SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43013: OPERATIONS MANAGEMENT

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
04	-	-	04	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: Industrial Engineering and Ergonomics, Mathematics II

COURSE OUTCOMES:

Upon successful completion of the course the student should be able to:

CO1: To explain the key introductory concepts to production and operations management and recognize their applicability in day-to-day industry operations

CO2: To solve various mathematical/analytical models for plant location and layout problems, material handling facilities, production and planning control and demand forecasting, and design these facilities considering the real practices in industries

CO3: To solve for mathematical models and formulations in aggregate planning problems (APP), master production scheduling, scheduling and sequencing problems, and to design and develop the assembly line solving line balancing problems by applying conventional methods and heuristics algorithms

CO4: To explain the fundamental concepts of purchase, stores/warehousing and materials management and to solve different deterministic and probabilistic models of inventory control, and material requirement planning and capacity requirement planning

CO5: To recognize the core concepts of maintenance principles and strategies like total productive maintenance and condition monitoring of equipment and to devise the solutions the problems related to individual and group replacement policies, and to develop the maintenance system considering the routine manufacturing operations

COURSE CONTENT:

UNIT 1. Production Management: Introduction, Systems Concept, Difference between Production & Operations management, Decisions, Organization, Objectives, and Historical review, Types of production system

UNIT 2. Facility Planning : Plant location, plant layout and Material Handling and facility design Procedures such as CORELAP, CRAFT etc. PPC, Functions, Make-Buy decision, Demand Forecasting Models – Single and Double Exponential Smoothing Models, Forecast Measures (MAD, MAPE, etc.)

UNIT 3. Aggregate Planning : Introduction, Strategies of aggregate planning, Graphic and Charting methods, Transportation and HMMS method master scheduling. Scheduling and Sequencing: Factors, Affecting scheduling and its approaches, Gantt Chart, Algorithms for job shop and flow shop, line balancing, LOB.

UNIT 4. Materials Management: Purchasing, Stores, Inventory models and selective inventory control and Just-In-Time Inventory System, Material requirement, Planning and capacity requirements planning, Introduction to MRP II.

UNIT 5. Maintenance Management: Types of maintenance strategies, Breakdown and Preventive Maintenance, Predictive and Total Productive Maintenance, Overall Equipment Efficiency (OEE), Condition Monitoring, Individual and Group Replacement Policies

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43013: OPERATIONS MANAGEMENT

ASSESSMENT:

Students will be assessed as following

(1) End Semester Exam: 70% weightage,

(2) Continuous assessment: 30% weightage (Two midterm tests: 67% weightage, assignment: 16.5% weightage, regularity 16.5% weightage)

TEXT BOOKS RECOMMENDED:

S.NO	BOOK	UNIT
1	Chase, R. B. Aquilano, N. J. Jacobs, F. R. Boston. Operations & Supply Management. 12th ed., McGraw-Hill/Irwin, Inc, 2009.	**1-5**
2	Chitale A .K. and Gupta R.C., Materials Management, PHI, India, 2007.	**1-5**
3	Agrawal G. K., Plant Layout and Material Handling, Jain Publication, India	**1-5**

REFERENCE BOOKS RECOMMENDED:

S.NO	BOOKS	UNIT
1	Gaither N. and Frezer G., Operations Management, 9th ed., Cengage Publication, India, 2009.	1-5

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43058: TOOL ENGINEERING AND DESIGN OF CUTTING TOOL

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	0	3	1	-	30	70	40	60	200

PRE-REQUISITE: NA

COURSE OUTCOMES:

Upon successful completion of the course the student will be able to:

CO1: To recognize the materials used, their properties and applicability and other aspects for various types of cutting tools, and to develop the capability to design these cutting tools based on different key considerations for diverse machining operations

CO2: To design and develop tools and tool dies for metal working processes based on their key design concepts and performing the design computations

C03: To demonstrate the ability to design tooling for forging and rolling operations in conformance to their design principles

CO4: To design jigs and fixtures for various machining operations considering their economics and other design aspects

CO5: To articulate the basic principles related to dies and mould design for polymer components depending on different molding processes

COURSE CONTENT:

UNIT 1. Tooling classification, material, properties and application, General design considerations. Design of single point cutting tool for strength & rigidity, Design for optimum geometry, Design strategies for H.S.S. Carbide and Ceramic, Chip Breakers, Design of form tool. Design of drill, and milling cutters

UNIT 2. Design of Metal Working Tools: Design of elements of press working tool dies and die set, concept of center of pressure, compound dies, progressive dies, Combination dies, bending, forming dies, press tonnage and its calculations.

UNIT 3. Tooling for forging and rolling – Design principles for forging dies, drop forging, upset forging, Design principles and practice for rolling, roll pass design.

UNIT 4. Design of Jig and Fixtures : Economics of jigs and fixture, principle of location and clamping, Drilling Bushes, Design of various jigs and fixtures, such as Drilling jig, milling fixture, Assembly fixture, Welding fixtures.

UNIT 5. Dies and Mould Design for Plastics and rubber Parts: Compression moulding, transfer molding, blow molding.

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43058: TOOL ENGINEERING AND DESIGN OF CUTTING TOOL

PRACTICALS:

LIST OF EXPERIMENTS:

1. Study of various locating devices
2. Study of various clamping devices
3. Study of tool guiding elements
4. Study of Drill jigs
5. Study of Milling fixture
6. To design a single point cutting tool for the turning of given bar
7. To design a drill jig for the given component
8. To design a form tool.

