, Purpose, Features of Lean ; Top seven wastes, Need for Lean management, The philosophy of lean management, Creating a lean enterprise, Elements of Lean, Lean principles, the lean metric, Hidden time traps. Introduction to quality, Definition of six sigma, origin of six sigma, Six sigma concept and Critical success factors for six sigma; Case analysis.

UNIT II INTEGRATION OF LEAN AND SIX SIGMA 9

Evolution of lean six sigma, the synergy of Lean and six sigma, Definition of lean six sigma, the principles of lean six sigma, Scope for lean six sigma, Features of lean six sigma. The laws of lean six sigma, Key elements of LSS, the LSS model and the benefits of lean six sigma. Initiation - Top management commitment – Infrastructure and deployment planning, Process focus, organizational structures, Measures – Rewards and recognition, Infrastructure tools, structure of transforming event and Launch preparation; Case study presentations.

UNIT III PROJECT SELECTION AND TEAM BUILDING 9

Resource and project selection, Selection of Champions, Identification of potential projects, top down (Balanced score card) and Bottom up approach – Methods of selecting projects – Benefit/Effort graph, Process mapping, value stream mapping, Predicting and improving team performance, Nine team roles and Team leadership; Case study presentations .Black belts, Training of Black belts and

UNIT IV THE DMAIC PROCESS AND TOOLS 9

The DMAIC process – Toll gate reviews; The DMAIC tools; Define tools – Project definition form, SIPOC diagram; Measure tools – Process mapping, Lead time/cycle time, Pareto chart, Cause and Effect matrix, FMEA; Idea – generating and organizing tools – Brainstorming, Nominal group technique, Multi-voting and Cause and effect diagram, Data collection and accuracy tools- Check sheet, Gauge R&R; Understanding and eliminating variation- run charts, control charts and process capability analysis; Analyze tools - Scatter plots, ANOVA, Regression analysis, Time trap analysis; Improve tools – Mistake proofing, Kaizen, set up time reduction (SMED), TPM, DOE and the pull system. Control tools – statistical process control.

UNIT V INSTITUTIONALIZING AND DESIGN FOR LSS 9

Institutionalizing lean six sigma – improving design velocity, creating cycle time base line, valuing projects, gating the projects, reducing product line complexity, Design for lean six sigma, QFD, Theory of Inventive Problem solving (TRIZ), Robust design; Case study presentations.

TOTAL:45 PERIODS

OUTCOMES:

CO1: The students will be able to understand what is Lean and Six sigma and their importance in the globalised competitive world.

CO2: The students will be able to understand the importance of integrating Lean and Six sigma and also the process of their integration.

CO3: The students will be able to plan the Resources required to undertake the LSS projects and also acquire how to select the suitable projects and the teams.

CO4: The students will be able apply DMAIC methodology to execute LSS projects and in this regard they will be acquainted with various LSS tools.

CO5: The students will be able to understand the process of institutionalizing the LSS effort and also understand the Design for LSS.

REFERENCES:

1. James P. Womack, Daniel T. Jones, Lean Thinking, Free press business, 2003.
2. Michael L. George, Lean Six Sigma, McGraw-Hill., 2002.
3. Ronald G.Askin and Jeffrey B.Goldberg, Design and Analysis of Lean Production Systems, John Wiley &Sons., 2003.
4. Salman Taghizadegan, Essentials of Lean Six Sigma, Elsevier, 2010.

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	-	-	-	-	-
CO2	1	-	-	-	-	-
CO3	-	-	-	1	-	-
CO4	-	-	1	-	-	-
CO5	-	-	-	-	-	-
Avg.	(1+1)/2=1	-	1/1=1	1/1=1	-	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4071 ADVANCED OPTIMIZATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- Learn to solve integer programming problems
- To know how to solve the Dynamic programming problems
- Learn to solve non – linear programming problems with un constrained optimization problems
- Understand to solve non-linear programming problems using KKT conditions, quadratic and separable programming
- To create awareness of Meta heuristic algorithms.

UNIT I INTEGER PROGRAMMING 9

Branch and Bound technique –cutting plane algorithm method - Travelling Salesman problem - Traveling Salesman Problem - Branch and Bound Algorithms for TSP - Heuristics for TSP - Chinese Postman Problem - Vehicle Routeing Problem

UNIT II DYNAMIC PROGRAMMING 9

Characteristics of Dynamic Programming Problems - Deterministic Dynamic Programming - Forward and Backward recursive recursion – selected dynamic programming application – investment model – inventory model – replacement model –reliability model – stage coach problem.

UNIT III NONLINEAR PROGRAMMING - I 9

Types of Nonlinear Programming Problems - One-Variable Unconstrained Optimization - Multivariable Unconstrained Optimization

UNIT IV NONLINEAR PROGRAMMING – II 9

The Karush-Kuhn-Tucker (KKT) Conditions for Constrained Optimization - Quadratic Programming - Separable Programming - Convex Programming - Nonconvex Programming

UNIT V NON-TRADITIONAL OPTIMIZATION 9

Overview of Genetic algorithms, Simulated Annealing, neural network based optimization. Particle Swarm optimization, Ant Colony Optimization, Optimization of Fuzzy Systems.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Know how to solve integer programming problems
CO2: Able to solve Dynamic programming problems
CO3: Familiar in solving unconstrained non linear optimization problems
CO4: Familiar in solving constrained liner optimization problems
CO5: Know how to solve non linear optimization problems using Meta heuristic algorithms

REFERENCES:

1. Fredrick S.Hillier and G.J.Liberman, “Introduction to Operations Research”, McGraw Hill Inc. 1995.
2. Kalymanoy Deb, “Optimization for Engineering Design”,PHI,2003
3. Christos H. Papadimitriou, Kenneth Steiglitz, Combinatorial Optimization, PHI 2006
4. Ravindran – Phillips –Solberg, “Operations Research – Principles and Practice”, John Wiley India, 2006.
5. Singiresu.S.Rao, “Engineering optimization – Theory and practices”, John Wiley and Sons, 1996.

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	-	-	-	-	-
CO2	-	1	-	-	-	-
CO3	-	1	-	-	-	-
CO4	-	1	-	-	-	-
CO5	-	1	-	-	-	-
Avg.	2/1=2	(1+1+1+1)/4=1	-	-	-	-

1 - low, 2-medium, 3-high, ‘-“- no correlation

IL4007 LOGISTICS AND DISTRIBUTION MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- Impart the basic knowledge on the concepts on logistics and distribution.
- Inculcate knowledge in Logistics Process, Planning and Materials Management.
- Teach the principles and activities in warehousing and storage.
- Provide knowledge on modes of transportation and international transport.
- Inculcate knowledge on performance monitoring, outsourcing and ICT application in logistics and distribution.

UNIT I CONCEPTS OF LOGISTICS AND DISTRIBUTION 9

Introduction to logistics and distribution- Integrated logistics and the supply chain- Integrated logistics and the supply chain- Customer service and logistics- Channels of distribution - Key issues an challenges for logistics.

UNIT II PLANNING FOR LOGISTICS 9

Planning framework for logistics -Logistics processes -Supply chain segmentation- Logistics network planning - Logistics management and organization - Manufacturing and materials management

UNIT III WAREHOUSING AND STORAGE 9

Principles of warehousing Storage and handling systems (palletized and non-palletized) - Order picking and replenishment- Receiving and dispatch - Warehouse design- Warehouse management and information.

