

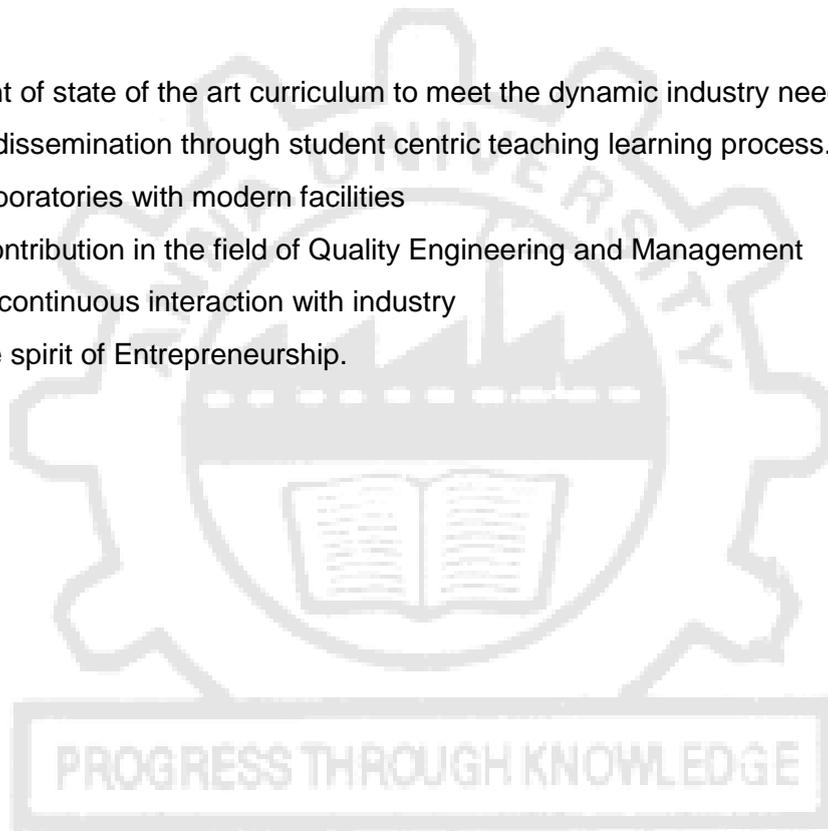
ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
REGULATIONS - 2019
CHOICE BASED CREDIT SYSTEM
M.E. QUALITY ENGINEERING AND MANAGEMENT (FT and PT)

VISION :

To emerge as a Centre of excellence in the field of Quality Engineering and Management where the world class practices of teaching, learning and research synergize.

MISSION :

- Development of state of the art curriculum to meet the dynamic industry needs.
- Knowledge dissemination through student centric teaching learning process.
- Enriching laboratories with modern facilities
- Research contribution in the field of Quality Engineering and Management
- Maintaining continuous interaction with industry
- Cultivate the spirit of Entrepreneurship.



Attested


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1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

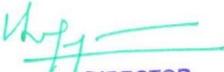
- I. To prepare students to excel in research or to succeed in Quality engineering and Management profession through global, rigorous post graduate education.
- II. To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve quality engineering problems.
- III. To train students with good scientific and engineering knowledge so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.
- IV. To inculcate students in professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate quality engineering issues to broader social context.
- V. To provide student with an academic environment aware of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career

2. PROGRAMME OUTCOMES (POs):

After going through the four years of study, our Quality Engineering and Management Graduates will exhibit ability to:

PO#	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply knowledge of mathematics, basic science and engineering science.
2	Problem analysis	Identify, formulate and solve engineering problems.
3	Design/development of solutions	Design a system or process to improve its performance, satisfying its constraints.
4	Conduct investigations of complex problems	Conduct experiments & collect, analyze and interpret the data.
5	Modern tool usage	Apply various tools and techniques to improve the efficiency of the system.
6	The Engineer and society	Conduct themselves to uphold the professional and social obligations.
7	Environment and sustainability	Design the system with environment consciousness and sustainable development.
8	Ethics	Interaction industry, business and society in a professional and ethical manner.
9	Individual and team work	Function in a multi-disciplinary team.
10	Communication	Proficiency in oral and written Communication.
11	Project management and finance	Implement cost effective and improved system.
12	Life-long learning	Continue professional development and learning as a life-long activity.

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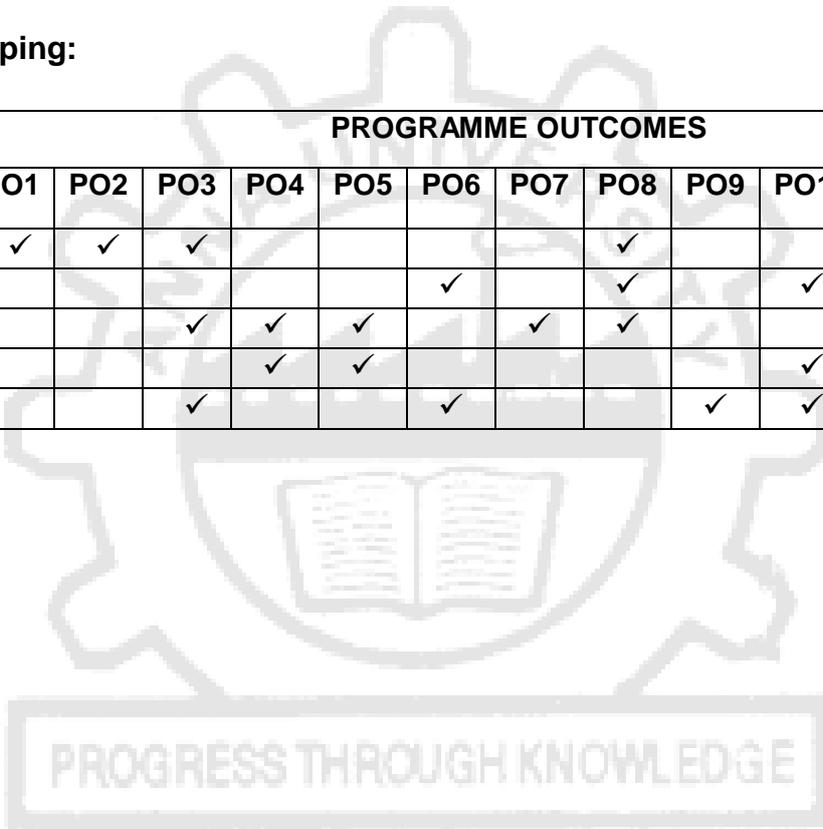
3. PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of Quality Engineering and Management program the student will have following Program specific outcomes.

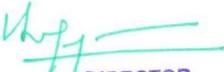
1. To demonstrate the knowledge and understanding of Quality Engineering and Management and apply them to improve quality of products and services and achieve optimality in any organization.
2. To use the knowledge of Quality Engineering and Management to design and develop quality management system and environmentally sustainable system to fulfill the needs of society.
3. Graduates should be able to design and develop enterprises and establish themselves as successful entrepreneurs.
4. Graduates should be able to design and manage systems, processes and operations of different sectors of economy.

4. PEO / PO Mapping:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
I	✓	✓	✓					✓				
II						✓		✓		✓	✓	
III			✓	✓	✓		✓	✓				
IV				✓	✓					✓	✓	✓
V			✓			✓			✓	✓	✓	✓



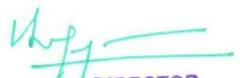
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Mapping of Course Outcome and Programme Outcome

		Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
YEAR 1	Semester 1	Statistical Methods for Engineers	✓		✓		✓							
		Optimization Techniques	✓		✓									
		Measurement Systems	✓											
		Program Elective I												
		Research Methodology and IPR	✓											
		Audit Course – I												
		Measurement Laboratory		✓				✓						
	Optimization Laboratory		✓				✓							
	Semester 2	Quality by Design		✓	✓	✓			✓			✓		
		Quality Management	✓						✓					
		Applied Quality Engineering	✓			✓	✓							
		Program Elective II												
		Program Elective III												
		Audit Course –II												
Quality Analytics Laboratory			✓				✓							
Quality System Design Project		✓		✓	✓	✓								
YEAR 2	Semester 3	Program Elective IV												
		Program Elective V												
		Open Elective												
		Dissertation-I		✓		✓			✓			✓		
	Technical Seminar							✓	✓					
Semester 4	Dissertation-II		✓		✓			✓			✓			

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M.E. QUALITY ENGINEERING AND MANAGEMENT (FT)
CURRICULUM AND SYLLABUS

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA5157	Statistical Methods for Engineers	FC	3	1	0	4	4
2.	IL5151	Optimization Techniques	PCC	3	1	0	4	4
3.	QE5101	Measurement Systems	PCC	4	0	0	4	4
4.	RM5151	Research Methodology and IPR	RMC	2	0	0	2	2
5.		Program Elective I	PEC	3	0	0	3	3
6.		Audit Course – I*	AC	2	0	0	2	0
PRACTICALS								
7.	QE5111	Measurement Laboratory	PCC	0	0	4	4	2
8.	IL5161	Optimization Laboratory	PCC	0	0	4	4	2
TOTAL				17	2	8	27	21

* Audit Course is optional.

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	QE5201	Quality By Design	PCC	3	1	0	4	4
2.	QE5202	Quality Management	PCC	3	1	0	4	4
3.	QE5251	Applied Quality Engineering	PCC	3	1	0	4	4
4.		Program Elective II	PEC	3	0	0	3	3
5.		Program Elective III	PEC	3	0	0	3	3
6.		Audit Course –II*	AC	2	0	0	2	0
PRACTICALS								
7.	QE5211	Quality Analytics Laboratory	PCC	0	0	4	4	2
8.	QE5212	Quality System Design Project	EEC	0	0	6	6	3
TOTAL				17	3	10	30	23

* Audit Course is optional.