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43058: TOOL ENGINEERING AND DESIGN OF CUTTING TOOL

THEORY ASSESSMENT:

Students will be assessed as following

(1) End Semester Exam: 70% weightage,

(2) Continuous assessment: 30% weightage (Two midterm tests: 67% weightage, assignment: 16.5% weightage, regularity 16.5% weightage)

PRACTICAL ASSESSMENT:

(1) Sessional: 40% Weightage (Continuous assessment of experiments and lab manual 50% weightage, final viva 25% weightage, regularity 25% weightage.)

(2) End semester practical viva: 60% weightage

TEXT BOOKS RECOMMENDED:

S.NO	BOOK	UNIT
1	Machine Tools Handbook: Design and Operation, Prakash Hiralal Joshi, DME, AMIE (India)	**1-5**
2	Fundamentals of Tool Design, David Spitler, Jeff Lantrip, John Nee, David A Smith, Society of Manufacturing Engineers; 5th Edition	**1-5**

REFERENCE BOOKS RECOMMENDED:

S.NO	BOOKS	UNIT
1	Eery and Johnson, Process Engineering, Prentice Hall, NJ, USA	1-5

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43065: ERGONOMICS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
04	02	00	03	01	—	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Industrial Engineering

COURSE OUTCOMES:

After successful completion of this course students will be able to

CO1: To state preliminary concepts related to ergonomics and its applications towards the benefit of worker's performance and to define the key characteristics of man-machine interaction

CO2: To discuss the functional aspects of information reception and processing like coding, input selection, etc. based on the ergonomic considerations

CO3: To demonstrate the usage of different types of displays based on their working principles, functional aspects and selection parameters

CO4: To discuss the significance of bio-mechanics, human controls, anthropometry and other related aspects aimed at developing solutions for practical applicability in workplaces focused on substantial work system design

CO5: To develop the ability to impart industrial work culture, and a sense of environmental concern and industrial safety among the workers, and to distinguish proper workstation settings towards the creation of safe working conditions

COURSE CONTENT:

UNIT 1 .Introduction: Definition, History of Development, Characteristics of Man Machine Systems, Relative capabilities of Human beings and Machines

UNIT 2. Information Input and Processing: Introduction to information theory, Factors affecting information reception and processing. Coding and Selection of sensory inputs.
Human Sensory Process: Vision, Hearing, Cutaneous, Kinesthitics, and orientation senses.

UNIT 3.Display: Visual Display: Quantitative and qualitative types of visual display, Visual indicators and warning signals, pictorial and Graphic displays, Alphanumeric Characteristics, Symbolic Codes, Auditory and Textual Display: General Principles, Characteristics and Selection of Auditory and Textual display

UNIT 4.Human Motor Activities : Bio-mechanisms of motion, Measurement of Physiological Functions, Energy Expenditure in Physical Activities. Human Control of Systems: Human input and output channels. Compatibility, Tracking Operations, Design of Control Anthropometry: Anthropometrics Data and their uses, Work Space Dimensions. Design of seats and seating Arrangement, Location of components, Design of work place.

UNIT 5.Environment and Safety: Introduction to Environmental stresses and their impacts on human work. Industrial Safety: Analysis of cost of accidents, Hazards in various fields like Fire, Electrical shocks

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43065: ERGONOMICS

PRACTICALS:

LIST OF EXPERIMENTS:

1. Measurement of reaction time and movement time for a perceptual motion task in a reaction time apparatus. Separating the reaction time and movement time with MTM standards.
2. Establish reaction between heart rate of a person and rate of expenditure at work and rest pauses.
3. Study of sound level meter.
4. To measure the illuminance in the given working area to compare it with standard illuminations for the given type of work.
5. To observe EMG waveform generated by human muscle.
6. To Measure the Heart Rate / Pulse Rate of subject (Human body) in resting state.
7. To measure the Respiration-Rate of subject (Human body)

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43065: ERGONOMICS

THEORY ASSESSMENT:

Students will be assessed as following

(1) End Semester Exam: 70% weightage,

(2) Continuous assessment: 30% weightage (Two midterm tests: 67% weightage, assignment: 16.5% weightage, regularity 16.5% weightage).

PRACTICAL ASSESSMENT:

(1) Sessional: 40% Weightage (Continuous assessment of experiments and lab manual 50% weightage, final viva 25% weightage, regularity 25% weightage.)

(2) End semester practical viva: 60% weightage

TEXT BOOKS RECOMMENDED:

S.NO	BOOK	UNIT
1	McCormick, Human Factors in Engineering and Design, 7th Ed, ISBN-13: 978-0070549012, McGraw Hill NY, USA.	1,2
2	Singleton, Introduction to Ergonomics: World Health Organization, Geneva.	1-5

REFERENCE BOOKS:

S.NO	BOOK	UNIT
1	Grandjean, fitting task to the men, Tata McGraw Hill Co., New Delhi	1-5

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP43203: BUSINESS ANALYTICS (ELECTIVE - II)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
04	-	-	03	-	-	CW	END SEM	SW	END SEM	100
						30	70	_	_	

PRE-REQUISITES: Mathematics - I, Mathematics - II, Mathematics - III, Operations Research, Quality Control and Reliability Engineering

COURSE OUTCOMES:

This course is designed to equip the students with the advanced concepts of business/data analytics adhering to the existing industry requirements. The emphasis will be on the application of data processing and data analysis tools/techniques to facilitate firm and effective decision-making processes having emphasis on making effective predictions accurately, and providing the solution to complex industry/business problems.