UNIT IV FREIGHT TRANSPORT 9

International logistics: modal choice - Maritime transport - Air transport - Rail and intermodal transport- Road freight transport: vehicle selection, vehicle costing and planning and resourcing International transportation systems in Global perspective.

UNIT V OPERATIONAL MANAGEMENT 9

Cost and performance monitoring- Benchmarking- Information and communication technology in supply chain- Outsourcing: services and decision criteria, the selection process – Outsourcing management- Security and safety in distribution - Logistics and the environment.

TOTAL: 45 PERIODS

OUTCOMES:

CO1 – Understand the concepts of logistics and distribution
CO2 – Effectively gain knowledge in logistics planning
CO3 – Apply and analyze various principles and concepts in warehousing and storage
CO4 – Effectively design and analyze a system of logistics for freight transport
CO5 – Understand the basic concepts in outsourcing, benchmarking and safety in distribution

REFERENCES:

1. Alan Rushton,PhilCroucher and Peter Baker(Eds.)The Handbook of Logistics and Distribution Management, Kogan Page,4th Edition,2010.
2. Jean-Paul Rodrigue, Claude Comtois and Brian Slack, “The geography of transport systems” (2009), New York: Routledge,

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	-	-	-	-	-
CO2	1	-	-	-	-	-
CO3	-	-	-	-	-	-
CO4	-	-	-	-	-	-
CO5	-	-	-	1	-	-
Avg.	(1+1)/2=1	-	-	1/1=1	-	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4078 SUPPLY CHAIN MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- Explain the role of supply chain management in an organization.
- Identify the various aspects of supply chain management and the factors affecting
- them.
- Explain the relationship among various factors involved in planning, organising and controlling supply chain operations.
- Summarize the sourcing and inventory decisions involved in supply chain operations.
- Explain the use of information technology in supply chain management.

UNIT I INTRODUCTION SUPPLY CHAIN MANAGEMENT 9

Introduction, Types of supply chains with and examples, Evolution of SCM concepts, Supply chain performance, Strategic Fit, Drivers of Supply Chain Performance – key decision areas – External Drivers of Change. Supply contracts – centralized vs. decentralized system

UNIT II SUPPLY CHAIN NETWORK DESIGN 9

Need for distribution network design- Factors affecting, Design options for distribution network. Network design decisions - Framework, factors influencing, Models of facility location and capacity allocation. Role of Transportation in supply chain, modes of transportation Modal Selection, Classification of carriers, Carrier Selection, Transportation Execution and Control. Food Mile Concept., design options.

UNIT III DEMAND AND SUPPLY IN SUPPLY CHAIN 9

Forecasting in supply chain- Methods, Approach, Errors.Aggregate planning in supply chain- Problem, Strategies and Implementation. Predictable variability in supply chain, Managing supply and demand. Distribution strategies-direct shipment, traditional warehousing, cross docking, inventory pooling, transhipment, Choosing appropriate strategy, Milk Run Model.

UNIT IV SOURCING AND INVENTORY DECISIONS IN SUPPLY CHAIN 9

Purchasing Vs Procurement Vs Strategic Sourcing, Item procurement importance matrix, Strategic Sourcing Methodology, Managing sourcing and procurement process, Supplier selection and evaluation, Bullwhip effect and its management, Economies of scale in supply chain- Cycle inventory, Estimation, Quantity discounts, Multiechelon cycle inventory. Uncertainty in supply chain- Safety inventory, Determination of appropriate level, Impact on uncertainity.

UNIT V SUPPLYCHAIN AND INFORMATION SYSTEMS 9

Information in supply chain, Role of Information technology, IT framework in supply chain, Supplier and Customer relationship management.Role of e-business in supply chain, e-sourcing and e-procurement.Technology drivers in supply chain - Risk management.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to:

CO1: To introduce the concepts and elements of supply chain management.
CO2: to understand supply chain network design aspects for various manufacturing and service sectors.
CO3: To understand the principle of demand and supply in supply chain
CO4: To gain knowledge on the sourcing and inventory decisions in supply chain.
CO5: To understand the concepts of supply chain information systems.

REFERENCES

1. Chopra S. and Meihdl P., “Supply Chain Management- Strategy, Planning and Operations”, Pearson Education Asia. 2007.
2. Dougart L., Stock J. and Ellram L., “Logistic Management”, Irwin McGraw Hill International Edition" 1998.
3. Kaminsky S., “Design and Managing the Supply chain” , McGraw Hill International Edition. 2000.
4. Raghuram G, and N.Rangaraj, “Logistics and Supply Chain Management -cases and concepts”, McMilan India Pvt Ltd, New Delhi,. 2000.
5. Sahay B.S. “Supply Chain Management: For Global Competitiveness”, 2nd Edition, Macmillan, India Ltd, 2011.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	-	-	-	-	-
CO2	-	-	-	-	-	-
CO3	-	-	-	-	2	-
CO4	-	-	-	-	-	-
CO5	2	-	-	-	-	-
Avg.	(1+2)/2=1.5	-	-	-	2/1=2	-

1 - low, 2-medium, 3-high, ‘-“- no correlation

IL4008 **MACHINE LEARNING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To understand the concepts and mathematical foundations of machine learning and types of " problems tackled by machine learning.
- To explore the different supervised learning techniques including ensemble methods
- To outline different aspects of unsupervised learning and reinforcement learning
- To outline the role of probabilistic methods for machine learning
- To understand the basic concepts of neural networks and deep learning

UNIT I INTRODUCTION AND MATHEMATICAL FOUNDATIONS 9

What is Machine Learning? Need –History – Definitions – Applications - Advantages, Disadvantages & Challenges -Types of Machine Learning Problems – Mathematical Foundations - Linear Algebra & Analytical Geometry -Probability and Statistics -Vector Calculus & Optimization -Information theory.

UNIT II SUPERVISED LEARNING 9

Introduction-Discriminative and Generative Models -Linear Regression -Least Squares -Under fitting / Over-fitting -Cross-Validation – Lasso Regression-Classification -Logistic Regression Gradient Linear Models -Support Vector Machines –Kernel Methods -Instance based Methods - K-Nearest Neighbours - Tree based Methods –Decision Trees –ID3 – CART - Ensemble Methods –Random Forest - Evaluation of Classification Algorithms.

UNIT III UNSUPERVISED LEARNING AND REINFORCEMENT LEARNING 9

Introduction - Clustering Algorithms -K – Means – Hierarchical Clustering - Cluster Validity - Dimensionality Reduction –Introduction -Principal Component Analysis – Recommendation Systems - EM algorithm. Reinforcement Learning – Elements -Model based Learning – Temporal Difference Learning.

UNIT IV PROBABILISTIC METHODS FOR LEARNING 9

Introduction -Naïve Bayes Algorithm -Maximum Likelihood -Maximum Apriori -Bayesian Belief Networks -Probabilistic Modelling of Problems -Inference in Bayesian Belief Networks – Probability Density Estimation - Sequence Models – Markov Models – Hidden Markov Models.