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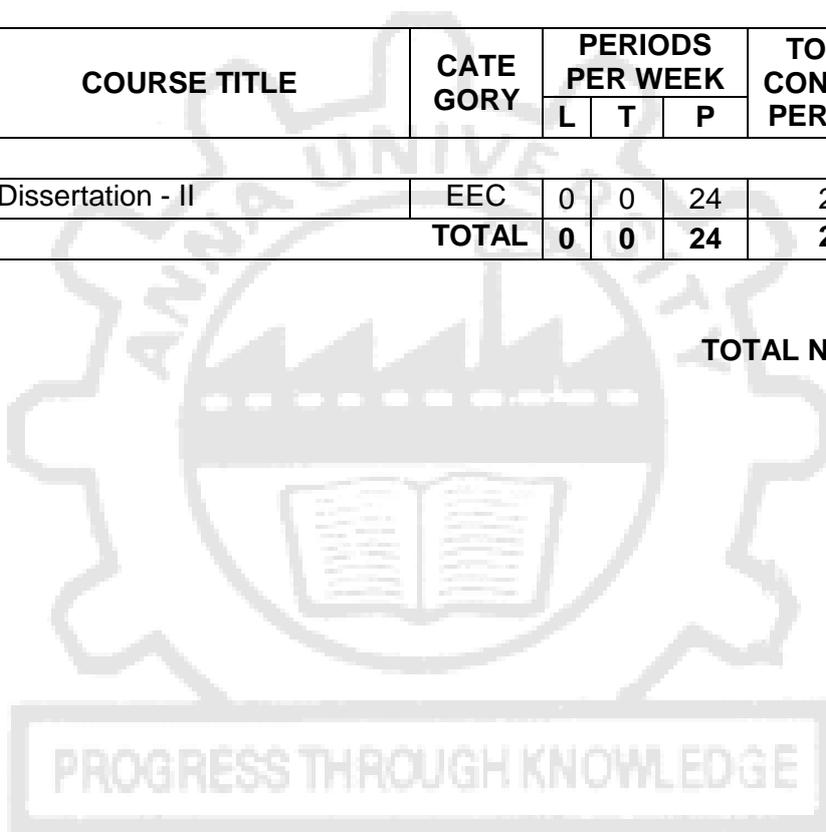
SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Program Elective IV	PEC	3	0	0	3	3
2.		Program Elective V	PEC	3	0	0	3	3
3.		Open Elective	OEC	3	0	0	3	3
PRACTICALS								
4.	QE5311	Dissertation - I	EEC	0	0	12	12	6
5.	QE5312	Technical Seminar	EEC	0	0	2	2	1
TOTAL				9	0	14	23	16

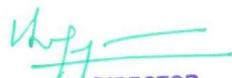
SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	QE5411	Dissertation - II	EEC	0	0	24	24	12
TOTAL				0	0	24	24	12

TOTAL NO. OF CREDITS = 72



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M.E. QUALITY ENGINEERING AND MANAGEMENT (PT)
CURRICULUM AND SYLLABUS

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA5157	Statistical Methods for Engineers	FC	3	1	0	4	4
2.	IL5151	Optimization Techniques	PCC	3	1	0	4	4
3.	QE5101	Measurement Systems	PCC	4	0	0	4	4
PRACTICALS								
4.	QE5111	Measurement Laboratory	PCC	0	0	4	4	2
TOTAL				10	2	4	16	14

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	RM5151	Research Methodology and IPR	RMC	2	0	0	2	2
2.		Program Elective I	PEC	3	0	0	3	3
3.		Audit Course – I*	AC	2	0	0	2	0
PRACTICALS								
4.	IL5161	Optimization Laboratory	PCC	0	0	4	4	2
TOTAL				7	0	4	11	7

* Audit Course is optional.

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	QE5201	Quality By Design	PCC	3	1	0	4	4
2.	QE5202	Quality Management	PCC	3	1	0	4	4
3.	QE5251	Applied Quality Engineering	PCC	3	1	0	4	4
PRACTICALS								
4.	QE5211	Quality Analytics Laboratory	PCC	0	0	4	4	2
TOTAL				9	3	4	16	14

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SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Program Elective II	PEC	3	0	0	3	3
2.		Program Elective III	PEC	3	0	0	3	3
3.		Audit Course – II*	AC	2	0	0	2	0
PRACTICALS								
4.	QE5212	Quality System Design Project	EEC	0	0	6	6	3
TOTAL				8	0	6	14	9

* Audit Course is optional.

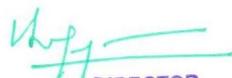
SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Program Elective IV	PEC	3	0	0	3	3
2.		Program Elective V	PEC	3	0	0	3	3
3.		Open Elective	OEC	3	0	0	3	3
PRACTICALS								
4.	QE5311	Dissertation - I	EEC	0	0	12	12	6
5.	QE5312	Technical Seminar	EEC	0	0	2	2	1
TOTAL				9	0	14	23	16

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	QE5411	Dissertation - II	EEC	0	0	24	24	12
TOTAL				0	0	24	24	12

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FOUNDATION COURSES (FC)

SL. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	MA5157	Statistical Methods for Engineers	3	1	0	4	1

PROGRAM CORE COURSES (PCC)

SL. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1.	IL5151	Optimization Techniques	3	1	0	4	1
2.	QE5101	Measurement Systems	4	0	0	4	1
3.	QE5111	Measurement Laboratory	0	0	4	2	1
4.	IL5161	Optimization Laboratory	0	0	4	2	1
5.	QE5201	Quality By Design	3	1	0	4	2
6.	QE5202	Quality Management	3	1	0	4	2
7.	QE5251	Applied Quality Engineering	3	1	0	4	2
8.	QE5211	Quality Analytics Laboratory	0	0	4	2	2

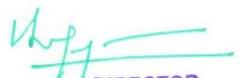
PROGRAM ELECTIVE COURSES [PEC]

SEMESTER I, ELECTIVE I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	QE5073	Product Innovation and Development	PEC	3	0	0	3	3
2.	QE5001	Quality Audits for Improved Performance	PEC	3	0	0	3	3
3.	QE5074	Software Quality Engineering	PEC	3	0	0	3	3
4.	IL5072	Applied Object Oriented Programming	PEC	3	0	0	3	3
5.	QE5002	Operations and Inventory Management	PEC	3	0	0	3	3

SEMESTER II, ELECTIVE II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IL5082	Reliability Engineering	PEC	3	0	0	3	3
2.	IL5073	Decision Support Systems	PEC	3	0	0	3	3
3.	QE5003	Discrete System Simulation	PEC	3	0	0	3	3
4.	IL5077	Lean Manufacturing and Six Sigma	PEC	3	0	0	3	3
5.	QE5004	Product Design and Value Engineering	PEC	3	0	0	3	3


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SEMESTER II, ELECTIVE III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IL5079	Management Accounting and Financial Management	PEC	3	0	0	3	3
2.	IL5251	Multi-Variate Data Analysis	PEC	3	0	0	3	3
3.	QE5005	Multi-Criteria Decision Making	PEC	3	0	0	3	3
4.	QE5006	Engineering Economics and Costing	PEC	3	0	0	3	3
5.	QE5007	Operations Scheduling	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IL5084	Supply Chain Management	PEC	3	0	0	3	3
2.	IL5078	Logistics and Distribution Management	PEC	3	0	0	3	3
3.	PD5351	Product Life Cycle Management	PEC	3	0	0	3	3
4.	IL5081	Project Management	PEC	3	0	0	3	3
5.	IL5083	Services Operations Management	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE V

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	QE5008	Modern Manufacturing Management Concepts	PEC	3	0	0	3	3
2.	QE5072	Materials Management	PEC	3	0	0	3	3
3.	QE5071	Maintenance Engineering and Management	PEC	3	0	0	3	3
4.	IL5075	Human Industrial Safety and Hygiene	PEC	3	0	0	3	3
5.	IL5080	Plant Layout and Material Handling	PEC	3	0	0	3	3

RESEARCH METHODOLOGY AND IPR COURSES (RMC)

SL. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
			L	T	P		
1.	RM5151	Research Methodology and IPR	2	0	0	2	2 <i>Attested</i>

OPEN ELECTIVE COURSES [OEC]
(Out of 6 Courses one Course must be selected)

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OE5091	Business Data Analytics	OEC	3	0	0	3	3
2.	OE5092	Industrial Safety	OEC	3	0	0	3	3
3.	OE5093	Operations Research	OEC	3	0	0	3	3
4.	OE5094	Cost Management of Engineering Projects	OEC	3	0	0	3	3
5.	OE5095	Composite Materials	OEC	3	0	0	3	3
6.	OE5096	Waste to Energy	OEC	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.	AX5091	English for Research Paper Writing	2	0	0	0
2.	AX5092	Disaster Management	2	0	0	0
3.	AX5093	Sanskrit for Technical Knowledge	2	0	0	0
4.	AX5094	Value Education	2	0	0	0
5.	AX5095	Constitution of India	2	0	0	0
6.	AX5096	Pedagogy Studies	2	0	0	0
7.	AX5097	Stress Management by Yoga	2	0	0	0
8.	AX5098	Personality Development Through Life Enlightenment Skills	2	0	0	0
9.	AX5099	Unnat Bharat Abhiyan	2	0	0	0

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SL. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			L	T	P		
1	QE5312	Technical Seminar	0	0	2	1	3
2	QE5212	Quality System Design Project	0	0	6	3	2
3	QE5311	Dissertation-I	0	0	12	6	3
4	QE5411	Dissertation-II	0	0	24	12	4

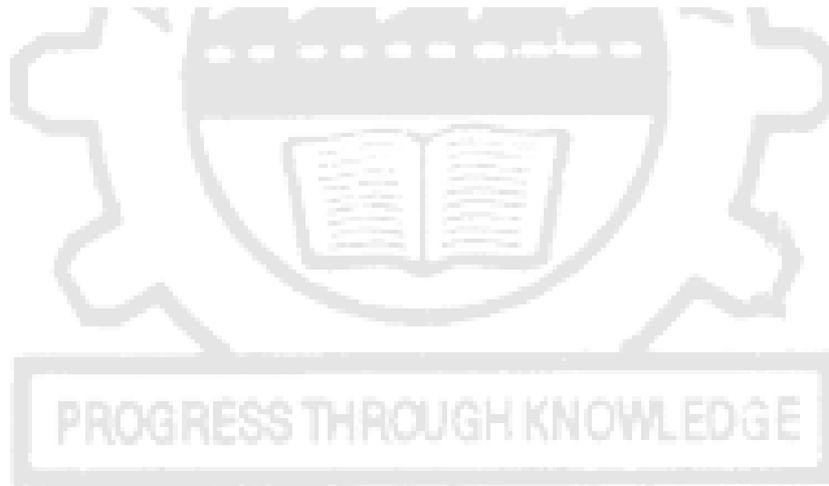
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SUMMARY

	Name of the Programme					
	Subject Area	Credits per Semester				Credits Total
		I	II	III	IV	
1.	FC	04	00	00	00	04
2.	PCC	12	14	00	00	26
3.	PEC	03	06	06	00	15
4.	RMC	02	00	00	00	02
5.	OEC	00	00	03	00	03
6.	EEC	00	03	07	12	22
7.	Non Credit/Audit courses	✓	✓	00	00	
	Total Credits	21	23	16	12	72



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OBJECTIVES:

- To enable them to estimate the value of the parameters involved in the specific distribution from a possible continuum of alternatives.
- To give an idea of testing the statistical hypothesis claimed based on a set of data points using suitable test statistics which follows standard sampling distributions.
- To establish a relationship that make it possible to predict one or more variable in terms of others using correlation and regression analysis.
- To introduce the various experimental designs and their corresponding analysis of variance which play vital role in many real time scenarios.
- To impart knowledge of handling random vectors which represent random variables in multi-dimensional space.

UNIT I ESTIMATION THEORY 12

Estimators: Unbiasedness, Consistency, Efficiency and Sufficiency – Maximum Likelihood Estimation – Method of moments.

UNIT II TESTING OF HYPOTHESIS 12

Tests based on Normal, t , χ^2 and F distributions for testing of means, variance and proportions – Analysis of $r \times c$ 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 coefficients.