CO1: To discuss the significance of dealing with, managing and analyzing large datasets towards providing the support to managerial decision-making processes employing the core principles of data analytics

CO2: To demonstrate the usage of various data mining and data reduction techniques for data organization and structuring of the crude datasets

CO3: To develop the ability to use and assess different descriptive and inferential statistical methods in data analysis and to evaluate predictive analytics techniques using large datasets for accurate predictions

CO4: To solve for mathematical/analytical models for developing the solutions to various advanced optimization modelling techniques

CO5: To explain the role of machine learning (ML) and artificial intelligence (AI) towards formulating the complex industry/business problems and giving their solutions

COURSE CONTENTS:

UNIT 1: Introduction, Scope, and Application: Introduction, Evolution, Trends, and Scope of Data Analytics (Descriptive, Diagnostic, Predictive and Prescriptive), Role and Scope of Data Science in Industry and Business Applications, Big Data Analytics – Conceptualization and Overview, Data Classification, Variable Types, Scale Classification, Application Areas of Data Analytics (Operations Analytics, Marketing Analytics, Healthcare Analytics, Product Analytics, Supply Chain Analytics, and HR Analytics)

UNIT 2: Data Mining and Data Reduction Techniques: Introduction to Data Mining Process, Multidimensional Data Analysis – Online Analytical Processing (OLAP), Association Analysis, Cluster Analysis, Data Mining Tools – XL Miner, Market Basket Analysis, Performance Matrix, Data Organization (Sources), Data Reduction Techniques, Dealing with Missing/Incomplete Dataset, Outliers, Data Partitioning, Factor Analysis, Principal Component Analysis (PCA), Confusion Matrix, K-Means Clustering, k-Nearest Neighbors (k-NN) Algorithm, Naïve Bias

UNIT 3: Descriptive and Inferential Analytics: Data Visualization Tools/Techniques – Data Charts and Graphs, Scatter Plots, Box Plots, and Heat Maps, Multidimensional Visualization, Measures of Location, Dispersion, and Shape, Descriptive Statistics for Grouped and Categorical Data, Statistical Inference, Review of z-, t-, and Chi-Square ($\chi 2$) Tests, ANOVA, Sampling, Hypothesis Testing, Confidence Intervals for Mean and Variance, Goodness of Fit

UNIT 4: Predictive Analytics: Time-series Models, Holt Walter Time-series Model with Seasonality, Types of Regression Models, Multicollinearity, Heteroscedasticity, Autocorrelation, Multiple Regression Analysis, Multiple Regression Modeling with Dummy Variable and Categorical Variable, Autoregressive Modeling, Logistic Regression, Curve Fitting

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE
Department of Industrial and Production Engineering
B.TECH IPE IV Year (4YDC)
IP43203: BUSINESS ANALYTICS (ELECTIVE - II)

UNIT 5: Prescriptive Analytics and Introduction to Machine Learning (ML): Optimality Testing, Model-building Tools (Modelling Characteristics, Excel Functions, Excel's 'Analysis ToolPak', etc.), Exploring Data and Spreadsheet Modelling, Monte-Carlo Simulation, Simulation Models for Risk Analysis, Network Optimization (Flow) Models, Decision Trees, Introductory Concepts to Machine Learning (ML), Classification and Regression Trees, Over Fitting, Pruning, Basic Concepts about Artificial Neural Networks (ANN), ANN Software(s), Artificial Intelligence (AI) – Evolution and Overview, Role of AI in Data Sciences

THEORY ASSESSEMENT:
Students' performance based on theory assessment will be evaluated as per these weightages:
1. End-semester Exam: 70% Weightage
2. Continuous Assessment: 30% Weightage (Two Mid-term Tests: 67% Weightage, Assignment: 16.5% Weightage, and Regularity: 16.5% Weightage)

TEXT READINGS:
1. Evans, J.R., (2019), Business Analytics – Methods, Models, and Decisions 2e, Pearson Education (Essex, UK)
2. Kimbrough, S.O., and Lau, H.C., (2016), Business Analytics for Decision Making, CRC Press – Taylor & Francis Group, LLC (Florida, US)
3. Gutierrez, D.D., (2015), Machine Learning and Data Science – An Introduction to Statistical Learning Methods with R, Technics Publications, LLC ((New Jersey, US)

REFERENCE/SUGGESTIVE READINGS:
1. Saltz, J.S., and Stanton, J.M., (2018), An Introduction to Data Science, Sage Publications (California, US)
2. Kumar, U.D., (2017), Business Analytics – The Science of Data-driven Decision Making, Wiley (New Delhi, India)
3. Min, H., (2016), Global Business Analytics Models – Concepts and Applications in Predictive, Healthcare, Supply Chain, and Finance Analytics, Pearson Education (Ohio, US)

SOURCE WEBLINKS TO ACCESS/DOWNLOAD COURSE SOFTWARE(S):
1. Data Visualization Tool: Access at http://www.tableausoftware.com/products/desktop/download
2. Excel Add-in: Access at www.solver.com/xlminer-data-mining
3. Data Mining Tool: Access at http://orange.biolab.si/
4. R-based Data Analysis Tool: Access at http://rattle.togaware.com/ (Open Source)
5. R-Programming/R-Studio: Access at these Source Weblinks:
   https://cran.r-project.org/bin/windows/base/
   https://cran.rproject.org/bin/windows/
   https://www.rstudio.com/products/rstudio/download/
   https://cran.r-project.org/bin/windows/Rtools/ (Open Sources)