UNIT V NEURAL NETWORKS AND DEEP LEARNING 9

Neural Networks – Biological Motivation- Perceptron – Multi-layer Perceptron – Feed Forward Network – Back Propagation-Activation and Loss Functions- Limitations of Machine Learning – Deep Learning – introduction – Convolution Neural Networks – Recurrent Neural Networks – LSTM- Use cases.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Understand and outline problems for each type of machine learning
CO2: Design a Decision tree and Random forest for an application
CO3: Implement Probabilistic Discriminative and Generative algorithms for an application and analyze the results.
CO4: Use a tool to implement typical Clustering algorithms for different types of applications.
CO5: Design and implement an HMM for a Sequence Model type of application.

REFERENCES:

1. Probabilistic Machine Learning: An Introduction by Kevin Murphy, MIT Press 2022. https://probml.github.io/pml-book/book1.html
2. Kevin Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
3. Peter Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”, First Edition, Cambridge University Press, 2012.
4. Stephen Marsland, “Machine Learning - An Algorithmic Perspective”, Chapman and Hall/CRC Press, Second Edition, 2014
5. EthemAlpaydin, “Introduction to Machine Learning”, Third Edition, Adaptive Computation and Machine Learning Series, MIT Press, 2014
6. Tom M Mitchell, “Machine Learning”, McGraw Hill Education, 2013
7. Shai Shalev-Shwartz and Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press, 2015

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	-	-	-	-
CO2	-	-	-	-	-	-
CO3	-	2	-	-	1	-
CO4	-	-	-	-	-	
CO5	-	-	-	-	-	-
Avg.	-	2/1=2	-	-	1/1=1	-

1 - low, 2-medium, 3-high, ‘-“- no correlation

IL4009 MANUFACTURING SYSTEMS AND MODELS L T P C
3 0 0 3

OBJECTIVES

- To introduce the basic manufacturing systems and its performance measures.
- To learn and apply DTMC models
- To learn and apply CTMC models
- To model and analyse the manufacturing systems for queuing problems
- To model the problems as Petrinet-models

UNIT I MANUFACTURING SYSTEMS- PERFORMANCE MEASURES 9

Manufacturing systems- Types, Concepts. Performance measures- types. Manufacturing Models- Types.

UNIT II DISCRETE TIME MARKOV CHAINS 9

Introduction to Markov Chains, DTMC, Properties of DTMC, Sojourn Times in DTMC Models, Applications of DTMC Models in Manufacturing Systems

UNIT III CONTINUOUS TIME MARKOV CHAINS 9

Introduction to CTMC, Properties of CTMC, Sojourn Times in CTMC Models, Applications of CTMC Models in Manufacturing Systems

UNIT IV QUEUING NETWORK MODELS 9

Birth and death process, performance measures in queuing models, open queuing networks and closed queuing networks- applications in manufacturing systems

UNIT V PETRINET MODELS 9

Introduction to petrinet models-Representational powers of Petrinets- Reachability graphs, Markings, Applications of petrinet models in manufacturing systems.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Able to identify and measure the performance of manufacturing system
CO2: Able to apply the DTMC model to a Manufacturing systems
CO3: Able to apply the CTMC model to a Manufacturing system
CO4: Able to apply the Queuing network model to a Manufacturing system
CO5: Able to apply the Petrinet model to a Manufacturing system

REFERENCES:

1. Viswanadham, N., &Narahari, Y., Performance modeling of automated manufacturing systems, Prentice Hall, 1992
2. Ronald G. Askin Charles R. Stand ridge, Modelling and analysis of manufacturing systems, John Wiley and son's .Inc, 1993.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	-	-	1	-
CO2	2	1	-	-	-	-
CO3	1	1	-	-	-	-
CO4	2	-	-	-	1	-
CO5	-	-	-	1	1	-
Avg.	(2+1+2)/3=1.6	(1+1)/2=1	-	1/1=1	(1+1+1)/3=1	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4077 PROJECT MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

Compare various models used in project selection.
Define project planning, and estimate the cost involved.
Apply network techniques for project scheduling and resource allocation.
Summarize the information needed planning, monitoring and controlling cycle of a project.
Recognize the values of project audit.

UNIT I STRATEGIC MANAGEMENT AND PROJECT SELECTION 9

Project selection models, Project portfolio process, Analysis under uncertainty, Project organization, Matrix organization

UNIT II PROJECT PLANNING AND COST ESTIMATION 9

Work breakdown structure, Systems integration, Interface coordination, Project life cycle, Conflict and negotiation, Estimating Project Budgets, Process of cost estimation.

UNIT III PROJECT IMPLEMENTATION 9

Scheduling: Network Techniques PERT and CPM, Risk analysis using simulation, CPM- crashing a project, Resource loading, leveling, and allocation.

UNIT IV MONITORING AND INFORMATION SYSTEMS 9

Information needs and the reporting process, computerized PMIS, Earned value analysis, Planning-Monitoring-Controlling cycle, Project control: types of control processes, design of control systems, control of change and scope

UNIT V PROJECT AUDITING 9

Construction and use of audit report, Project audit life cycle, Essentials of audit and evaluation,Varieties of project termination, the termination process, The Final Report – A project history

TOTAL: 45 PERIODS

OUTCOMES:

CO1 - Understand various models used in project selection.
CO2 - Acquire knowledge in project planning, and estimate the cost involved.
CO3 - Prepare Project Scheduling and resource allocation.
CO4 - Understand about planning, monitoring and controlling cycle of a project.
CO5 - Understand the values of project audit.

REFERENCES:

1. Harold Kerzner, Project Management – A Systems Approach to Planning, Scheduling and Controlling, John Wiley and Sons, 12th edition, 2017.
2. Jack R. Meredith, and Samuel J. Mantel Jr, Project Management – A Managerial Approach, John Wiley and Sons, 10th edition, 2017.
3. Panneerselvam .R, Senthil Kumar .P, Project Management, PHI, 2009.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	-	-	-	-
CO2	-	1	1	-	1	-
CO3	-	1	-	-	1	-
CO4	-	-	1	-	1	-
CO5	-	-	1	1	-	-
Avg.	1/1=1	(1+1+1)/3=1	(1+1+1)/3=1	1/1=1	(1+1+1)/3=1	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4072 **DESIGN OF EXPERIMENTS** **L T P C**
3 0 0 3

OBJECTIVES:

- Impart knowledge on principles and steps in designing a statistically designed experiment.
- Build foundation in analysing the data in single factor experiments and to perform post hoc tests.
- Provide knowledge on analysing the data in factorial experiments.
- Educate on analysing the data analysis in special experimental designs and Response Surface Methods.
- Impart knowledge in designing and analysing the data in Taguchi's Design of Experiments to improve Process/Product quality.

UNIT I EXPERIMENTAL DESIGN FUNDAMENTALS 9

Importance of experiments, experimental strategies, basic principles of design, terminology, ANOVA, steps in experimentation, sample size, normal probability plot, linear regression models.

UNIT II SINGLE FACTOR EXPERIMENTS 9

Completely randomized design, Randomized block design, Latin square design. Statistical analysis, estimation of model parameters, model adequacy checking, pair wise comparison tests.

UNIT III MULTIFACTOR EXPERIMENTS 9

Two and three factor full factorial experiments, Randomized block factorial design, Experiments with random factors, rules for expected mean squares, approximate F- tests. 2K factorial Experiments.