UNIT IV DESIGN OF EXPERIMENTS 12

Analysis of variance – One-way and two-way classifications – Completely randomized design – Randomized block design – Latin square 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**OUTCOMES:**

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

- Obtain the value of the point estimators using the method of moments and method of maximum likelihood.
- Use various test statistics in hypothesis testing for mean and variances of large and small samples.
- Determine the regression line using the method of least square and also to calculate the partial and multiple correlation coefficient for the given set of data points.
- Test the hypothesis for several means using one way, two way or three way classifications.
- Get exposure to the principal component analysis of random vectors and matrices.

REFERENCES:

1. Devore, J.L., "Probability and Statistics for Engineering and the Sciences", Thomson and Duxbury, Singapore, 6th Edition, Boston, 2004.
2. Gupta, S.C., and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, Eleventh Edition, Reprint, New Delhi, 2019.
3. Johnson, R. A. and Gupta, C. B., "Miller & Freund's Probability and Statistics for Engineers", Pearson Education, Asia, Eighth Edition, New Delhi, 2015.
4. Johnson, R.A., and Wichern, D.W., "Applied Multivariate Statistical Analysis", Pearson Education, Sixth Edition, New Delhi, 2013.
5. Spiegel, M.R. and Stephens, L.J., "Schaum's outlines on Statistics", Tata McGraw-Hill, 6th Edition, New York, 2018.

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**12**

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**12**

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**12**

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**12**

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**12**

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

PROGRESS THROUGH KNOWLEDGE

TOTAL: 60 PERIODS**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.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓		✓								
CO2	✓	✓		✓								
CO3	✓	✓	✓	✓								
CO4	✓	✓	✓	✓								Attested
CO5	✓	✓	✓	✓								

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.

QE5101

MEASUREMENT SYSTEMS

L	T	P	C
4	0	0	4

OBJECTIVES:

- Describe the principles of engineering tribology.
- Summarize the metrology of surface finish.
- Relate computer in measurement/industrial inspectionsystems.
- Contrast the corrosiontypes and itstesting methods.
- Describe the principle and standardsof destructive and non destructive testing.

UNIT I FRICTION AND WEAR MEASUREMENT

12

Introduction to tribology - friction, wear and lubrication. Wear– types - adhesive, abrasive, fatigue etc. Lubrication: Methods of lubrication; industrial lubricants and their grades. Measurement of friction – tribometer – parameters – different testing methods. Wear debris and surface analysis, wear reduction methods.

UNIT II SURFACE FINISH &VIDEO MEASUREMENT SYSTEMS

12

Surface texture, surface roughness parameter, ideal surface roughness. Factors affecting surface roughness. Roughness measurement equipments - Tomlinson's surface meter, Taylor- Hobson surface meter, grades of roughness, specifications.Video Measurement Systems: introduction and principle, measurement of kerf taper angle, delamination factor, edge slope and corner accuracy.

UNIT III COMPUTER AIDED METROLOGY

12

Computer Aided Metrology - principles and interfacing, soft metrology - application of lasers in precision measurements - laser interface, laser scanners, Coordinate Measurement Machine (CMM), types of CMM & applications. CMM software, scanning, reverse engineers applications, performance evaluation of co-ordinate measuring machines, possible sources of error in CMM.

UNIT IV MEASUREMENT OF CORROSION

12

Introduction – types- definition and principles. Purpose of corrosion testing - corrosion testing equipments – susceptibility tests for intergranular corrosion - Stress corrosion test. Salt spray test humidity and porosity tests, accelerated weathering tests.ASTM standards for corrosion testing.

UNIT V DESTRUCTIVE AND NON DESTRUCTIVE TESTING

12

Destructive Testing: Principle, standards and procedure for the measurement - hardness, tensile strength, fatigue, creep, impact, fracture toughness. Non Destructive Testing: Principle, standards and procedure- Dye penetrant test,Magnetic Particle test,Radiographic test, Eddy current test, Ultrasonic test.

TOTAL: 60 PERIODS

OUTCOMES: At the end of the course the students will be able to learn about:

CO1:The principles of engineering tribology and the procedures for performing tribological tests.

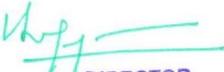
CO2:The fundamentals of metrology of surface finish.

CO3:The applications of computer in measurement/inspection system.

CO4:The various types ofcorrosion, effectsandtesting methods.

CO5:The principles and procedure of destructive and non destructive testing.

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PROGRAMME OUTCOMES (POs):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	✓			✓	✓							
CO2	✓	✓	✓	✓								
CO3	✓			✓	✓							
CO4	✓	✓	✓	✓								
CO5	✓	✓	✓	✓	✓							

REFERENCES:

1. Beckwith T. G., Marangoni R. D., and Lienhard J. H., "Mechanical Measurements," 6th Edition, Pearson Higher Education, ISBN: 0132296071, 2007.
2. Foster, P. Field (2007), The Mechanical Testing of Metals and Alloys, Read Books, ISBN 978-1406734799.
3. Gupta I.C., "Engineering Metrology", Dhanpat Rai Publications, 2005.
4. Halling J. "Principles of Tribology", Macmillan Publishers Limited 1978, Print ISBN : 978-0-333-24686-3
5. Jain R.K., "Engineering Metrology," Khanna Publishers, ISBN: 817409153X, 20th Reprint, 2014.

RM5151

RESEARCH METHODOLOGY AND IPR

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

To impart knowledge and skills required for research and IPR:

- Problem formulation, analysis and solutions.
- Technical paper writing / presentation without violating professional ethics
- Patent drafting and filing patents.

UNIT I RESEARCH PROBLEM FORMULATION**6**

Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations

UNIT II LITERATURE REVIEW**6**

Effective literature studies approaches, analysis, plagiarism, and research ethics.

UNIT III TECHNICAL WRITING /PRESENTATION**6**

Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR)**6**

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT V INTELLECTUAL PROPERTY RIGHTS (IPR)**6**

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TOTAL: 30 PERIODS**COURSE OUTCOMES:**

1. Ability to formulate research problem
2. Ability to carry out research analysis
3. Ability to follow research ethics
4. Ability to understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
5. Ability to understand about IPR and filing patents in R & D.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓										
CO2	✓											
CO3	✓							✓				
CO4	✓				✓							
CO5	✓					✓						✓

REFERENCES:

1. Asimov, "Introduction to Design", Prentice Hall, 1962.
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners" 2010

QE5111

MEASUREMENT LABORATORY

L T P C
0 0 4 2

OBJECTIVES:

- Summarize the applications of measurement sensors and actuators.
- Correlate heat treatment and its effects on materials.
- Develop specimens for microstructure analysis.
- Use of tribological test for wear and friction assessment of different materials.
- Contrast the corrosion and surface roughness of different materials.

LIST OF EXPERIMENTS

1. Study of measurement sensors and actuators.
2. Effect of ultra-sonication on the properties of castings.
3. Effect of heat treatment on microstructure of engineering materials.
4. Preparation of specimen for microstructure analysis.
5. Analysis of microstructure using optical microscope.
6. Determination of friction and wear characteristics at dry and wet conditions.
7. Determination of friction and wear characteristic at elevated conditions.
8. Measurement of surface roughness on different work samples.
9. Determination of pH values for various concentration of a given solutions.
10. Measurement of corrosion on different materials.

LIST OF EQUIPMENTS:

1. Ultra-sonication assisted casting Setup.
2. High temperature furnace.
3. Moulding machine.
4. Polishing machine.
5. Optical microscope.
6. Weighing balance.
7. Pin-on-disc Tribometer.
8. Surface roughness meter.
9. pH meter.
10. Salt spray corrosion tester.

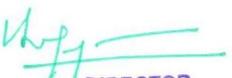
TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of this course, students should be able to:

- CO1: Demonstrate the necessary skills to collect data and interpret results.
CO2: Perform the heat treatment on materials to assess the thermal effects.
CO3: Prepare specimen and perform microstructural characterization.
CO4: Perform the tribological test at different conditions.
CO5: Analyse the corrosion behaviour of various materials.

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CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓	✓				✓					
CO2					✓		✓					
CO3		✓	✓				✓					
CO4					✓		✓		✓		✓	
CO5					✓		✓		✓		✓	

IL5161

OPTIMIZATION LABORATORY

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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

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓	✓	✓								
CO2				✓	✓							
CO3		✓	✓	✓								
CO4				✓	✓							
CO5				✓	✓							

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OBJECTIVES:

- Impart basic knowledge on quality loss function and design of experiments
- Inculcate knowledge in single and factorial experiments
- Provide insights on orthogonal experiments
- Describe the concepts in robust design
- Provide exposure on response surface methods and shainin DOE

UNIT I INTRODUCTION**12**

Perception of quality, Taguchi's definition of quality – quality loss function, Planning of experiments, design principles, terminology, normal probability plot, Analysis of variance, Linear regression models.

UNIT II FACTORIAL EXPERIMENTS**12**

Design and analysis of single factor and multi-factor experiments, tests on means, EMS rules. 2^k Factorial designs, Fractional factorial designs, Nested designs, Blocking and Confounding.

UNIT IV ORTHOGONAL EXPERIMENTS**12**

Selection of orthogonal arrays (OA's), OA designs, conduct of OA experiments, data collection and analysis of simple experiments, Modification of orthogonal arrays.

UNIT V ROBUST DESIGN**12**

Variability due to noise factors, Product and process design, Principles of robust design, objective functions in robust design - S/N ratios, Inner and outer OA experiments, optimization using S/N ratios, fraction defective analysis, case studies.

UNIT V RESPONSE SURFACE METHODS AND SHAININ DOE**12**

Introduction to Response Surface Methods, Central Composite Design. Basics of Shainin DOE - Problem Solving Algorithm - Problem Identification Tools- Shainin DOE Tools - case studies.

TOTAL: 60 PERIODS**OUTCOMES:**

Students should be able to:

CO1 – Get an introduction about various quality design principles, methods and terminologies

CO2 – Effectively design and analyze factorial experiments

CO3 – Apply and analyze orthogonal experiments while designing quality of the system

CO4 – Understand the concepts in robust design procedures

CO5 – Gain knowledge on response surface methods and tools in shainin DOE

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓										
CO2	✓	✓		✓								
CO3	✓	✓	✓	✓								
CO4	✓	✓	✓		✓							
CO5	✓	✓	✓	✓								

REFERENCES:

1. Krishnaiah, K. and Shahabudeen, P. Applied Design of Experiments and Taguchi Methods, PHI, 2012.
2. Montgomery D.C., "Design and analysis of experiments", John Wiley, Eighth Edition, 2012.
3. NicoloBelavendram, "Quality by design" Taguchi techniques for Industrial experimentation, Prentice Hall, 1999.