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43282: PROJECT MANANAGEMENT (ELECTIVE-II)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	Tu	T	P	Tu	CW	END SEM	SW	END SEM	
04	-	-	3	-	-	30	70	_	_	100

PRE-REQUISITES: Mathematics - III, Engineering Economics and Financial Accounting

COURSE OUTCOMES:

After successful completion of this course students will be able to have:

CO1: To explain the introductory concepts related to selecting and managing the projects along with their feasibility assessments considering the cases of project execution in real practices and to define the role, skills and functions of a project manager

CO2: To solve various mathematical/analytical models for project monitoring and control and to demonstrate the ability to design and develop the network for project execution

CO3: To solve for various financial models towards budgeting and project feasibility and risk assessment and to use different types of analyses to validate these models focused on risk mitigation approaches

CO4: To define and cite the key concepts related to financial management and to solve for models incorporating financial ratio analysis towards the assessment of firms' overall financial status while handling and executing the projects with respect to time value of money

CO5: To develop the ability to solve for financial modelling problems adapting to real project execution practices using mathematical/analytical approaches

COURSE CONTENT:

UNIT 1 Project management and feasibility: Introduction to projects. Characteristics and types of projects, Gaining importance, Project selection, technical feasibility and technology selection, project life cycle, market feasibility, Social Cost Benefit Analysis, project manager's skills and functions, learning curves

UNIT 2 Project Monitoring and Control: Network analysis, construction of networks, CPM, various types of floats and their application, PERT and its applications. Time cost relationship, crashing for optimum cost and optimum time. Resource leveling. Earned Value Analysis,

UNIT 3 Feasibility and Risk Analysis: Time value of money, DCF and Non DCF Methods for Evaluating Projects. Types of risk, techniques of risk evaluation and its mitigation. Sensitivity analysis, Hiller's model, scenario analysis, simulation with numerical aspects

UNIT 4 Financial Management and Analysis: Concept, Nature, Scope, and Objective of Financial Management, Finance Functions, Sources of Finance. Liquidity, Activity, Profitability and Leverage Ratios. Interpretation of ratios.

UNIT 5 Capital structuring and Working capital management: Cost of Capital, Cost of Debt, Preference shares, Equity Shares, Weighted Average Cost of Capital. Working Capital: Concept, Need and Determinants. Computing working capital.

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43282: PROJECT MANANAGEMENT (ELECTIVE-II)

THEORY ASSESSMENT:

Students will be assessed as following

(1) End Semester Exam: 70% weightage,

(2) Continuous assessment: 30% weightage (Two midterm tests: 67% weightage, assignment: 16.5% weightage, regularity 16.5% weightage)

TEXT BOOKS RECOMMENDED:

S.NO	BOOK	UNIT
1	Chandra, Prasanna, "Projects, planning, analysis, selection, financing, implementation and review", New Delhi, Tata McGraw Hill	1,2
2	Pandey, I.M., "Financial Management", New Delhi: Vikas Publication House	4-5
3	Khan, M.Y., Jain, P.K., "Financial Management", Delhi: Tata McGraw Hill	4-5

REFERENCE/SUGGESTIVE READINGS:

S.NO	BOOK	UNIT
1	Gray, C.F., Larson, E.W., & Desai, G.V., Project Management: The Managerial Process, New York: McGraw-Hill/Irwin.	1-5
2	Schwalbe, K., Introduction to Project Management, Boston: Course Technology, Cengage Learning	1-5

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP 43377: TOTAL QUALITY MANAGEMENT (ELECTIVE – III)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	Tu	T	P	Tu	CW	END SEM	SW	END SEM	
04	00	00	03	-	-	30	70	-	-	100

PRE-REQUISITES: Industrial Engineering, Metrology and Industrial Inspection, and Quality Control and Reliability Engineering (QCRE)

COURSE OUTCOMES:

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

CO1: To explain the key preliminary concepts of TQM based on different perspectives and stakeholders' involvement

CO2: To recognize and describe the core principles and strategies in TQM like TQC, SPC, Fishbone Diagram, QFD, etc., and to develop the ability to use and integrate these TQM concepts/principles connecting to real practices in manufacturing as well as service sectors

CO3: To demonstrate the ability to identify and eliminate various wastes using the key principles/techniques and best practices in lean/world class manufacturing (LM/WCM) relating to the complexities involved in both the manufacturing and service firms

CO4: To make the contrast between push versus pull system of production citing practical applicability in industries, and to articulate the JIT principles addressing its implementation prospects

CO5: To define the applicability of TQM concepts and principles in service sector, and to recognize the significance of service quality and to correlate its applicability with the help of case studies in service sector

COURSE CONTENTS

UNIT 1: Evolution of Total Quality Management, Historical perspective. People involvement, Teamwork, Discipline, Supplier involvement, defining the immediate customer, Quality at Source, Various Quality Awards

UNIT 2: Elements of TQM: Total employee involvement, Elimination of Waste and problem exposure, Total Quality Control (TQC) Systems, SPC and ISO 9000, Demings wheel, Deming 14 points-Pros and Cons in Industrial Engineering context. Philip Crosby Philosophy, Ishikawa Diagram. Just-in-time philosophy, Design and Development strategy in TQM, Quality Function Development (QFD)