UNIT IV SPECIAL EXPERIMENTAL DESIGNS: 9

Blocking and confounding in 2K designs. Two level Fractional factorial design, nested designs, Split plot design, Introduction to Response Surface Methods.

UNIT V TAGUCHI METHODS 9

Steps in experimentation, design using Orthogonal Arrays, data analysis, Robust design- control and noise factors, S/N ratios, parameter design, Multi-level experiments, Multi-response optimization, Introduction to Shainin DOE.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Understand the fundamental principles of Design of Experiments.
CO2: Analyze data in the single factor experiments.
CO3: Analyze data in the multifactor experiments.
CO4: Understand the special experimental designs & Response Surface Methods.
CO5: Apply Taguchi based approach to evaluate quality.

REFERENCES

1. Krishnaiah, K. and Shahabudeen, P. Applied Design of Experiments and Taguchi Methods, PHI learning private Ltd., 2012.
2. Montgomery, D.C., Design and Analysis of experiments, John Wiley and Sons, Eighth edition, 2012.
3. NicoloBelavendram, Quality by Design; Taguchi techniques for industrial experimentation, Prentice Hall, 1995.
4. Phillip J.Rose, Taguchi techniques for quality engineering, McGraw Hill, 1996.
5. Montgomery, D.C., Design and Analysis of Experiment, Minitab Manual, John Wiley and Sons, Seventh edition, 2010.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	-	-	-	-
CO2	-	-	1	1	-	-
CO3	-	-	1	1	-	-
CO4	-	-	1	1	1	-
CO5	2	1	1	-	-	-
Avg.	(1+2)/2=1.5	(1+1)/2=1	(1+1+1+1)/4=1	(1+1+1)/3=1	1/1=1	-

1 low, 2-medium, 3-high, '-"- no correlation

IL4010 PRODUCT INNOVATION AND DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:

- Gain knowledge of innovation in Product design and development.
- Summarize the development of new products through conceptualization, design and development phases.
- Associate various aspects of product development with industrial design and manufacturing.
- Interpret the fundamental concept of Rapid Prototyping.
- Generate products which are suitable for the needs of the society.

UNIT I PRODUCT DEVELOPMENT AND CONCEPT SELECTION 9

Product development process – Product development organizations- Identifying the customer needs – Establishing the product specifications – concept generation – Concept selection.

UNIT II PRODUCT ARCHITECTURE 9

Product architecture – Implication of the architecture – Establishing the architecture – Related system level design issues.

UNIT III INDUSTRIAL AND MANUFACTURING DESIGN 9

Need for industrial design – Impact of industrial design – Industrial design process. Assessing the quality of industrial design- Human Engineering consideration -Estimate the manufacturing cost – Reduce the component cost – Reduce the assembly cost – Reduce the support cost – Impact of DFM decisions on other factors

UNIT IV PROTOTYPING AND ECONOMIC ANALYSIS 9

Principles of prototyping – Planning for prototypes – Rapid Prototyping- Elements of economic analysis – Base case financial model – Sensitivity analysis – Influence of the quantitative factors.

UNIT V MANAGING PRODUCT DEVELOPMENT PROJECTS 9

Sequential, parallel and coupled tasks - Baseline project planning – Project Budget- Project execution – Project evaluation- patents- patent search-patent laws-International code for patents.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: The students should be able to understand the basic concept of product development.
CO2: Design and develop new products in a systematic using the studied tools and techniques.
CO3: To associate various aspects of product development with industrial design and manufacturing.
CO4: To understand the fundamental concept of Rapid Prototyping.
CO5: To be able to design products which are suitable for the needs of the society.

REFERENCES:

1. Gevirtz C, Developing New products with TQM, McGraw – Hill International editions,1994.
2. Jamnia A, Introduction to Product Design and Development for Engineers, Taylor and Francis Group, 2018.
3. RosenthalS, Effective product design and development, Irwin 1992.
4. Ulrich K, Eppinger S, Product Design and Development, McGraw- Hill International Fifth Editions, 2012.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	1	-	-	-
CO 2	-	2	-	-	1	-
CO 3	-	-	-	-	1	1
CO 4	-	-	2	1	-	-
CO 5	-	-	-	-	-	2
Avg.	1/1=1	(1+2)/2=1.5	(1+2)/2=1.5	1/1=1	(1+1)/2=1	(1+2)/2=1.5

1-low, 2-medium, 3-high, '-"- no correlation

IL4011 SERVICES OPERATIONS MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- Summarize the importance of services in competitive environment
- Describe the services design and development
- Illustrate the services performance
- Conclude decisions in services facility
- Plan operations involved in services

UNIT I INTRODUCTION 9

Services – Importance, role in economy, service sector – growth; Nature of services - Serviceclassification , Service Package, distinctive characteristics , open-systems view; Service Strategy – Strategic service vision, competitive environment, generic strategies, winning customers; Role of information technology; stages in service firm competitiveness; Internet strategies – Environmental strategies.

UNIT II SERVICE DESIGN 9

New Service Development – Design elements – Service Blue-printing - process structure – generic approaches –Value to customer; Retail design strategies – store size – Network configuration ; Managing Service Experience –experience economy, key dimensions ; Vehicle Routing and Scheduling

UNIT III SERVICE QUALITY 9

Service Quality- Dimensions, Service Quality Gap Model; Measuring Service Quality –SERVQUAL - Walk-through Audit; Quality service by design - Service Recovery - Service Guarantees; Service Encounter – triad, creating service orientation, service profit chain; Front-office Back-office Interface – service decoupling.

UNIT IV SERVICE FACILITY 9

Service scapes – behavior - environmental dimensions – framework; Facility design – nature, objectives, process analysis – process flow diagram, process steps, simulation; Service facility layout; Service Facility Location – considerations, facility location techniques – metropolitan metric, Euclidean, centre of gravity, retail outlet location , location set covering problem

UNIT V MANAGING CAPACITY AND DEMAND 9

Managing Demand – strategies; Managing capacity – basic strategies, supply management tactics, operations planning and control; Yield management; Inventory Management in Services– Retail Discounting Model, Newsvendor Model; Managing Waiting Lines –Queuing systems, psychology of waiting; Managing for growth- expansion strategies, franchising , globalization.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Able to summarize service strategies
CO2. Able to describe service network
CO3. Able to illustrate service performance using software tools
CO4. Able to locate facilities using simulation
CO5. Able to formulate inventory and queuing models.

REFERENCES:

1. James A. Fitzsimmons, Service Management – Operations, Strategy, Information Technology,Tata McGraw-Hill – 5th Edition , 2006.
2. Richard Metters, Kathryn King-Metters, Madeleine Pullman, Steve Walton , Successful Service Operations Management ,Cengage Learning, 2nd Edition ,2005

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	-	-	-	-
CO2	-	-	-	1	-	-
CO3	-	2	1	1	-	-
CO4	-	-	1	-	1	-
CO5	-	1	-	-	-	-
Avg.	1/1=1	(2+2+1)/3=1.66	(1+1)/2=1	(1+1)/2=1	1/1=1	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4012 SCHEDULING ALGORITHMS L T P C
3 0 0 3

OBJECTIVES:

- Introduce the basic concepts of scheduling theory.
- Understand the application of single machine scheduling algorithms.
- Perceive knowledge in parallel machine scheduling algorithms.
- Grasp the concept of flow shop scheduling and its algorithm.
- Familiarize the students in the use of algorithms for job scheduling problems

UNIT I SCHEDULING THEORY 9

Scheduling background – Scheduling function – Sequencing – Ready time – Flow time – Tardiness - Weighted flow time – Inventory – Regular measures of performance – Dominant schedules – SPT, EDD, WSPT sequences – Scheduling Theorems.