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OBJECTIVES:

- Summarize the Overview of Quality
- Illustrate the essentials of Quality
- Understand and apply Selected Quality Improvement techniques
- Interpret the concepts and application of TPM, Reliability and FMEA
- Develop comprehensive knowledge on Quality Management Systems and awards

UNIT I INTRODUCTION**9+3=12**

History of Quality – Objectives and Importance of Quality Management – Contributions of Quality Gurus - Quality Information System – Strategy Development and Deployment – Need for Quality approach to strategy – Definition of Quality and its types – Distinction between product quality and service quality

UNIT II ESSENTIALS OF QUALITY MANAGEMENT**9+3=12**

Leadership - Desirable Qualities of a Leader - Role of Leaders in Quality improvement; Customer focus – Steps of developing customer focus – Customer and management – Factors affecting customer satisfaction – Importance of customer retention – Employee Involvement - Motivation - Empowerment - Teams - Rewards and Recognition - Performance appraisal - Quality circles

UNIT III QUALITY IMPROVEMENT TECHNIQUES**9+3=12**

Continuous process improvement - The Juran Trilogy - Improvement strategies - The PDSA Cycle - Kaizen - Six- Sigma - Bench Marking – Cost of Quality – Quality function Deployment - The role of Information Technology in Quality improvement.

UNIT IV TOTAL PRODUCTIVE MAINTENANCE (TPM)**9+3=12**

Objectives of TPM – Elimination of Wastes by TPM – Equipment Maintenance Techniques – Benefits of TPM – Performance Measures of Maintenance System – Pillars of TPM – Stages of Implementation of TPM – Reliability – Failure Modes and Effects analysis (FMEA)

UNIT V QUALITY MANAGEMENT SYSTEMS AND AWARD**9+3=12**

ISO 9000 Series – ISO 9000: 2015 – ISO 9000 Vs Baldrige award – Malcolm Baldrige National Quality award - Environmental Management Systems– Business Process Re – engineering - Building and sustaining Quality

TOTAL: 60 PERIODS**OUTCOMES:**

- CO1** – Recognition of importance of Quality
CO2 – Acquiring essentials of Quality
CO3 – Application of Quality Improvement tools
CO4 – Machine effectiveness and Reliability
CO5 – Comprehensive Quality Management System

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓					✓		
CO2		✓			✓				✓			✓
CO3	✓		✓	✓	✓							
CO4	✓		✓	✓	✓							
CO5		✓		✓	✓				✓			✓

REFERENCES:

1. Bester field, D.H., Carol Bester field, G.H., Mary Bester field - - sacre, "Total Quality Management", Pearson Education, INC, third edition (Revised) (2012).
2. K.Krishnaiah, ""Applied Statistical Quality Control and Improvement", PHI Learning, New Delhi – 2014.
3. Panneerselvam.R and SivaSankaran.P, "Quality Management", PHI Learning, New Delhi - 2014.
4. Summers, C.S., Quality Management: Creating and Sustaining Organization effectiveness, Prentice – Hall of India, New Delhi, 2005.

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 CONTROL CHARTS**12**

Chance and assignable causes of process variation, statistical basis of the control chart, control charts for variables- 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, 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.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓				✓			✓
CO2		✓	✓		✓				✓			✓
CO3	✓	✓	✓		✓				✓			✓
CO4	✓		✓		✓							
CO5		✓			✓				✓			✓

REFERENCES:

1. Douglas C Montgomery, Introduction to Statistical Quality Control, John Wiley, Seventh Edition, 2012.
2. Grant E.L. and Leavens worth, Statistical Quality Control, TMH, 2000.
3. IS 2500 Standard sampling plans.
4. K Krishnaiah, Applied Statistical Quality control and Improvement, PHI, 2014.

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OBJECTIVES

- To get hands on training and exposure on descriptive and Inferential statistics, Hypothesis testing, Regression and Correlation Analysis.
- To get hands on training and exposure on Factor Analysis, Discriminant Analysis and Cluster Analysis.
- To get hands on training and exposure to techniques on Single factor experiments, Factorial experiments and 2^k design.
- To get hands on training and exposure on design and Analysis of Taguchi's DOE
- To get hands on training on Response Surface Methodology and MANOVA.

EXPERIMENTS

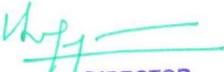
- Statistical analysis: Descriptive Statistics • Inferential statistics
- Testing of Hypothesis
- Linear Regression and Correlation
- Discriminant analysis
- Control charts
- Process capability
- Single Factor Experiments
- Factorial experiments
- 2^k Design
- Analysis of Variance (ANOVA)
- Taguchi Design of Experiments
- Factor analysis
- Cluster Analysis
- Response Surface Method
- MANOVA

TOTAL: 60 PERIODS**OUTCOMES:**

- CO1 : Ability to compute descriptive and inferential statistics, Hypothesis testing, Regression and Correlation Analysis for a given data using Excel/ Python/ Minitab software.
- CO2 : Ability to perform Factor Analysis, Discriminant Analysis, Cluster Analysis and develop Process control using Excel/ Python/ Minitab software.
- CO3 : Ability to perform DOE (Single, Factorial and 2^k design) for a given data using Excel/ Python/ Minitab software.
- CO4 : Ability to perform Taguchi Design using Excel/ Python / Minitab software
- CO5 : Ability to perform Response Surface Methodology and MANOVA for a given data using Excel/ Python/ Minitab software.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓	✓	✓								
CO2				✓	✓							
CO3		✓	✓	✓								
CO4				✓	✓						✓	✓
CO5				✓	✓						✓	✓

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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.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11
1		✓			✓						
2		✓	✓								
3											
4	✓										
5			✓					✓		✓	✓

REFERENCES:

1. Gevartz 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.

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OBJECTIVES:

- Understand Various Auditing Process
- Prepare and Manage the Audit Program
- Perform Auditing and Reporting
- Follow Up Audit Procedure and Perform Closure of Audit Procedures.
- Perform Process Based Auditing

UNIT I INTRODUCTION 9

Brief history of auditing – General model of auditing – The compliance audit – Performance audit – Product audits – Process audits – System audits – Audit defined – Management principles

UNIT II AUDIT PROGRAM MANAGER AND PREPARATION 9

Accountability – Resources for audit program – Phases of audit – The audit team – Second rule of auditing – Authority – Requirements – Understand the process – Audit Plan – Evaluate documents

UNIT III PERFORMANCE AND REPORTING 9

Opening meeting – Gather the facts – Tracing – Interviews – Interview Techniques – Perceptions – Team meetings – Daily briefings – Onward – Report Characteristics – Pain and pleasure – Findings – Preparing the finding sheets – Recommendations – Exit meeting – Formal report – Report distribution

UNIT IV FOLLOW UP AND CLOSURE 9

Closure phase – Remedial action – Corrective action – Corrective action response – Adequacy of the response – Records – An Example Procedure.

UNIT V PROCESS BASED AUDITING 9

The process approach – Auditing process based Quality Management System – Audit program management – The process of Auditing – Audit reporting phase – Audit closure phase

TOTAL: 45 PERIODS

OUTCOMES:

- CO1 : Able to Understand Various Auditing Process
 CO2 : Able to Prepare and Manage the Audit Program
 CO3 : Able to Perform Auditing and Reporting
 CO4 : Able to Follow Up Audit Procedure and Perform Closure of Audit Procedures.
 CO5 : Able to Perform Process Based Auditing

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓					✓		
CO2		✓			✓				✓			✓
CO3	✓		✓	✓	✓							
CO4	✓		✓	✓	✓							
CO5		✓		✓	✓				✓			✓

REFERENCES:

1. Dennis R.Arter, “Quality, Audits for Improved Performance”, ASQ Quality Press, 2003.
2. Dennis R. Arter Charles A, Cianfrani, John E, West Jack West “How to audit the process based QMS”, ASQ Quality Press, 2012.
3. Dennis Pronovost, “Internal Quality Auditing”, ASQ Quality Press, 2000.

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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 MANAGEMENT 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 9000 series – 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓					✓		
CO2		✓			✓				✓			✓
CO3	✓		✓		✓							
CO4	✓		✓		✓							
CO5		✓			✓				✓			✓

REFERENCES:

1. Dunn Robert M., Software Quality: Concepts and Plans, Englewood cliffs, 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.

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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**OUTCOMES:**

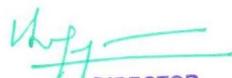
- CO1: Able to and write and execute C++ programs,
 CO2: Able to understand the need for object oriented programming
 CO3: Able to create class in C++ program
 CO4: Able to derive a class from the basic class
 CO5: Able to write a program for solving the industrial problem.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓										
CO2	✓											
CO3	✓								✓			
CO4								✓				
CO5			✓									

REFERENCES:

1. E.Balagurusamy, Object oriented programming with C ++,Tata Mc Graw Hill,2003
2. Nabajyoti Barkakati,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.

Attested


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OBJECTIVES:

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

UNIT I INTRODUCTION TO OPERATIONS AND ITS DESIGN 9

Introduction to Operations Management, Manufacturing trends in India, Systems Perspective, Functions of Operations Management, Challenges and current priorities 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 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 MANAGEMENT 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 MANAGEMENT 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, its strategies 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.

Attested

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓										✓
CO2						✓				✓		✓
CO3			✓		✓				✓			
CO4	✓				✓		✓				✓	✓
CO5			✓			✓		✓				

REFERENCES:

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

IL5082

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	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓									
CO2	✓	✓	✓	✓								Abster
CO3	✓	✓	✓		✓							
CO4	✓	✓		✓	✓							✓
CO5	✓	✓	✓	✓								✓

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.

IL5073**DECISION SUPPORT SYSTEMS**

L	T	P	C
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OBJECTIVES:

- Summarize managerial role in decision making.
- Articulate insights in the 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

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓						✓	✓			✓
CO2	✓	✓	✓			✓						
CO3	✓	✓	✓		✓				✓			
CO4	✓	✓			✓							✓
CO5	✓	✓	✓									

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.

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OBJECTIVES:

- Explain about generating of random numbers and random variates.
- Teach how to test the random numbers and random variates.
- Illustrate how to design the simulation experiment.
- Develop to be trained in simulation software packages.
- Apply simulation techniques for various optimization problems.

UNIT I INTRODUCTION TO DISCRETE EVENT SYSTEM SIMULATION 9

Discrete –Event system simulation – Model of a system – Types of models – component of system – Advantages and Disadvantages of Simulation – Steps in a simulation study – Simulation of queuing system- Simulation of Inventory systems.

UNIT II STATISTICAL MODELS IN SIMULATION AND RANDOM NUMBER AND TESTING 9

Discrete distributions- Continuous distributions – Poisson process – Empirical Distribution Properties of random numbers – Manual methods of generation -Generation of Pseudo-Random Numbers — Mid square – Mid product – constant multiplier – linear congruential method – additive congruential – Frequency test- Runs Test- Test for Autocorrelation – Gap Test – Poker Test

UNIT III RANDOM VARIATE GENERATION AND TESTING 9

Inverse Transform Technique – Exponential Distribution – Uniform Distribution – Weibull Distribution – Triangular Distribution – Convolution Method - Acceptance- Rejection Technique – Poisson Distribution – Gamma Distribution Testing of random Variate – Frequency Test.