UNIT 3: Lean/World Class Manufacturing (LM/WCM) – Waste Elimination, Eight (8) Types of Wastes, Tools/Techniques in LM (Kaizen and Continuous Improvement, 5S, Visual Control, Kanban, VSM, Poka-Yoke, Andon, etc.), Toyota Production System (TPS), Total Productive maintenance (TPM)

UNIT 4: Just-in-time Management: Problems of queues, Tenets of JIT. Load smoothing, Push vs pull method of production, Set-up time reduction/Single Minute Exchange of Die (SMED)

UNIT 5: Applications of TQM to Service Type Organizations, Dimensions of Service Quality, SERVQUAL Model, Service Guarantee and Recovery, Case Studies on Application of TQM Principles to Service Type Organizations, Cost Benefit Analysis, Life Cycle Costing

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP 43377: TOTAL QUALITY MANAGEMENT (ELECTIVE – III)

THEORY ASSESSMENT

(1) End Semester Exam: 70% weightage.

(2) Continuous assessment: 30% weightage (Two midterm tests: 67% weightage, assignment: 16.5% weightage, regularity 16.5% weightage).

TEXT BOOKS RECOMMENDED:

S. No.	BOOKS	UNIT
1	D. D. Shanna, TQM, Sultanchand	1-5
2	Chitale and Jain, TQM & ISO -9000	1-5

REFERENCES RECOMMENDED:

S. No.	BOOKS	UNIT
1	Juran J M, Quality Planning and Analysis	1-5

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43614: PRODUCT MANAGEMENT (ELECTIVE – IV)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
04	-	-	03	-	_	30	70	-	-	100

PRE-REQUISITES: Industrial Engineering, Design of Machine Elements

COURSE OUTCOMES:

Upon successful completion of the course the student should be able to:

CO1: To recognize and define the fundamental and core introductory concepts to product design, and to relate these concepts with the design problems in real practices

CO2: To illustrate the concepts in design for X (DFX) – design for manufacturing (DFM), design for assembly (DFA), etc. and to relate to various considerations like aesthetics, ergonomics, etc., and to solve for robust and reliability-based design models

CO3: To explain various components and their functions of product design and development processes like value analysis, etc., and to describe the significance of IPR and other design regulations connecting to design problems and issues in reality

CO4: To define and illustrate the various concepts and strategies in marketing management related to product design from concept to customer over entire product lifecycle

CO5: To recognize the significance of marketing and pricing strategies and market research and to develop the ability for preparing a comprehensive plan for new product marketing starting with ideation to completion of the proposed marketing mix having the focus to solve consumer problems or other market issues

COURSE CONTENT:

UNIT 1. Product Design : Product specifications, concept development, configuration design involving synthesis, analysis and optimization, Detailed design, Presentation of design Oral and Visual presentations, various types of models used in product design, Design through creative routes, Adaptive and variant design, Concurrent Engineering.

UNIT 2. Design for manufacturing and Design for assembly, Role of Aesthetics and Ergonomics in design. Design for Environment. Robust Design using Taguchi methods, Reliability based design. Modular versus integral design.

UNIT 3. Value analysis-scope techniques and job plan, Standardization, Renard series, Simplification vis-a-vis Variety in products .Patents, copyright and Intellectual Property Rights.

UNIT 4. Marketing Management: Philosophies of Marketing, Market and Product strategies, BCG matrix, Portfolio management, Product Life Cycle, New Product development strategy.

UNIT 5. Marketing channels, Pricing strategies and Promotional strategies, Consumer behavior, Sales Management, Planning of sales, Sales skills, evaluation and promotion, Advertising methods, preparation of advertising briefs

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43614: PRODUCT MANAGEMENT (ELECTIVE – IV)

THEORY ASSESSMENT:

Students will be assessed as following

(1) End Semester Exam: 70% weightage,

(2) Continuous assessment: 30% weightage (Two midterm tests: 67% weightage, assignment: 16.5% weightage, regularity 16.5% weightage)

TEXT BOOKS RECOMMENDED:

S.NO	BOOK	UNIT
1	Gupta V., Lal G.K. and Reddy, Fundamentals of Design and manufacturing Narosa Publishing, New	**3**
2	Kolter, Philip, Marketing Management, PHI. New Delhi, India.	**4,5**

REFERENCE BOOKS RECOMMENDED:

S.NO	BOOK	UNIT
1	Chitale A. K. and Gupta R. C., Product Design and Manufacturing, PHI, New Delhi, India.	**1-5**
2	Dieter, Engineering Design, Marketing Management, PHI.	**1-5**
3	Stanton, Principles of Marketing, Prentice Hall.	**1-5**
4	James Garrat, Design & Technology, Cambridge University Press.	**1-5**

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP43XXX: ADDITIVE MANUFACTURING (ELECTIVE-IV)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
04	-	-	03	-	-	30	70	_	_	100

PRE-REQUISITES: Manufacturing Processes, Metal Cutting and CNC Machines, Materials Science and Metallurgy, Product Design, Rapid Prototyping

COURSE OBJECTIVES:

After successful completion of this course students will be able to have:

CO1: To discuss the significance of additive manufacturing processes, various additive manufacturing technologies, selection of suitable material, pre-processing and post processing of manufactured parts

CO2: To understand basic construction of different types of additive manufacturing machines, different systems like energy delivery, material delivery, nozzle and heating systems

CO3: To demonstrate the ability to design for additive manufacturing processes based on different design capabilities and considerations

CO4: To understand the concept and principles of rapid tooling, its requirements and applications

CO5: To explain the different applications of additive manufacturing parts from various fields like automobile, aerospace, bio-medical, etc.