UNIT II SINGLE MACHINE SCHEDULING 9

Pure sequencing model – Hodgson's algorithm – Smith's rule – Wilkerson Irwin algorithm – Neighborhood search – Dynamic programming technique – Branch and Bound algorithm – Non simultaneous arrivals – Minimizing T and F for dependent jobs – Sequence dependent set up times.

UNIT III PARALLEL MACHINE SCHEDULING 9

Preemptive jobs: McNaughton's algorithm – Non preemptive jobs – Heuristic procedures – Minimizing Fw : H1 &Hm heuristics – Dependent jobs: Hu's algorithm – Muntz Coffman algorithm.

UNIT IV FLOW SHOP SCHEDULING 9

Characteristics – Johnson's algorithm – Extension of Johnson's rule – Campbell Dudek Smith algorithm – Palmer's method – Start lag, stop lag – Mitten's algorithm – Ignall Schrage algorithm - Despatch index heuristic.

UNIT V JOB SHOP SCHEDULING 9

Characteristics –Graphical tools – Jackson's algorithm – Feasible, Semi-active and Active schedules – Single pass approach – Non delay schedule – Priority dispatching rules – Heuristic schedule generation – Open shop scheduling.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Understand the basics of Scheduling theory.
CO2: Understand various single machine scheduling algorithms.
CO3: Understand various parallel machine scheduling algorithms.
CO4: Understand various flow shop scheduling algorithms.
CO5: Understand various job shop scheduling algorithms

REFERENCES:

1. Kenneth R.Baker, "Introduction to sequencing and scheduling", John Wiley & Sons, New York 2000.
2. Richard W. Conway, William L.Maxwell and Louis W. Miller,"Theory of Scheduling", Dover Publications, 2003.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	-	-	-	-
CO2	-	-	1	2	-	-
CO3	-	1	1	-	1	-
CO4	-	-	1	-	1	-
CO5	-	1	1	-	1	-
Avg.	1/1=1	(2+1+1)/3=1.33	(1+1+1+1)/4=1	2/1=2	(1+1+1)/3=1	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4013 MAINTENANCE ENGINEERING AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- Describe basic maintenance concepts
- Extract optimum maintenance decisions
- Illustrate the root cause for maintenance problems
- Plan the spare parts for maintenance activity
- Discover the losses and improve the Overall Equipment Effectiveness

UNIT I MAINTENANCE CONCEPT 9

Maintenance definition–Maintenance objectives-Maintenance challenges–Tero Technology Maintenance costs-Scope of maintenance department.

UNIT II MAINTENANCE MODELS 9

Proactive/reactive maintenance Maintenance policies – Imperfect maintenance Preventive/breakdown maintenance–Optimal PM schedule and product characteristics– Inspection decisions-Maximizing profit-Minimizing downtime–Replacement decisions.

UNIT III MAINTENANCEQUALITY 9

Fivezeroconcept–FMEA-FMECA–Rootcauseanalysis–Repairtimedistribution–Analysisofdowntime–Maintainabilityprediction–Designformaintainability–ReliabilityCenteredMaintenance.

UNITI V MAINTENANCE MANAGEMENT 9

Humanfactors–Maintenancestaffing-Learningcurves–Simulation–Optimalsizeofservicefacility–Optimalrepaireffort–Sparepartsmanagement–Maintenanceplanning–Maintenancescheduling.

UNIT V TOTAL PRODUCTIVE MAINTENANCE 9

TPM philosophy – Chronic and sporadiclosses –Equipment defects–Sixmajorlosses –Over all equipment effectiveness–TPM pillars–Autonomous maintenance.

TOTAL:45PERIODS

OUTCOMES:

CO1:Able to describe basic maintenance concepts.
CO2:Able to extract maintenance policies for maximizing the profit
CO3:Able to make a diagnosis of maintenance problems
CO4:Able to improve uptime of machines by effective spare parts management
CO5:Able to improve the overall Equipment Effectiveness

REFERENCES:

1. AndrewK.S.Jardine&AlbertH.C.Tsang,“Maintenance,ReplacementandReliability” , TaylorandFrancis,2006.
2. Bikas Badhury & Basu S K,“TeroTechnology:Reliability Engineering and MaintenanceManagement”,AsianBooks,2003.
3. MishraRCandPathakK.,“MaintenanceEngineeringandManagement”,PHI,2012
4. SeichiNakajima,“TotalProductiveMaintenance”,ProductivityPress,1993.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	-	2	-	-	-
CO2	-	-	-	-	1	-
CO3	-	1	-	-	-	-
CO4	-	-	1	-	-	-
CO5	-	-	-	1	1	-
Avg.	1/1=1	1/1=1	(2+1)/2=1.5	1/1=1	(1+1)/2=1	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4014 PRODUCTIVITY MANAGEMENT AND RE - ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- Identify the basic principles of Productivity Models
- Classify various ways in which productivity is measured and evaluated.
- Describe the basic concept of Re-Engineering.
- Use Re-Engineering tools and techniques to improve productivity.
- Compare the various Re-Engineering Models.

UNIT I PRODUCTIVITY 9

Productivity Concepts – Macro and Micro factors of productivity – Dynamics of Productivity - Productivity Cycle Productivity Measurement at International, National and Organisation level - Productivity measurement models.

UNIT II SYSTEMS APPROACH TO PRODUCTIVITY MEASUREMENT 9

Conceptual frame work, Management by Objectives (MBO), Performance Objectivated Productivity (POP) – Methodology and application to manufacturing and service sector.

UNIT III ORGANISATIONAL TRANSFORMATION 9

Elements of Organisational Transformation and Reengineering-Principles of organization al transformation and re-engineering, fundamentals of process re-engineering, preparing the workforce for transformation and re-engineering, methodology, guidelines, LMI CIP Model – DSMC Q & PMP model.

UNIT IV RE-ENGINEERING PROCESS IMPROVEMENT MODELS 9

PMI models, PASIM Model, Moen and Nolan Strategy for process improvement, LMICIP Model,NPRDC Model.

UNIT V RE-ENGINEERING TOOLS AND IMPLEMENTATION 9

Analytical and process tools and techniques – Information and Communication Technology – Implementation of Reengineering Projects – Success Factors and common implementation Problem– Cases.

TOTAL: 45 PERIODS

OUTCOMES:
Student will be able to:
CO1: Understand the term productivity.
CO2: Measure and evaluate productivity.
CO3: Plan and implement various productivity techniques.
CO4: Reengineer the process for improving the productivity.
CO5: Implement BPR tools for improving the productivity.