UNIT IV VERIFICATION AND VALIDATION OF SIMULATION MODELS 9

Model Building- Verification and Validation – Face validity – Validation Input- Output Transformations – Input –Output Validation: Using a Turing Test- Monte Carlo simulation- Simulation Experiments

UNIT V SIMULATION LANGUAGES AND CASE STUDIES 9

Simulation in C++ - Simulation in GPSS – Simulation with software packages – waiting line models – Inventory models

TOTAL : 45 PERIODS**OUTCOMES:**

- CO1: Able to understand the Discrete event system simulation
 CO2: Able to generate random numbers and test statistically.
 CO3: Able to generate random variate and test statistically.
 CO4: Able to do the simulation model and validate the model.
 CO5: How to use simulation software to simulate and analyse various problems.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓		✓								
CO2	✓	✓		✓								
CO3		✓	✓							✓		
CO4	✓	✓	✓	✓	✓							✓
CO5		✓	✓	✓	✓							

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.
4. Thomas J Schriber, "Simulation Using GPSS", John Wiley, 2002.

Attested

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 Black belts, Training of Black belts and 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.

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.

Attested

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓										✓
CO2						✓				✓		✓
CO3					✓				✓			
CO4	✓				✓		✓				✓	✓
CO5			✓			✓	✓	✓				

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.

QE5004

PRODUCT DESIGN AND VALUE ENGINEERING

L T P C
3 0 0 3

OBJECTIVES :

- Gain knowledge of product development integrated with value engineering.
- Summarize the development of new products through conceptualization, design and development phases.
- To associate various aspects of product development with industrial design and manufacturing.
- Check the value of a product using tools and techniques.
- Generate products which are suitable for the needs of the society.

UNIT I VALUE ENGINEERING BASICS

9

Origin of Value Engineering, Meaning of value, Definition of Value Engineering and Value analysis, Difference between Value analysis and Value Engineering, Types of Value, function - Basic and Secondary functions, concept of cost and worth, creativity in Value Engineering.

UNIT II VALUE ENGINEERING JOB PLAN AND PROCESS

9

Seven phases of job plan, FAST Diagram as Value Engineering Tool, Behavioural and organizational aspects of Value Engineering, Ten principles of Value analysis, Benefits of Value Engineering.

UNIT III IDENTIFYING CUSTOMER NEEDS and PRODUCT SPECIFICATIONS

9

Product Development process – Product development organizations. Gather raw data – Interpret raw data- organize the needs into a hierarchy – Relative importance of the needs. Specifications – Refining specifications.

UNIT IV CONCEPT GENERATION, SELECTION AND PRODUCT ARCHITECTURE

9

Clarify the problem – Search internally – Search externally – Explore systematically. Concept Screening – Concept scoring. Product architecture – Implication of architecture – Establishing the architecture – Related system level design issues.

UNIT V INDUSTRIAL DESIGN, PROTOTYPING AND ECONOMICS OF PRODUCT DEVELOPMENT

9

Need for industrial design – Impact of industrial design – Industrial design process – Management of industrial design process – Assessing the quality of industrial design.

TOTAL: 45 PERIODS

OUTCOMES:

Student will be able to:

- CO1: To understand the basic concept of product development integrated with value engineering.
- CO2: Design new products in a systematic manner considering the concept of value engineering.
- CO3: To associate various aspects of product development with industrial design and manufacturing.
- CO4: To practically access the value of a product using tools and techniques.
- CO5: To be able to design products which are suitable for the needs of the society.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11
CO1		✓			✓						
CO2		✓	✓								
CO3											
CO4	✓			✓							
CO5			✓					✓		✓	✓

REFERENCES:

1. Arthur E. "Value Engineering"- A systematic approach, McGraw Hill, New York, 2000.
2. Gevirtz C, "Developing New products with TQM", McGraw Hill, International Editions, 1994.
3. RosenthalS, "Effective Product Design and Development", Irwin, 1992..
4. Ulrich K, Eppinger S, "Prodcut Design and Development", McGraw Hill, International Editions, 2003.

IL5079 MANAGEMENT ACCOUNTING AND FINANCIAL MANAGEMENT

L T P C
3 0 0 3

OBJECTIVES:

- Preparing the P&L A/C, Balance sheet and other accounting
- Applying the various cost accounting methods
- Sketch and Prepare a budget
- Evaluating and making investment decisions and select the most desirable projects
- Developing financial decision

UNIT I FINANCIAL ACCOUNTING

9

Trading Account, Profit and Loss Account, Balance sheet statement, Cash flow and fund flow analysis, Working capital management, Inventory valuation, financial ratio analysis– Depreciation.

UNIT II COST ACCOUNTING

9

Cost Accounting systems: Job costing, Process costing, Allocation of Overheads, Activity based Costing, Differential and Incremental cost, Variance analysis, Software costing.

UNIT III BUDGETING

9

Requirements for a sound budget, Fixed budget – Preparation of sales and Production budget, Flexible budgets, Zero base budgeting and budgetary control.

UNIT IV FINANCIAL MANAGEMENT

9

Investment decisions – Capital investment process, Type of investment proposals, Investment appraisal techniques – Payback period method, Accounting rate of return, Net present value method, Internal rate of return and Profitability index method.

UNIT V FINANCIAL DECISIONS

9

Cost of capital – Capital structure – Dividend policy – Leasing.

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Ability to prepare P&L A/C, Balance sheet and other accounting

CO2: Ability to apply the various cost accounting methods

CO3: Ability to prepare a budget

CO4: Ability to Evaluate, make investment decisions and select the most desirable projects

CO5: Ability to make financial decision

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2					✓				✓		✓	
CO3											✓	
CO4			✓								✓	
CO5			✓								✓	

REFERENCES

1. Bhattacharya, S.K. and John Deardon, "Accounting for management – Text and Cases", Vikas Publishing house, New Delhi, 2010.
2. Charles, T.Horn Green – "Introduction to Management Accounting", Prentice Hall, New Delhi, 1996.
3. James, C.Van Horne, "Fundamental of Financial Management", Pearson education, 12th Edition, 2002.
4. Pandey, I.M., "Financial Management", Vikas Publishing house, New Delhi, 8th Edition, 2004.

IL5251

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.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓											
CO3		✓										
CO4				✓								
CO5					✓							

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).

QE5005

MULTI-CRITERIA DECISION MAKING

L T P C
3 0 0 3

UNIT I INTRODUCTION TO MCDM METHODS 9

Overview – Classification of MCDM methods – Simple Additive Weighting method – Weighted Product method – Principle, Steps and Numerical illustration.

UNIT II ANALYTIC HIERARCHY PROCESS AND ANALYTIC NETWORK PROCESS 9

Network based MCDM methods – Analytic Hierarchy Process – Revised Analytic Hierarchy Process – Analytic Network Process – Principle, Steps and Numerical illustration.

UNIT III OUTRANKING MCDM METHODS 9

Outranking MCDM methods – PROMETHEE, ELECTRE, TOPSIS - Compromise Ranking method – VIKOR – DEMATEL – Principle, Steps and Numerical illustration.

UNIT IV ADVANCES IN MCDM 9

Fuzzy based MCDM methods – Hybrid MCDM methods – Group Decision Making- Graph Theory and Matrix approach – Principle, Steps and Numerical illustration.

UNIT GOAL PROGRAMMING AND BALANCED SCORECARD APPROACH 9

Goal Programming – Balanced Scorecard Approach - MCDM application areas – Case studies on application of MCDM techniques.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1 : Understand the importance of Multi-Criteria Decision Making problems in real life applications.

CO2 : Apply AHP and ANP to solve MCDM problems.

CO3 : Effectively apply various outranking MCDM methods to solve real time problems.

CO4 : Effectively apply Fuzzy and Hybrid MCDM methods for effective decision making.

CO5 : Understand the principles of Goal programming and balanced scorecard approach in solving real time problems.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓	✓								
CO2	✓	✓	✓	✓					✓			
CO3	✓	✓	✓	✓					✓			
CO4	✓	✓	✓	✓	✓				✓			
CO5	✓	✓	✓	✓	✓							

REFERENCES:

1. Belton, V., Stewart, T.J. "Multiple Criteria Decision Analysis: An Integrated Approach", Kluwer Academic Publishers, Dordrecht, 2003.
2. Kahraman, C., "Fuzzy Multi-criteria Decision Making: Theory and Applications with Recent Developments", Springer, 2008.
3. Pedrycz, W., Ekel, P., Parreiras, R., "Fuzzy Multi Criteria Decision-Making: Models, Methods and Applications", John Wiley & Sons, 2011.
4. Triantaphyllou, E., "Multi-Criteria Decision Making Methods: A Comparative Study", Springer, 2010.

OBJECTIVES :

- Understanding the concept of Engineering Economics and apply in the real word.
- Gaining knowledge in the field of value engineering to enable the students to estimate the costing factors
- Understand the concept of cash flow and its methods of comparison
- Acquire knowledge in the field of cost estimation
- Enable the students to estimate the cost of various manufacturing processes.

UNIT I INTRODUCTION TO ECONOMICS**9**

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis – P/V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II VALUE ENGINEERING**9**

Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor – Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW**9**

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV PROFIT ANALYSIS**9**

The concept of profit: Profit planning, control and measurement of profits. Profit maximisation – Cost volume profit analysis – Investment Analysis.

UNIT V COSTING**9**

Job costing-Process costing-Operating costing-Standard Costing (variance analysis) and budgeting.

TOTAL: 45 PERIODS**OUTCOMES:**

Students will be able to:

CO1 : Understand the principles and fundamentals of Engineering economics

CO2 : Gain knowledge on value engineering concepts

CO3 : Analyze cash flow and methods of pricing decisions

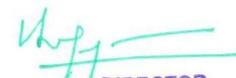
CO4 : Students will become familiar with principles of cost estimation.

CO5 : Able to apply these principles to appreciate the functioning of product and input market as well as the economy

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓					✓				
CO2		✓	✓					✓				
CO3		✓	✓					✓				
CO4		✓	✓					✓				
CO5	✓	✓	✓					✓				

TEXT BOOK:

- Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2013.

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REFERENCES:

1. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2011.
2. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2010.
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, "Engineering Economy", Macmillan, New York, 2011.
4. Zahid A khan: Engineering Economy, "Engineering Economy", Dorling Kindersley, 2012

QE5007**OPERATIONS SCHEDULING****L T P C****3 0 0 3****OBJECTIVES :**

- Explain to students about the Scheduling techniques, algorithms, and Heuristics that are applied for operations management.
- Cite the basic scheduling concepts.
- Illustrate machine model concepts in scheduling.
- Interpret the flow shop model concepts and algorithms.
- Develop knowledge on job shop modeling concepts.

UNIT I SCHEDULING BASICS**9**

Scheduling theory and function – Sequencing objectives – Performance measures– Dominant schedules – SPT, EDD, WSPT sequences – Sequencing Theorems.

UNIT II SINGLE MACHINE MODEL**9**

Pure sequencing –Minimizing T ,F – Hodgson's algorithm – Smith's rule – WI algorithm – Dynamic programming – Branch and Bound – Non simultaneous arrivals –Dependent jobs – Sequence dependent set up times.