COURSE CONTENTS:

Unit 1. Introduction to Additive Manufacturing (AM): Evolution of AM Processes, Comparison between AM Processes and CNC Machining, Benefits of AM, Construction of Basic AM machines, AM Machine Set-up

Unit 2. AM Processes: Classification of AM Processes, Liquid Polymer System (LPS), Discrete Particle System (DPS), Powder Qualities, Molten Material Systems (MMS), Solid Sheet System (SSS), AM Process Chain – Conceptualization, CAD, Conversion to Stereolithography (STL), Transfer to AM, STL File Manipulation, Build, Removal and Clean-up, and Post-processing

Unit 3. Design for AM Processes: Motivation behind Design for AM Processes, Design for Manufacturing and Assembly – Concepts and Objectives, AM Unique Capabilities, Exploring Design Freedoms, Design Tools for AM Processes, Part Orientation, Removal of Supports, Hollowing out Parts, Inclusion of Undercuts and Other Manufacturing Constraining Features, Interlocking Features, Reduction of Part Count in an Assembly, Identification of Markings/Numbers

Unit 4. Guidelines for Process Selection and Post-processing: Selection Methods for a Part, Challenges towards Process Selection, Example System for Preliminary Selection, Production Planning And Control for AM, Post-processing of AM Parts – Support Material Removal, Surface Texture Improvement, Accuracy Improvement, Aesthetic Improvement, Preparation for Use as a Pattern, and Property Enhancements employing Non-Thermal and Thermal Techniques

Unit 5. Rapid Tooling and AM Applications: Introduction Concepts about Rapid Tooling, New Materials Development, Bi-Metallic Parts, Re-Manufacturing, AM Applications in Various Industry Domains – Aerospace, Defense, Automotive, Bio-Medical and General Engineering, Functional Models, Patterns for Investment and Vacuum Casting, Medical Models, Art Models, Engineering Analysis Models

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP43XXX: ADDITIVE MANUFACTURING (ELECTIVE-IV)

THEORY ASSESSMENT:

Students will be assessed as following

(1) End Semester Exam: 70% weightage,

(2) Continuous assessment: 30% weightage (Two midterm tests: 67% weightage, assignment: 16.5% weightage, regularity 16.5% weightage)

TEXT READINGS:

1. Chua, C.K., Leong, K.F., and Lim, C.S., (2010), *Rapid Prototyping: Principles and Applications*, World Scientific Publishing Company
2. Killi, S.W., (2017), *Additive Manufacturing: Design, Methods, and Processes*, CRC Press
3. Milewski, J.O., (2017), Additive Manufacturing of Metals, 258, Springer (Cham, Switzerland)

REFERENCE/SUGGESTIVE READINGS:

1. Gibson, I., Rosen, D.W., Stucker, B., Khorasani, M., Rosen, D., Stucker, B., and Khorasani, M., (2021), *Additive Manufacturing Technologies*, 17, Springer (Cham, Switzerland)
2. Pham, D., and Dimov, S.S., (2012), *Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling*, Springer
3. Gebhardt, A., and Hötter, J.S., (2016), *Additive Manufacturing: 3D Printing for Prototyping and Manufacturing*, Carl Hanser Verlag GmbH Co KG.

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP43612: SIX SIGMA (ELECTIVE - V)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
04	-	-	03	-	-	30	70	_	_	100

PRE-REQUISITES: Mathematics-III, Quality Control and Reliability Engineering, Operations Management

COURSE OUTCOMES:

CO1: To state the core concept of six sigma basics and its principles and the significance of six sigma process in the day-to-day industry and service operations

CO2: To solve for the various mathematical/statistical/analytical models aimed at execution and assessment of the six sigma process under different conditions

CO3: To develop the ability to design implementation methodologies for six sigma projects facilitated by process measurement, analysis, improvement and control with the use of different tools/techniques required for six sigma execution

CO4: To demonstrate the key execution capabilities for six sigma deployment in both manufacturing as well as service firms incorporating the detailed procedure followed by validating the implementation of six sigma projects

CO5: To get well-acquainted with the best and modern-day practices, training module, and certifications of six sigma execution addressing the world class applications and cases

COURSE CONTENT:

UNIT-1. Introductory Concepts: Core Conceptualization of Six Sigma, Building the Foundation for Six Sigma, Setting Priorities for Six Sigma, Relevance of Six Sigma in Quality Engineering, Review of Preliminary Concepts in Probability and Statistics, Inferential Statistics, Testing of Hypotheses, Process Capability and Sigma Level, Principles of Six Sigma, Mapping the Current Process

UNIT-2: Procedural Techniques for Six Sigma Execution: Non-Parametric Tests, ANOVA, Design of Experiments (DOE), Evolutionary Operations Methodology (EVOP), Fractional, Full and Orthogonal Experiments, Regression Model Building, Optimizing the Process – Response Surface Method (RSM) and Response Surface Designs, Taguchi Methods for Robust Design

UNIT-3: Methodologies adopted for Six Sigma Execution: The Process behind Six Sigma,DMAIC and DMADV Methodologies, Organizing for Six Sigma Projects, Criteria for Six Sigma Project Selection, Process Measurement, Process Metrics, Tools and Techniques for Process Analysis and Improvement – Value Stream Mapping (VSM), Kaizen Blitz, Poka-Yoke, etc., Statistical Process Control (SPC), SPC Metrics, Run Charts, Controlling Six Sigma Processes