REFERENCES:

1. Edosomwan, J.A., "Organisational Transformation and Process Re-engineering", LibraryCataloging in Pub. Data, 1996.
2. Rastogi, P.N., "Re-engineering and Re-inventing the Enterprise", Wheeler Pub. New Delhi, 1995.
3. Sumanth, D.J., 'Productivity Engineering and Management', TMH, New Delhi, 1990
4. Vrat P, Sardana, G.D. and Sahay, B.S., "Productivity Management – A Systems Approach",Narosa Publishing House. New Delhi, 1998.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	-	-	-	-
CO2	-	1	1	-	-	-
CO3	-	-	-	1	1	-
CO4	-	-	-	-	1	1
CO5	-	-	1	1	1	-
Avg.	1/1=1	(2+1)/2=1.5	(1+1)/2=1	(1+1)/2=1	(1+1+1)/3=1	1/1=1

1 - low, 2-medium, 3-high, '-"- no correlation

IL4076 PLANT LAYOUT AND MATERIAL HANDLING L T P C
3 0 0 3

COURSE OBJECTIVES:
- To provide provided with the knowledge of the process of analyzing and developing information to produce a plant layout based on the locations and working conditions.
- To educate the students about the basic things of work conditions which includes ventilation, comfort, lighting and its effect based on various nature of work.
- To provide knowledge on effective and safe layout design of an industry.

UNIT I PLANT LOCATION 9
Selection of plant locations, territorial parameters, considerations of land, water, electricity, location for waste treatment and disposal, further expansions
Safe location of chemical storages, LPG, LNG, CNG, acetylene, ammonia, chlorine, explosives and propellants

UNIT II PLANT LAYOUT 9

Safe layout, equipment layout, safety system, fire hydrant locations, fire service rooms, facilities for safe effluent disposal and treatment tanks, site considerations, approach roads, plant railway lines, security towers.

Safe layout for process industries, engineering industry, construction sites, pharmaceuticals, pesticides, fertilizers, refineries, food processing, nuclear power stations, thermal power stations, metal powders manufacturing, fireworks and match works

UNIT III WORKING CONDITIONS 9

Principles of good ventilation, purpose, physiological and comfort level types, local and exhaust ventilation, hood and duct design, air conditioning, ventilation standards, application.

Purpose of lighting, types, advantages of good illumination, glare and its effect, lighting requirements for various work, standards- Housekeeping, principles of 5S.

UNIT IV MANUAL MATERIAL HANDLING AND LIFTING TACKLES 9

Preventing common injuries, lifting by hand, team lifting and carrying, handling specific shape machines and other heavy objects – accessories for manual handling, hand tools, jacks, hand trucks, dollies and wheel barrows – storage of specific materials - problems with hazardous materials, liquids, solids – storage and handling of cryogenic liquids - shipping and receiving, stock picking, dock boards, machine and tools, steel strapping and sacking, glass and nails, pitch and glue, boxes and cartons and car loading – personal protection – ergonomic considerations.

Fiber rope, types, strength and working load inspection, rope in use, rope in storage - wire rope, construction, design factors, deterioration causes, sheaves and drums, lubrication, overloading, rope fitting, inspection and replacement – slings, types, method of attachment, rated capacities, alloy chain slings, hooks and attachment, inspection

UNIT V MECHANICAL MATERIAL HANDLING 9

Hoisting apparatus, types - cranes, types, design and construction, guards and limit devices, signals, operating rules, maintenance safety rules, inspection and inspection checklist – conveyors, precautions, types, applications.

Powered industrial trucks, requirements, operating principles, operators selection and training and performance test, inspection and maintenance, electric trucks, gasoline operated trucks, LPG trucks – power elevators, types of drives, hoist way and machine room emergency procedure, requirements for the handicapped, types- Escalator, safety devices and brakes, moving walks – man lifts, construction, brakes, inspection.

TOTAL: 45 PERIODS

OUTCOMES:

CO 1: The students will be able to Identify equipment requirements for a specific process and for various locations and working conditions.
CO 2: The students will be able to Design an efficient material handling system.
CO 3: Understand the difficulties during the design and implementation of the plant layout.
CO 4: Know about material handling requirements and methods
CO 5: Understand the inspection and maintenance techniques.

REFERENCES:

1. ”Accident prevention manual for industrial operations” N.S.C., Chicago, 1982.
2. Alexandrov. M.P. ”Material handling equipment” Mir Publishers, Moscow, 1981
3. APPLE M. JAMES “Plant layout and material handling”, 3rd edition, John Wiley and sons.
4. “Encyclopedia of occupational safety and health”, ILO Publication, 1985

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	-	-	-	-	-
CO2	-	-	-	-	-	-
CO3	2	-	-	2	-	-
CO4	-	-	-	-	2	-
CO5	-	-	-	-	2	-
Avg.	(2+2)/2=2	-	-	2/1=2	(2+2)/2=2	-

1 - low, 2-medium, 3-high, '-"- no correlation

IL4015 SOFTWARE QUALITY ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- Studying the basic principles and concepts in software quality
- Effectively designing, analyzing and developing the software engineering activities
- Gaining knowledge on software quality assurance and risk management
- Analyze the principles and applications of software quality management tools
- Gaining knowledge about software quality standards

UNIT I SOFTWARE QUALITY 9

Definition of Software Quality, Quality Planning, Quality system – Quality Control Vs Quality Assurance – Product life cycle – Project life cycle models.

UNIT II SOFTWARE ENGINEERING ACTIVITIES 9

Estimation, Software requirements gathering, Analysis, Architecture, Design, development, Testing and Maintenance.

UNIT III SUPPORTING ACTIVITIES 9

Metrics, Reviews –SCM – Software quality assurance and risk management.

UNIT IV SOFTWARE QUALITY TOOLS 9

Seven basic Quality tools – Checklist – Pareto diagram – Cause and effect diagram – Run chart – Histogram – Control chart – Scatter diagram – Poka Yoke – Statistical process control – Failure Mode and Effect Analysis – Quality Function deployment – Continuous improvement tools – Case study.

UNIT V QUALITY ASSURANCE MODELS 9

Software Quality Standards, ISO systems– CMM, CMMI – P-CMM – Case study.

TOTAL: 45 PERIODS

OUTCOMES:

CO1 – understand the basic principles and concepts in software quality
CO2 – effectively design, analyze and develop software engineering activities
CO3 – gain knowledge on software quality assurance and risk management
CO4 – understand the principles and applications of software quality management tools
CO5 – gain knowledge about software quality standards

REFERENCES:

1. Dunn Robert M., Software Quality: Concepts and Plans, Englewood clifts, Prentice Hall Inc., 2003.
2. Metrics and Models in Software Quality Engineering, Stephen, Stephen H. Kan, Pearson education, 2006, Low price edition.
3. Norman E – Fenton and Share Lawrence P flieger, Software metrics , International Thomson Computer press , 1997.
4. Ramesh Gopalswamy, Managing global Projects ; Tata McGraw Hill, 2002.
5. Software Engineering: A Practitioners Approach, 5th Edition Roger S. Pressman McGraw – Hill International Edition, 6th Edition, 2006.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	2	-	-	-
CO2	-	-	1	-	2	-
CO3	-	2	-	-	1	-
CO4	-	-	-	1	2	-
CO5	-	-	2	2	-	-
Avg.	-	2/1=2	(2+1+2)/3=1.6	(1+2)/2=1.5	(2+1+2)/3=1.6	-

1-low, 2-medium, 3-high, '-"- no correlation

IS4351 RELIABILITY ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- Impart knowledge in reliability concepts.
- Facilitate students in filling the life data into theoretical distribution.
- Educate the students in reliability evaluation of various configuration.
- Impart knowledge in reliability monitoring methods.
- Analyze effectively various techniques to improve reliability of the system.