UNIT III PARALLEL MACHINE MODEL**9**

Minimizing make span: McNaughton's algorithm – Heuristic procedures – Minimizing Fw: H_1 & H_m heuristics – Hu's algorithm – Muntz Coffman algorithm.

UNIT IV FLOW SHOP MODEL**9**

Johnson's algorithm – Campbell Dudek Smith algorithm – Palmer's method – Mitten's algorithm – Ignall Schrage algorithm - Dispatch index heuristic.

UNIT V JOB SHOP MODEL**9**

Graphical representation – Jackson's algorithm – Semi-active schedule – Active schedule – Non delay schedule – Dispatching rules – Heuristic schedule generation.

PROGRESS THROUGH KNOWLEDGE**TOTAL: 45 PERIODS****OUTCOMES:**

Students will be able to :

CO1 : Understand the basic scheduling concepts

CO2 : Effectively gain knowledge on single machine model concepts

CO3 : Analyze parallel machine model concepts in scheduling

CO4 : Understand the flow shop model concepts and algorithms

CO5 : Gain knowledge on job shop modeling concepts

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓									
CO2	✓	✓	✓	✓								
CO3	✓	✓	✓	✓								
CO4	✓	✓	✓	✓								
CO5	✓	✓	✓	✓								

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.

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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, transshipment, 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 uncertainty.

UNIT – V SUPPLY CHAIN 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.

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.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11
CO1					✓						
CO2		✓									
CO3		✓	✓				✓	✓			
CO4					✓						✓
CO5					✓						✓

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.

IL5078

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓				✓	✓				
CO2	✓	✓	✓				✓	✓				Attested
CO3	✓	✓	✓				✓	✓				
CO4	✓	✓	✓				✓	✓				
CO5	✓	✓	✓				✓	✓				Attested

REFERENCES:

1. Alan Rushton, Phil Croucher 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,.

0.3- Low

0.6- Medium

0.9- High

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.3	0.6	0.6	0.3								0.3	0.6	0.3	
2	0.6	0.6	0.6	0.3								0.3	0.6	0.3	
3	0.6	0.3	0.6	0.3								0.3	0.6	0.3	0.3
4	0.3	0.3	0.9	0.3								0.3	0.6	0.3	
5	0.3	0.3	0.3	0.3								0.3	0.6	0.3	0.3

PD5351

PRODUCT LIFE CYCLE MANAGEMENT

L T P C
3 0 0 3

COURSE OBJECTIVES

1. To study about the history, concepts and terminology in PLM
2. To understand the functions and features of PLM/PDM
3. To understand different modules offered in commercial PLM/PDM tools
4. To demonstrate PLM/PDM approaches for industrial applications
5. To Use PLM/PDM with legacy data bases, CAx & ERP systems

UNIT-I HISTORY, CONCEPTS AND TERMINOLOGY OF PLM

9

Introduction to PLM, Need for PLM, opportunities of PLM, Different views of PLM - Engineering Data Management (EDM), Product Data Management (PDM), Collaborative Product Definition Management (cPDM), Collaborative Product Commerce (CPC), Product Lifecycle Management (PLM). PLM/PDM Infrastructure – Network and Communications, Data Management, Heterogeneous data sources and applications

UNIT-II PLM/PDM FUNCTIONS AND FEATURES

9

User Functions – Data Vault and Document Management, Workflow and Process Management, Product Structure Management, Product Classification and Programme Management. Utility Functions – Communication and Notification, data transport, data translation, image services, system administration and application integration

UNIT-III DETAILS OF MODULES IN A PDM/PLM SOFTWARE

9

Case studies based on top few commercial PLM/PDM tools – Teamcenter, Windchill, ENOVIA, Aras PLM, SAP PLM, Arena, Oracle Agile PLM and Autodesk Vault.

UNIT-IV ROLE OF PLM IN INDUSTRIES

9

Case studies on PLM selection and implementation (like auto, aero, electronic) - other possible sectors, PLM visioning, PLM strategy, PLM feasibility study, change management for PLM, financial justification of PLM, barriers to PLM implementation, ten step approach to PLM, benefits of PLM for-business, organisation, users, product or service, process performance

UNIT-V BASICS ON CUSTOMISATION/INTEGRATION OF PDM/PLM SOFTWARE

9

PLM Customization, use of EAI technology (Middleware), Integration with legacy data base, CAD, SLM and ERP

TOTAL = 45 PERIODS

OUTCOMES:

On Completion of the course the student will be able to

1. Summarize the history, concepts and terminology of PLM
2. Use the functions and features of PLM/PDM
3. Use different modules offered in commercial PLM/PDM tools.
4. Implement PLM/PDM approaches for industrial applications.
5. Integrate PLM/PDM with legacy data bases, CAx& ERP systems

REFERENCES:

1. AnttiSaaksvuori and Anselmilmonen, "Product Lifecycle Management", Springer Publisher, 2008 (3rd Edition)
2. IvicaCrnkovic, Ulf Asklund and Annita Persson Dahlqvist, "Implementing and Integrating Product Data Management and Software Configuration Management", Artech House Publishers, 2003.
3. John Stark, "Global Product: Strategy, Product Lifecycle Management and the Billion Customer Question", Springer Publisher, 2007
4. John Stark, "Product Lifecycle Management: 21st Century Paradigm for Product Realisation", Springer Publisher, 2011 (2nd Edition).
5. Michael Grieves, "Product Life Cycle Management", Tata McGraw Hill, 2006.

0.3- Low

0.6- Medium

0.9- High

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.3	0.6	0.6	0.3								0.3	0.6	0.3	
2	0.6	0.6	0.6	0.3								0.3	0.6	0.3	
3	0.6	0.3	0.6	0.3								0.3	0.6	0.3	0.3
4	0.3	0.3	0.9	0.3								0.3	0.6	0.3	
5	0.3	0.3	0.3	0.3								0.3	0.6	0.3	0.3

IL5081

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.

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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.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			✓		✓			✓	✓			
CO2		✓	✓		✓				✓		✓	✓
CO3					✓	✓					✓	
CO4					✓						✓	
CO5						✓	✓					✓

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. Panneer selvam .R, Senthil Kumar .P, Project Management, PHI, 2009

IL5083 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 –Service classification , 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.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓	✓	✓	✓								
CO3	✓	✓	✓	✓								
CO4	✓	✓	✓	✓								
CO5	✓	✓	✓	✓								

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

QE5008**MODERN MANUFACTURING MANAGEMENT CONCEPTS****L T P C
3 0 0 3****OBJECTIVES:**

- Develop basic knowledge on lean manufacturing concepts.
- Inculcate knowledge in agile manufacturing principles.
- Solve and analyze various concepts in sustainable manufacturing.
- Teach the tools and techniques used in sustainable manufacturing.
- Articulate knowledge about the design, principles and challenges in industry 4.0

UNIT I LEAN MANUFACTURING**9**

Introduction to Lean Manufacturing, Comparison of Mass Manufacturing and Lean Manufacturing, Lean Principles, Types of Wastes –Types of activities –Examples - Tools of Lean Manufacturing- Principle, Procedural - Lean rules - Implementation for lean systems- Leanness assessment – Indicators, methods.

UNIT II AGILE MANUFACTURING**9**

Fundamentals of Agile Manufacturing, Agile Principles, Conceptual models, Product Development Strategies for agility, Developing the agile enterprise, Managing People in agile organizations ,Strategic approach to agile manufacturing, Information Technology applications in Agile Manufacturing, Assessment of agility - Activity Based Costing - Case studies .

UNIT III SUSTAINABLE MANUFACTURING**9**

Concepts of sustainability and sustainable development – Need for sustainable development - Components of sustainability- Social, Economic, Environmental dimensions - Linkages between technology and sustainability - Sustainable Manufacturing –Scope, Need and Benefits.

UNIT IV TOOLS AND TECHNIQUES OF SUSTAINABLE MANUFACTURING**9**

Tools and Techniques of Sustainable Manufacturing – Environmental Conscious Quality Function Deployment, Life cycle assessment, Design for Environment, R3 and R6 cycles, Design for Disassembly - Sustainable Product Development Phases. Frameworks for measuring sustainability- Indicators of sustainability – Environmental, Economic, Societal and Business indicators - Concept Models and Various Approaches, Product Sustainability and Risk/Benefit assessment.

UNIT V INDUSTRY 4.0:**9**

Definition, Design, Principles, Challenges

TOTAL : 45 PERIODS**OUTCOMES:**

Students should be able to

CO1 – Understand the basic philosophies of lean manufacturing concepts

CO2 – Effectively gain knowledge in agile manufacturing principles

CO3 – Apply and analyze various concepts in sustainable manufacturing

CO4 – Understand the tools and techniques used in sustainable manufacturing

CO5 – Gain knowledge about the design, principles and challenges in Industry 4.0

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓	✓		✓							
CO2		✓	✓		✓							
CO3		✓	✓		✓							
CO4		✓	✓	✓	✓							
CO5		✓	✓		✓							

REFERENCES:

1. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things 1st Edition, Apress, 2016
2. Asefa S., "The Economics of Sustainable Development", W.E. Upjohn Institute for Employment Research, 2005.
3. Atkinson G., Dietz S., Neumayer E., — "Handbook of Sustainable Manufacturing". Edward Elgar Publishing Limited, 2007.
4. Lawn P., "Sustainable Development Indicators in Ecological Economics", Edward Elgar Publishing Limited.
5. Rodick, D. "Industrial Development for the 21st Century: Sustainable Development Perspectives", UN New York, 2007.

QE5072**MATERIALS MANAGEMENT****L T P C
3 0 0 3****OBJECTIVES:**

- Impart knowledge on basic concepts of aggregate planning, manufacturing planning and enterprise resource planning.
- Pivot foundation in material planning concepts.
- Articulate knowledge on inventory management models.
- Educate the purchasing techniques and concepts.
- Exposure on warehouse management activities.

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UNIT I INTRODUCTION 9

Operating environment-aggregate planning-role, need, strategies, costs techniques, approaches master scheduling-manufacturing planning and control system-manufacturing resource planning enterprise resource planning-making the production plan.

UNIT II MATERIALS PLANNING 9

Materials requirements planning-bill of materials-resource requirement planning-manufacturing resource planning-capacity management-scheduling orders-production activity control-codification.

UNIT III INVENTORY MANAGEMENT 9

Policy Decisions-objectives-control -Retail Discounting Model, Newsvendor Model; EOQ and EBQ models for uniform and variable demand With and without shortages -Quantity discount models. Probabilistic inventory models.