UNIT-4: Execution of Six Sigma Implementation: Design for Six Sigma (DFSS), Process Design and Re-design for Six Sigma, Principles for Six Sigma Execution, Detailed Procedure for Six Sigma Implementation, Reliability Prediction in DFSS, Simulation in DFSS, Process Simulation, Design Verification for Six Sigma Process, The DFSS Toolkit

UNIT-5: Advanced Concepts and Real-life Based Applications: Integrating Six Sigma with Lean Concept, Managing Change – Leadership and Teams, Integration between Six Sigma and Knowledge Management, Future Prospects of Six Sigma, Six Sigma Sustainability, Training Module for Six Sigma, Six Sigma Certifications, Six Sigma Case Studies and Applications

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP43612: SIX SIGMA (ELECTIVE - V)

THEORY ASSESSEMENT:

Students' performance based on theory assessment will be evaluated as per these weightages:
End-semester Exam: 70% Weightage
Continuous Assessment: 30% Weightage (Two Mid-term Tests: 67% Weightage, Assignment: 16.5% Weightage, and Regularity: 16.5% Weightage)

TEXT BOOKS RECOMMENDED:

1. Urdhwareshe, H., (2011), *Six Sigma for Business Excellence: Approach, Tools and Applications*, Pearson Education India (New Delhi, India)
2. Evans, J.R., and Lindsay, W.M., (2014), *An Introduction to Six Sigma and Process Improvement*, Cengage Learning (New Delhi, India)
3. Lunau, S., Hugo, C.V., Bosselmann, P., Mollenhauer, J.P., Meran, R., and Roenpage, O., (2013), *Design for Six Sigma Toolset*, Springer Series (Heidelberg: Berlin, Germany)
4. Yang, K., and El-Haik, B.S., (2009), *Design for Six Sigma: A Roadmap for Product Development*, McGraw-Hill (New Delhi, India)

REFERENCE BOOKS RECOMMENDED:

1. Antony, J., Kumar, A. and Bañuelas, R.,(2006), *World Class Applications of Six Sigma – Real World Examples of Success*, Routledge: Elsevier (Chennai, India)
2. Montgomery, D.C., (2017), *Design and Analysis of Experiments*, Wiley (Hoboken: New Jersey, US)
3. Pyzdek, T. and Keller, P., (2014), The *Six sigma Handbook:A Complete Guide for Green Belts,Black Belts, and Managers at All Levels*,McGraw-Hill (New Delhi, India)
4. Crager, J., Lemons, D., Blashka, S.E., and Vestal, W., (2004), *Six Sigma Management: A Guide for Your Journey to Best-Practice Processes*, APQC (New Delhi, India)

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43616: SUPPLY CHAIN MANAGEMENT (ELECTIVE – V)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
04	02	00	03	01	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Operations Research, Production Management

COURSE OUTCOMES:

This course is designed to enable students in their learning:

CO1: To develop a sound perception of the crucial role of supply chain management in today's business environment, and to demonstrate the capability to deploy supply chain theories and concepts in real practices with the help of case studies and problem-based learning scenarios

CO2: To discuss the basic components of demand management in supply chain and their roles in the success of supply chain

CO3: To solve for the mathematical models, optimization and simulation models towards supply chain planning and decision-making

CO4: To demonstrate the capability for usage of internet technologies and electronic commerce systems as well as technical aspects of key IT-enabled components in supply chain operations

CO5: To state the core significance of integrated logistics systems deploying various strategies of distribution, transportation and network design aspects

COURSE CONTENT:

UNIT 1 Introduction to SCM: Definition, elements of supply chain, building blocks of supply chain network, drivers of supply chain, Decision making in supply chain, Decision making models, supply chain performance measurement.

UNIT 2 Demand management in supply chain: Demand planning and forecasting, types of demand, Forecasting methods, aggregate planning, Economic Order Quantity models and Reorder Point models, Inventory optimization in supply chain.

UNIT 3 Mathematical foundations of Supply chain Solutions: Stochastic models and Optimization techniques in Supply Chain Planning, Facility layout, capacity planning, routing and scheduling in supply chain, determining optimal levels of product availability.

UNIT 4 Logistic Management: Definition, Elements of logistics management, Organization for logistics function, Logistics function integration, logistic function performance measurement, distribution and distribution strategies, integrated logistics and business logistics, customer orientation and relationship management.

UNIT 5 Transportation, Network design and Information Technology: Transportation fundamentals, Decisions in transportation, Network design in supply chain, Information Technology for supply chain management, Coordination, E-business, E-procurement, E-logistics, E-markets, Internet auctions, E-business process optimization.

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43616: SUPPLY CHAIN MANAGEMENT (ELECTIVE – V)

ASSESSMENT:

Students will be assessed as following

(1) End Semester Exam: 70% weightage,

(2) Continuous assessment: 30% weightage (Two midterm tests: 67% weightage, assignment: 16.5% weightage, regularity 16.5% weightage)

TEXT BOOKS RECOMMENDED:

S.NO	BOOK	UNIT
1	Chopra, S. and P. Meindl, Supply Chain Management: Strategy Planning and Operation, (4th ed.),	**1,2,4,5**
2	Prentice Hall, Upper Saddle River, NJ, USA 2010. (Textbook)	**1-5**
3	Christopher, M. Logistics and supply chain management: strategies for reducing cost and improving service (3rd ed.). London: FT Press, UK, 2005.	**1,2,4,5**