UNIT I RELIABILITY CONCEPTS 9

Reliability definition – Quality and Reliability– Reliability mathematics – Reliability functions – Hazard rate – Measures of Reliability – Design life –A priori and posteriori probabilities – Mortality of a component –Mortality curve – Useful life.

UNIT II LIFE DATA ANALYSIS 9

Data collection –Non Parametric methods: Ungrouped/Grouped, Complete/Censored data – Time to failure distributions: Exponential, Weibull – Probability plotting – Goodness of fit tests.

UNIT III RELIABILITY ASSESSMENT 9

Different configurations – Redundancy – k out of n system – Complex systems: RBD – Baye's approach – Cut and tie sets – Fault Trees – Standby systems.

UNIT IV RELIABILITY MONITORING **9**

Life testing methods: Failure terminated – Time terminated – Sequential Testing –Reliability growth monitoring – Reliability allocation – Software reliability-Human reliability.

UNIT V RELIABILITY IMPROVEMENT **9**

Analysis of downtime – Repair time distribution – System repair time – Maintainability prediction – Measures of maintainability – Inspection decisions –System Availability.

TOTAL: 45 PERIODS

OUTCOMES:

CO1 : Understand the basic concepts of reliability engineering
CO2 : Effectively analyze various non parametric methods and failure distributions
CO3 : Conduct reliability assessment and failure analysis on any complex systems
CO4 : Effectively design and analyze reliability monitoring techniques
CO5 : Analyze various techniques to improve reliability of the system

	PO1	PO2	PO3	PO4	PO5	PO6
CO1		3				
CO2				3		
CO3	3					
CO4						
CO5						2
AVg.	3/1=3	3/1=3		3/1=3	-	2/1=2

REFERENCES:

1. Charles E. Ebeling, “An introduction to Reliability and Maintainability engineering”, TMH, 2000.
2. Roy Billington and Ronald N. Allan, “Reliability Evaluation of Engineering Systems”, Springer, 2007.

IL4074 HUMAN FACTORS IN ENGINEERING **L T P C**
3 0 0 3

OBJECTIVES:

- Studying the work procedure and understanding the relationships between the workers and working environments.
- To study the applications of ergonomic principles and physiology of workers.
- To know the concepts of personal protective equipment and its usages.
- To create the knowledge in process and equipment design in safety aspects.

UNIT I ERGONOMICS AND ANATOMY **9**

Introduction to ergonomics: The focus of ergonomics**,** ergonomics and its areas of application in the work system, a brief history of ergonomics, attempts to humanize work, modern ergonomics, future directions for ergonomics

Anatomy, Posture and Body Mechanics: Some basic body mechanics, anatomy of the sprine and pelvis related to posture, posture stability and posture adaptation, low back pain, risk factors for musculoskeletal disorders in the workplace, behavioural aspects of posture, effectiveness and cost effectiveness, research directions

UNIT II HUMAN BEHAVIOR 9

Individual differences, Factors contributing to personality, Fitting the man to the job, Influence of difference on safety, Method of measuring characteristics, Accident Proneness. Motivation, Complexity of Motivation, Job satisfaction. Management theories of motivation, Job enrichment theory. Frustration and Conflicts, Reaction to frustration, Emotion and Frustration. Attitudes- Determination of attitudes, Changing attitudes Learning, Principles of Learning, Forgetting, Motivational requirements.

UNIT III ANTHROPOMETRY AND WORK DESIGN FOR STANDING AND SEATED WORKS 9

Designing for a population of users, percentile, sources of human variability, anthropometry and its uses in ergonomics, principals of applied anthropometry in ergonomics, application of anthropometry in design, design for everyone, anthropometry and personal space, effectiveness and cost effectiveness

Fundamental aspects of standing and sitting, an ergonomics approach to work station design, design for standing workers, design for seated workers, work surface design, visual display units, guidelines for design of static work**,** effectiveness and cost effectiveness, research directions

UNIT IV MAN - MACHINE SYSTEM AND REPETITIVE WORKS AND MANUAL HANDLING TASK 9

Applications of human factors engineering, man as a sensor, man as information processor, man as controller – Man vs Machine.

Ergonomics interventions in Repetitive works, handle design, key board design- measures for preventing in work related musculoskeletal disorders (WMSDs), reduction and controlling, training Anatomy and biomechanics of manual handling, prevention of manual handling injuries in the work place, design of manual handling tasks, carrying, postural stability

UNIT V HUMAN SKILL AND PERFORMANCE AND DISPLAY, CONTROLS AND VIRTUAL ENVIRONMENTS 9

A general information-processing model of the users, cognitive system, problem solving, effectiveness.

Principles for the design of visual displays- auditory displays- design of controls- combining displays and controls- virtual (synthetic) environments, research issues.

TOTAL: 45 PERIODS

OUTCOMES:

- Students can have the knowledge in work procedure and applications in hazardous workplaces.
- Students can design their own safety devices and equipment to reduce the accidents possibilities.
- Students will be able to incorporate human factors in design of Personal protective equipment.
- They know the risk factors, guide lines for safe design of man machine systems considering human factors.

REFERENCES

1. Ergonomic design for organizational effectiveness, Michael O'Neill 1st Edition 1998.
2. Human factors in engineering and design, MARK S.SANDERS 1992.
3. Introduction to Ergonomics, R.S. Bridger, Taylor and Francis 3rd Edition 2008.
4. The Ergonomics manual, Dan Mc Leod, Philip Jacobs and Nancy Larson

CO-PO MAPPING

CO	PO					
	1	2	3	4	5	6
1	-	-	-	3	-	-
2	-	-	3	-	-	-
3	2	-	-	-	-	2
4	-	-	-	-	3	-
5	-	-	-	-	-	-
AVg.	2/1=2	-	3/1=3	3/1=3	3/1=3	2/1=2

1- low, 2-medium, 3-high, '-"- no correlation

IL4016 HUMAN INDUSTRIAL SAFETY AND HYGIENE L T P C
3 0 0 3

OBJECTIVES:

- Identify and prevent operational hazard
- Categorize, analyze and interpret the accidents data based on various safety techniques.
- Use proper safety techniques on safety engineering and management.
- Design the system with environmental consciousness by implementing safety regulation
- Use safety management practices in Industries.

UNIT I OPERATIONAL SAFETY 9

Hot metal operation, boiler, pressure vessels – heat treatment shop – gas furnace operation – electroplating – hot bending pipes – safety in welding and cutting, Cold – metal operation – safety in machine shop – cold bending and chamfering of pipes- metal cutting – shot blasting, grinding, painting – power press and other machines. Management of toxic gases and chemicals – industrial fires and prevention – road safety – highway and urban safety – safety of sewage disposal and cleaning – control of environmental pollution – managing emergencies in industries – planning security and risk assessments, on – site and off site. Control of major industrial hazards.

UNIT II SAFETY APPRAISAL AND ANALYSIS 9

Human side of safety – personal protective equipment – causes and cost of accidents. Accidents prevention program – specific hazard control strategies – HAZOP training and development of employees – first aid – fire fight devices – accident reporting, investigation .Measurement of safety performance, accident reporting and investigation – plant safety inspection, job safety analysis – safety permit procedures. Product safety – plant safety rules and procedures – safety sampling – safety inventory systems. Determining the cost effectiveness of safety measurement.