UNIT IV PURCHASING MANAGEMENT 9

Establishing specifications-selecting suppliers-price determination-forward buying-mixed buying strategy-price forecasting-buying seasonal commodities-purchasing under uncertainty-demand - price forecasting-purchasing under uncertainty-purchasing of capital equipment, international purchasing

UNIT V WAREHOUSE MANAGEMENT 9

Warehousing functions – types - Stores management-stores systems and procedures-incoming materials control-stores accounting and stock verification-Obsolete, surplus and scrap-value analysis-material handling-transportation and traffic management -operational efficiency productivity-cost effectiveness-performance measurement

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to:

- CO1 : Understand the basic concepts of aggregate planning, manufacturing planning and enterprise resource planning
- CO2 : Effectively gain knowledge of materials planning concepts
- CO3 : Design and analyze inventory management models
- CO4 : Effectively understand the purchasing techniques and concepts
- CO5 : Gain knowledge on warehouse management activities

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓										
CO2		✓	✓									
CO3		✓	✓	✓	✓							
CO4		✓	✓	✓	✓	✓						
CO5		✓	✓	✓		✓						

REFERENCES:

1. Ajay K Garg, Production and Operations Management, Tata McGraw Hill , 2012
2. A.K.Chitale and R.C.Gupta, Materials Management, Text and Cases, PHI Learning, 2nd Edition, 2006
3. A.K.Datla, Materials Management, Procedure, Text and Cases, PHI Learning, 2nd Edition, 2006
4. ARonald H. Ballou and Samir K. Srivastava, Business Logistics and Supply Chain Management, Pearson education,Fifth Edition.
5. J.R.Tony Arnold, Stephen N. Chapman, Lloyd M. Clive, Materials Management, Pearson, 2012.

QE5071 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

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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 MAINTENANCE QUALITY

9

Five zero concept – FMEA- FMECA – Root cause analysis – Repair time distribution – Analysis of
downtime – Maintainability prediction – Design for maintainability – Reliability Centered Maintenance.

UNIT IV MAINTENANCE MANAGEMENT

9

Human factors – Maintenance staffing - Learning curves – Simulation – Optimal size of service facility –
Optimal repair effort – Spare parts management – Maintenance planning – Maintenance
scheduling.

UNIT V TOTAL PRODUCTIVE MAINTENANCE

9

TPM philosophy – Chronic and sporadic losses – Equipment defects – Six major losses – Overall
equipment effectiveness – TPM pillars – Autonomous maintenance.

TOTAL: 45 PERIODS

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓	✓	✓									
CO3	✓	✓	✓									
CO4	✓										✓	
CO5	✓										✓	

REFERENCES:

1. Andrew K.S.Jardine & Albert H.C. Tsang, "Maintenance, Replacement and Reliability" Taylor and Francis, 2006.
2. Bikas Badhury & Basu S K, "Tero Technology: Reliability Engineering and Maintenance Management", Asian Books, 2003.
3. Mishra R C and Pathak K., "Maintenance Engineering and Management", PHI, 2012
Seichi Nakajima, "Total Productive Maintenance", Productivity Press, 1993.

IL5075

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.

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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 APPRAISA LAND 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.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓										
CO2				✓								
CO3					✓							
CO4							✓					
CO5							✓				✓	

REFERENCES:

1. John. V. Grimaldi and Rollin. H Simonds, "Safety Managenent", 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.

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OBJECTIVES:

- Explain the basic principles in facilities planning and plant location
- Interpret the basic principles in facility layout design decisions through proper analysis.
- Illustrate and explain various techniques while designing a layout
- Impart knowledge in line balancing concepts to implement improved system
- Summarize the basic principles in designing, measuring and analyzing material flow to improve the efficiency of the system

UNIT I PLANT LOCATION 9

Plant location analysis – factors, costs, location decisions – Single facility location models, Multi facility location models - Mini-sum model - Mini-max model - Gravity location models, Brown & Gibbs model

UNIT II FACILITIES LAYOUT 9

Facilities requirement, need for layout study – types of layout, Systematic layout planning, Relationship diagram, Designing the product layout – Line balancing - mixed model assembly line balancing

UNIT III LAYOUT DESIGN 9

Designing the process layout - computerized layout planning procedure – ALDEP, CORELAP, CRAFT – Trends in computerized layout

UNIT IV GROUP TECHNOLOGY 9

Group technology – OPTIZ classification system - Production Flow analysis (PFA), ROC (Rank Order Clustering)

UNIT V MATERIALS HANDLING 9

Principles, unit load concept, material handling system design, handling equipment types, selection and specification, containers and packaging.

TOTAL: 45 PERIODS**OUTCOMES:**

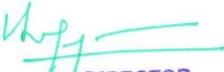
- CO1 : apply and evaluate appropriate location models for various facility types
 CO2 : effectively design and analyze various facility layouts
 CO3 : apply and analyze various computerized techniques while designing a layout
 CO4 : effectively design and analyze a layout using grouping techniques
 CO5 : implement smooth and cost effective system in the material handling process

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓	✓		✓							
CO2		✓	✓									
CO3			✓		✓	✓					✓	
CO4					✓						✓	
CO5			✓									✓

REFERENCES:

1. James Apple, M.Plant layout and “Material Handling”, John Wiley, 1977.
2. Pannerseivam,R, “Production and Operations Management”, PHI,2017
3. Richard Francis.L. and John A.White, “Facilities Layout and location - an analytical approach”, PHI., 2002
4. Tompkins, J.A. and J.A.White, “Facilities planning”, John Wiley, 2010.

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OPEN ELECTIVE COURSES (OEC)

OE5091

BUSINESS DATA ANALYTICS

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.

UNIT I OVERVIEW OF BUSINESS ANALYTICS

9

Introduction – Drivers for Business Analytics – Applications of Business Analytics: Marketing and Sales, Human Resource, Healthcare, Product Design, Service Design, Customer Service and Support – Skills Required for a Business Analyst – Framework for Business Analytics Life Cycle for Business Analytics Process.

Suggested Activities:

- Case studies on applications involving business analytics.
- Converting real time decision making problems into hypothesis.
- Group discussion on entrepreneurial opportunities in Business Analytics.

Suggested Evaluation Methods:

- Assignment on business scenario and business analytical life cycle process.
- Group presentation on big data applications with societal need.
- Quiz on case studies.

UNIT II ESSENTIALS OF BUSINESS ANALYTICS

9

Descriptive Statistics – Using Data – Types of Data – Data Distribution Metrics: Frequency, Mean, Median, Mode, Range, Variance, Standard Deviation, Percentile, Quartile, z-Score, Covariance, Correlation – Data Visualization: Tables, Charts, Line Charts, Bar and Column Chart, Bubble Chart, Heat Map – Data Dashboards.

Suggested Activities:

- Solve numerical problems on basic statistics.
- Explore chart wizard in MS Excel Case using sample real time data for data visualization.
- Use R tool for data visualization.

Suggested Evaluation Methods:

- Assignment on descriptive analytics using benchmark data.
- Quiz on data visualization for univariate, bivariate data.

UNIT III MODELING UNCERTAINTY AND STATISTICAL INFERENCE

9

Modeling Uncertainty: Events and Probabilities – Conditional Probability – Random Variables – Discrete Probability Distributions – Continuous Probability Distribution – Statistical Inference: Data Sampling – Selecting a Sample – Point Estimation – Sampling Distributions – Interval Estimation – Hypothesis Testing.

Suggested Activities:

- Solving numerical problems in sampling, probability, probability distributions and hypothesis testing.
- Converting real time decision making problems into hypothesis.

Suggested Evaluation Methods:

- Assignments on hypothesis testing.
- Group presentation on real time applications involving data sampling and hypothesis testing.
- Quizzes on topics like sampling and probability.

UNIT IV ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK

9

Introducing Hadoop – RDBMS versus Hadoop – Hadoop Overview – HDFS (Hadoop Distributed File System) – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – Algorithms Using Map-Reduce: Matrix-Vector Multiplication, Relational Algebra Operations, Grouping and Aggregation – Extensions to MapReduce.

Suggested Activities:

- Practical – Install and configure Hadoop.
- Practical – Use web based tools to monitor Hadoop setup.
- Practical – Design and develop MapReduce tasks for word count, searching involving text corpus etc.

Suggested Evaluation Methods:

- Evaluation of the practical implementations.
- Quizzes on topics like HDFS and extensions to MapReduce.

UNIT V OTHER DATA ANALYTICAL FRAMEWORKS

9

Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

Suggested Activities:

- Practical – Installation of NoSQL database like MongoDB.
- Practical – Demonstration on Sharding in MongoDB.
- Practical – Install and run Pig
- Practical – Write PigLatin scripts to sort, group, join, project, and filter data.
- Design and develop algorithms to be executed in MapReduce involving numerical methods for analytics.

Suggested Evaluation Methods:

- Mini Project (Group) – Real time data collection, saving in NoSQL, implement analytical techniques using Map-Reduce Tasks and Result Projection.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student will be able to:

- Identify the real world business problems and model with analytical solutions.
- Solve analytical problem with relevant mathematics background knowledge.
- Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
- Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce
- Use open source frameworks for modeling and storing data.
- Apply suitable visualization technique using R for visualizing voluminous data.

REFERENCES:

1. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing, 2013.
2. Umesh R Hodeghatta, Umesha Nayak, "Business Analytics Using R – A Practical Approach", Apress, 2017.
3. Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
4. Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, "Essentials of Business Analytics", Cengage Learning, second Edition, 2016.
5. U. Dinesh Kumar, "Business Analytics: The Science of Data-Driven Decision Making", Wiley, 2017.
6. A. Ohri, "R for Business Analytics", Springer, 2012
7. Rui Miguel Forte, "Mastering Predictive Analytics with R", Packt Publication, 2015.

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COURSE OBJECTIVES:

- Summarize basics of industrial safety
- Describe fundamentals of maintenance engineering
- Explain wear and corrosion
- Illustrate fault tracing
- Identify preventive and periodic maintenance

UNIT I INTRODUCTION**9**

Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT II FUNDAMENTALS OF MAINTENANCE ENGINEERING**9**

Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT III WEAR AND CORROSION AND THEIR PREVENTION**9**

Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT IV FAULT TRACING**9**

Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V PERIODIC AND PREVENTIVE MAINTENANCE**9**

Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

CO1: Ability to summarize basics of industrial safety

CO2: Ability to describe fundamentals of maintenance engineering

CO3: Ability to explain wear and corrosion

CO4: Ability to illustrate fault tracing

CO5: Ability to identify preventive and periodic maintenance

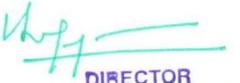
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓											
CO3	✓	✓	✓									
CO4	✓	✓	✓									
CO5	✓	✓	✓									

REFERENCES:

1. Audels, Pump-hydraulic Compressors, Mcgrew Hill Publication, 1978.
2. Garg H P, Maintenance Engineering, S. Chand and Company, 1987.
3. Hans F. Winterkorn, Foundation Engineering Handbook, Chapman & Hall London, 2013.
4. Higgins & Morrow, Maintenance Engineering Handbook, Eighth Edition, 2008



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COURSE OBJECTIVES:

- Solve linear programming problem and solve using graphical method.
- Solve LPP using simplex method
- Solve transportation , assignment problems
- Solve project management problems
- Solve scheduling problems

UNIT I LINEAR PROGRAMMING**9**

Introduction to Operations Research – assumptions of linear programming problems - Formulations of linear programming problem – Graphical method

UNIT II ADVANCES IN LINEAR PROGRAMMING**9**

Solutions to LPP using simplex algorithm- Revised simplex method - primal dual relationships – Dual simplex algorithm - Sensitivity analysis

UNIT III NETWORK ANALYSIS – I**9**

Transportation problems -Northwest corner rule, least cost method, Voges's approximation method - Assignment problem -Hungarian algorithm

UNIT IV NETWORK ANALYSIS – II**9**

Shortest path problem: Dijkstra's algorithms, Floyds algorithm, systematic method -CPM/PERT

UNIT V NETWORK ANALYSIS – III**9**

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

CO1: To formulate linear programming problem and solve using graphical method.