REFERENCE BOOKS RECOMMENDED:

S.NO	BOOK	UNIT
1	Bowersox D.J., ClossD.J. and Helferich O.K., Logistical Management, McGraw-Hill College, UK	**1-5**

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP 43499: MAJOR PROJECT PHASE - I

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	Tu	T	P	Tu	CW	END SEM	SW	END SEM	
0	06	00	00	03	-	-	-	100	-	100

PRE- REQUISITES: Industrial Training - I

COURSE OUTCOMES:

Following are the expected course outcomes of this course:

1. To identify and formulate an appropriate problem for the project.
2. To develop an enquiring aptitude and build confidence amongst students by working on solutions of small industrial problems
3. To give students an opportunity to do something creative and to assimilate a real life work situation in the institute
4. To adapt students to latest developments and to handle with team and independently new situations
5. To develop good power of expression and presentation abilities in the students.

COURSE CONTENTS:

Students undertake projects based on topics from industrial engineering, production management and/ or manufacturing. During this course students have to:

1. Select an area of research interest
2. Carry out detailed literature review
3. Find out the research gaps and finalize the topic.
4. Select and appropriate proposed methodology.

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP 43499: MAJOR PROJECT PHASE - I

ASSESSMENT:

Students will be assessed as following

Practical: (1) Sessional: 70 % Weightage The students' projects are evaluated twice in the whole year, once during every semester. For the award of sessional marks in the first semester, a departmental committee comprising of HOD and all project supervisors, evaluate the students for the award of sessional marks. The students are required to give a presentation of about 20 minutes and submit a write up of the work carried out. The committee awards marks out of a maximum of 100 and gives suggestions to the students regarding possible improvements in their project.

During the second semester, the students complete their project work under the guidance of their respective supervisors, prepare a final report and give a presentation of about 20 minutes to the departmental committee. The committee awards sessional marks out of 60, based on the students' presentation and the final report.

(2) End semester practical viva: 30% weightage

For conducting practical/viva of the students, based on the project report, an external examiner from Industry/ academia 1s invited. The project supervisor acts as an internal examiner. Both the examiners award marks out of a maximum of 60 marks, based on the students' performance in the practical/viva.

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43998: MAJOR PROJECT PHASE - II

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	Tu	T	P	Tu	CW	END SEM	SW	END SEM	
0	10	00	00	05	-	-	-	40	60	100

PRE- REQUISITES: Industrial Training – I, Internship/Industrial Training - II

COURSE OUTCOMES:

After successful completion of this course students will be able to:

1. To provide student with a comprehensive experience for applying the knowledge gained so far by studying various courses.
2. To develop an enquiring aptitude and build confidence amongst students by working on solutions of small industrial problems.
3. To give students an opportunity to do something creative and to assimilate a real life work situation in the institute.
4. To adapt students to latest developments and to handle with team and independently new situations.
5. To develop good power of expression and presentation abilities in the students.

COURSE CONTENTS:

Students undertake projects based on topics from industrial engineering, production management and/ or manufacturing. During this course students have to:

1. Work on the topic finalized in the phase I
2. Collect the relevant data and perform data analyze it
3. Derive results and conclusions

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP- 43998: MAJOR PROJECT PHASE - II

ASSESSMENT:

Course assessment: Students will be assessed as following:

Practical: (1) Sessionals: 70 % Weightage: The students' projects are evaluated twice in the whole year, once during every semester. For the award of sessional marks in the first semester, a departmental committee comprising of HOD and all project supervisors, evaluate the students for the award of sessional marks. The students are required to give a presentation of about 20 minutes and submit a write up of the work carried out. The committee awards marks out of a maximum of 100 and gives suggestions to the students regarding possible improvements in their project.

During the second semester, the students complete their project work under the guidance of their respective supervisors, prepare a final report and give a presentation of about 20 minutes to the departmental committee. The committee awards sessional marks out of 60, based on the students' presentation and the final report.

(2) End semester practical viva: 30% weightage: For conducting practical/viva of the students, based on the project report, an external examiner from Industry/ academia 1s invited. The project supervisor acts as an internal examiner. Both the examiners award marks out of a maximum of 60 marks, based on the students' performance in the practical/viva.

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SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP-43482: INDUSTRIAL TRAINING & SEMINAR

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
0	4	0	0	02	-	-	-	40	60	100

PRE-REQUISITES: NA

COURSE OUTCOMES:

This course is designed to enable students in their learning for the following-

1. To provide student with a comprehensive experience for applying the knowledge gained so far by studying various courses.
2. To develop an enquiring aptitude and build confidence amongst students by working on solutions of small industrial problems
3. To give students an opportunity to do something creative and to assimilate a real life work situation in the institute
4. To adapt students to latest developments and to handle with team and independently new situations
5. To develop good power of expression and presentation abilities in the students

COURSE CONTENTS

The students are required to work in industry and gain exposure to various departments of the company.

SHRI G. S. INSTITUTE OF TECHNOLOGY AND SCIENCE

Department of Industrial and Production Engineering

B.TECH IPE IV Year (4YDC)

IP-43482: INDUSTRIAL TRAINING & SEMINAR

PRACTICALS,

LIST OF PRACTICALS

The students are required to work in industry and gain exposure to various departments of the company

ASSESSMENT:

The students are assessed on the basis of following criteria-

1. PPT presentation and its quality: 40% weightage.
2. Evaluation of training report submitted and question answers: 20% weightage.
3. Attendance: 40% weightage.