UNIT III OCCUPATIONAL HEALTH 9

Concept and spectrum of health functional units and activities of operational health service – occupational and related disease – levels of prevention of diseases – notifiable occupational diseases Toxicology Lead – Nickel, chromium and manganese toxicity – gas poisoning (such as CO, Ammonia Chlorise, So2, H2s.) their effects and prevention – effects of ultra violet radiation and infrared radiation on human system.

UNIT IV SAFETY AND HEALTH REGULATIONS 9

Safety and health standards – industrial hygiene – occupational diseases prevention welfare facilities. The object of factories act 1948 with special reference to safety provisions, model rules 123a, history of legislations related to safety – pressure vessel act – Indian boiler act – the environmental protection act – electricity act – explosive act.

UNIT V SAFETY MANAGEMENT 9

Evaluation of modern safety concepts – safety management functions – safety organization, safety department- safety committee, safety audit – performance measurements and motivation – employee participation in safety - safety and productivity.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Ability to Identify and prevent operational hazard
CO2:Ability to collect, analyze and interpret the accidents data based on various safety techniques.
CO3: Ability to apply proper safety techniques on safety engineering and management.
CO4: Ability to design the system with environmental consciousness by implementing safety regulation
CO5: Ability to apply safety management practices in Industries.

REFERENCES:

1. John. V. Grimaldi and Rollin. H Simonds, “Safety Management”, All India traveler Book seller, New Delhi – 1989.
2. John V Grimaldi, Safety Management. AITB publishers, 2003.
3. Krishnan N.V, “Safety in Industry”, Jaico Publisher House, 1996.
4. Singh, U.K and Dewan, J.M., “Sagety, Security and Risk Management”, APH publishing company, New Delhi, 1996.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	-	1	-	-
CO2	1	-	-	-	1	-
CO3	2	-	-	1	1	-
CO4	-	-	2	-	-	1
CO5	-	-	-	-	1	1
Avg.	(1+2)/2=1.5	(1+2)/2=1.5	2/1=2	(1+1)/2=1	(1+1+1)/3=1	(1+1)/2=1

1-low, 2-medium, 3-high, ‘-“- no correlation

IL4017 DECISION SUPPORT SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- Summarize managerial role in decision making.
- Articulate insights inthe models used for decision making
- Interpret knowledge management methods
- Relate knowledge acquisition and representation.
- Discover the issues in implementation of decision making systems.

UNIT I DECISION MAKING 9

Managerial decision making, system modeling and support-preview of the modeling process-phases of decision making process.

UNIT II MODELING AND ANALYSIS 9

DSS components- Data warehousing, access, analysis, mining and visualization-modeling and analysis-DSS development.

UNIT III KNOWLEDGE MANAGEMENT 9

Group support systems- enterprise DSS- supply chain and DSS-knowledge management methods, technologies and tools.

UNIT IV INTELLIGENT SYSTEMS 9

Artificial intelligence and expert systems-concepts, structure, types-knowledge acquisition and validation, knowledge representation, Graphical user interface

UNIT V IMPLEMENTATION 9

Implementation, integration and impact of management support systems.

TOTAL : 45 PERIODS

OUTCOMES:

CO1 – Make decisions in the semi structured and unstructured problem situations using systems and semantic networks.
CO2 – Understand various components of DSS and modeling& analysis phases of DSS
CO3 – Understand the concepts of knowledge management methods in DSS
CO4 – Gain knowledge on artificial intelligence systems
CO5 – Implement management support systems

REFERENCES:

1. Efraim Turban and Jay E Aronson, Decision Support and Intelligent Systems,Pearson education Asia, Seventh edition, 2005.
2. Elain Rich and Kevin Knight, Artificial intelligence, TMH, 2006.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	1	-	-	-
CO2	-	-	-	2	-	-
CO3	-	2	-	1	2	-
CO4	-	-	1	-	2	-
CO5	-	-		-	-	1
Avg.	-	2/1=2	(1+1)/2=1	(2+1)/2=1.5	(2+2)/2=2	1/1=1

1-low, 2-medium, 3-high, '-"- no correlation

IL4073 ENTERPRISE RESOURCE PLANNING L T P C
3 0 0 3

OBJECTIVES:

- Describe an idea about ERP
- Creating awareness of core and extended modules of ERP
- Extract knowledge of ERP implementation cycle
- Gaining knowledge about effects of ERP after its implementation.
- Understanding the emerging trends on ERP

UNIT I INTRODUCTION 9

Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems.

UNIT II ERP SOLUTIONS AND FUNCTIONAL MODULES 9

Overview of ERP software solutions- Small, medium and large enterprise vendor solutions, BPR, and best business practices - Business process Management, Functional modules.

UNIT III ERP IMPLEMENTATION 9

Planning Evaluation and selection of ERP systems - Implementation life cycle - ERP implementation, Methodology and Frame work- Training – Data Migration. People Organization in implementation- Consultants, Vendors and Employees.

UNIT IV POST IMPLEMENTATION 9

Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of ERP Implementation.

UNIT V EMERGING TRENDS ON ERP 9

Extended ERP systems and ERP add-ons -CRM, SCM, Business analytics - Future trends in ERP systems-web enabled, Wireless technologies, cloud computing

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Get an idea about ERP
CO2: Awareness of core and extended modules of ERP
CO3: Knowledge of ERP implementation cycle
CO4: Gain knowledge about effects of ERP after its implementation.
CO5: Understand the emerging trends on ERP

REFERENCES:

1. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008.
2. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008
3. MahadeoJaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009
4. Sinha P. Magal and Jeffery Word, Essentials of Business Process and Information System, Wiley India, 2012
5. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall of India, 2006.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	-	-	-	-
CO2	-	2	1	-	-	-
CO3	-	-	1	-	-	-
CO4	-	-	1	1	-	-
CO5	-	-	-	1	1	-
Avg.	1/1=1	(1+2)/2=1.5	(1+1+1)/3=1	(1+1)/2=1	1/1=1	-

1-low, 2-medium, 3-high, '-"- no correlation

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 மலர் க்காட்சி
4. புறநானூறு (95,195) - போரை நிறுத்திய ஔவையார்

UNIT II அறநெறித் தமிழ் **6**

1. அறநெறி வகுத்த திருவள்ளுவர் - அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புரவறிதல், 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 போர் வை கொடுத்தது, அதியமான் ஔவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்
2. நற்றிணை
   - அன்னைக்குரிய புன்னை சிறப்பு
3. திருமந்திரம் (617, 618)
   - இயமம் நியமம் விதிகள்
4. தர் மச் சாலையை நிறுவிய வள்ளலார்
5. புறநானூறு
   - சிறுவனே வள்ளலானான்
6. அகநானூறு (4) - வண்டு
   நற்றிணை (11) - நண்டு
   கலித்தொகை (11) - யானை, புறா
   ஐந்திணை 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. சுற்றுச் சூழல் 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. தர் மபுர ஆதீன வெளியீடு
4. வாழ்வியல் களஞ்சியம் - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக் களஞ்சியம் - தமிழ் வளர் ச் சித்துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம் - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்