CO2: To solve LPP using simplex method

CO3: To formulate and solve transportation, assignment problems

CO4: To solve project management problems

CO5: To solve scheduling problems

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓											
CO3	✓	✓	✓									
CO4	✓	✓	✓									
CO5	✓	✓	✓									

REFERENCES:

1. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010
2. Hitler Libermann, Operations Research: McGraw Hill Pub. 2009
3. Pant J C, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Pannerselvam, Operations Research: Prentice Hall of India 2010
5. Taha H A, Operations Research, An Introduction, PHI, 2008

COURSE OBJECTIVES:

- Summarize the costing concepts and their role in decision making
- Infer the project management concepts and their various aspects in selection
- Interpret costing concepts with project execution

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- Develop knowledge of costing techniques in service sector and various budgetary control techniques
- Illustrate with quantitative techniques in cost management

UNIT I INTRODUCTION TO COSTING CONCEPTS 9

Objectives of a Costing System; Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost; Creation of a Database for operational control.

UNIT II INTRODUCTION TO PROJECT MANAGEMENT 9

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents, Project team: Role of each member, Importance Project site: Data required with significance, Project contracts.

UNIT III PROJECT EXECUTION AND COSTING CONCEPTS 9

Project execution Project cost control, Bar charts and Network diagram, Project commissioning: mechanical and process, Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Pricing strategies: Pareto Analysis, Target costing, Life Cycle Costing.

UNIT IV COSTING OF SERVICE SECTOR AND BUDGETERY CONTROL 9

Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis, Budgetary Control: Flexible Budgets; Performance budgets; Zero-based budgets.

UNIT V QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT 9

Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Learning Curve Theory.

TOTAL: 45 PERIODS

OUTCOMES

- CO1 – Understand the costing concepts and their role in decision making
- CO2–Understand the project management concepts and their various aspects in selection
- CO3–Interpret costing concepts with project execution
- CO4–Gain knowledge of costing techniques in service sector and various budgetary control techniques
- CO5 - Become familiar with quantitative techniques in cost management

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓			✓	✓		✓	✓
CO2	✓	✓	✓		✓				✓		✓	✓
CO3	✓	✓	✓		✓	✓					✓	✓
CO4	✓	✓	✓		✓		✓				✓	✓
CO5	✓	✓	✓		✓	✓	✓				✓	✓

REFERENCES:

1. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher, 1991
2. Charles T. Horngren and George Foster, Advanced Management Accounting, 1988
3. Charles T. Horngren et al Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi, 2011
4. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting, 2003
5. Vohra N.D., Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd, 2007

OE5095

COMPOSITE MATERIALS

L T P C
3 0 0 3

Attested

COURSE OBJECTIVES:

- Summarize the characteristics of composite materials and effect of reinforcement in composite materials.

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- Identify the various reinforcements used in composite materials.
- Compare the manufacturing process of metal matrix composites.
- Understand the manufacturing processes of polymer matrix composites.
- Analyze the strength of composite materials.

UNIT I INTRODUCTION

9

Definition – Classification and characteristics of Composite materials - Advantages and application of composites - Functional requirements of reinforcement and matrix - Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II REINFORCEMENTS

9

Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers - Properties and applications of whiskers, particle reinforcements - Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures - Isostrain and Isostress conditions.

UNIT III MANUFACTURING OF METAL MATRIX COMPOSITES

9

Casting – Solid State diffusion technique - Cladding – Hot isostatic pressing - Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving - Properties and applications.

UNIT IV MANUFACTURING OF POLYMER MATRIX COMPOSITES

9

Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding - Properties and applications.

UNIT V STRENGTH

9

Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- CO1 - Know the characteristics of composite materials and effect of reinforcement in composite materials.
- CO2 – Know the various reinforcements used in composite materials.
- CO3 – Understand the manufacturing processes of metal matrix composites.
- CO4 – Understand the manufacturing processes of polymer matrix composites.
- CO5 – Analyze the strength of composite materials.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		✓	✓	✓								
CO2		✓✓	✓	✓	✓						✓	
CO3			✓	✓	✓		✓				✓	
CO4			✓	✓	✓		✓				✓	
CO5				✓	✓		✓					

REFERENCES:

1. Cahn R.W. - Material Science and Technology – Vol 13 – Composites, VCH, West Germany.
2. Callister, W.D Jr., Adapted by Balasubramaniam R, Materials Science and Engineering, An introduction, John Wiley & Sons, NY, Indian edition, 2007.
3. Chawla K.K., Composite Materials, 2013.
4. Lubin.G, Hand Book of Composite Materials, 2013.

OE5096

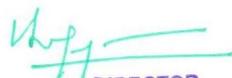
WASTE TO ENERGY

L T P C
3 0 0 3

COURSE OBJECTIVES:

- Interpret the various types of wastes from which energy can be generated
- Develop knowledge on biomass pyrolysis process and its applications
- Develop knowledge on various types of biomass gasifiers and their operations

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- Invent knowledge on biomass combustors and its applications on generating energy
- Summarize the principles of bio-energy systems and their features

UNIT I INTRODUCTION TO EXTRACTION OF ENERGY FROM WASTE 9
 Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT II BIOMASS PYROLYSIS 9
 Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT III BIOMASS GASIFICATION 9
 Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT IV BIOMASS COMBUSTION 9
 Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT V BIO ENERGY 9
 Properties of biogas (Calorific value and composition), Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production -Urban waste to energy conversion - Biomass energy programme in India.

TOTAL: 45 PERIODS

OUTCOMES:

- CO1 – Understand the various types of wastes from which energy can be generated
- CO2 – Gain knowledge on biomass pyrolysis process and its applications
- CO3 – Develop knowledge on various types of biomass gasifiers and their operations
- CO4 – Gain knowledge on biomass combustors and its applications on generating energy
- CO5 – Understand the principles of bio-energy systems and their features

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓		✓									✓
CO2	✓		✓									✓
CO3	✓	✓	✓		✓							✓
CO4	✓	✓	✓		✓		✓					✓
CO5	✓	✓	✓		✓							✓

REFERENCES:

1. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
2. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.

AUDIT COURSES (AC)

AX5091

ENGLISH FOR RESEARCH PAPER WRITING

L T P C
2 0 0 0

COURSE OBJECTIVES:

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section

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- 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

COURSE 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										✓		✓
CO2										✓		✓
CO3										✓		✓
CO4										✓		✓
CO5										✓		✓

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.

AX5092

DISASTER MANAGEMENT

L T P C
2 0 0 0

COURSE 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.

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- 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

COURSE 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓											
CO3	✓	✓	✓									
CO4	✓	✓	✓									
CO5	✓	✓	✓									

REFERENCES

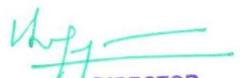
1. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "NewRoyal book Company,2007.
3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences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

AX5093

SANSKRIT FOR TECHNICAL KNOWLEDGE

COURSE OBJECTIVES:

Attested
L T P C
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- Illustrate the basic sanskrit language.
- Recognize sanskrit, the scientific language in the world.
- Appraise learning of sanskrit to improve brain functioning.
- Relate sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
- Extract huge knowledge from ancient literature.

UNIT I ALPHABETS 6
Alphabets in Sanskrit

UNIT II TENSES AND SENTENCES 6
Past/Present/Future Tense - Simple Sentences

UNIT III ORDER AND ROOTS 6
Order - Introduction of roots

UNIT IV SANSKRIT LITERATURE 6
Technical information about Sanskrit Literature

UNIT V TECHNICAL CONCEPTS OF ENGINEERING 6
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- CO1 - Understanding basic Sanskrit language.
- CO2 - Write sentences.
- CO3 - Know the order and roots of Sanskrit.
- CO4 - Know about technical information about Sanskrit literature.
- CO5 - Understand the technical concepts of Engineering.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										✓		✓
CO2										✓		✓
CO3												✓
CO4												✓
CO5												✓

REFERENCES

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi, 2017.

AX5094

VALUE EDUCATION

L T P C
2 0 0 0

COURSE OBJECTIVES:

Students will be able to

- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character

UNIT I

Values and self-development–Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non-moral valuation. Standards and principles. Value judgements

Attested

UNIT II

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature,

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Discipline

UNIT III

Personality and Behavior Development-Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brother hood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT IV

Character and Competence–Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Students will be able to

- Knowledge of self-development.
- Learn the importance of Human values.
- Developing the overall personality.

Suggested reading

1. Chakroborty, S.K.“Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

AX5095

CONSTITUTION OF INDIA

L T P C
2 0 0 0

COURSE 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 Revolution in 1917 and 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

COURSE 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

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

AX5096

PEDAGOGY STUDIES

L T P C
2 0 0 0

COURSE OBJECTIVES

Students will be able to:

- Review existing evidence on there view topic to inform programme design and policy
- Making under taken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

UNIT I INTRODUCTION AND METHODOLOGY:

Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW

Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES

Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT

Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS

Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Students will be able to understand:

- What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

SUGGESTED READING

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31(2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36(3):361-379.
3. Akyeampong K (2003) Teacher training in Ghana-does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33(3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf

AX5097

STRESS MANAGEMENT BY YOGA

L T P C
2 0 0 0

COURSE OBJECTIVES

- To achieve overall health of body and mind
- To overcome stress

UNIT I

Definitions of Eight parts of yoga. (Ashtanga)

UNIT II

Yam and Niyam - Do's and Don't's in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.

UNIT III

Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects - Types of pranayam

TOTAL: 30 PERIODS

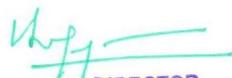
COURSE OUTCOMES

Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

SUGGESTED READING

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1. "Yogic Asanas for Group Training-Part-I":Janardan Swami Yoga bhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

AX5098

**PERSONALITY DEVELOPMENT THROUGH
LIFE ENLIGHTENMENT SKILLS**

**L T P C
2 0 0 0**

COURSE OBJECTIVES:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

UNIT I

Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (don't's) - Verses- 71,73,75,78 (do's)

UNIT II

Approach to day to day work and duties - Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.

UNIT III

Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 - Verses 13, 14, 15, 16,17, 18 - Personality of role model - shrimad bhagwad geeta - Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 30 PERIODS

COURSE OUTCOMES:

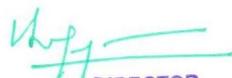
Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neet is hatakam will help in developing versatile personality of students.

SUGGESTED READING

1. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari's Three Satakam, Niti-sringar-vairagya, New Delhi,2010
2. Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram, Publication Department, Kolkata, 2016.

Attested


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