

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

M.Tech. MANUFACTURING SCIENCE & ENGINEERING (MSE)

I SEMESTER

Sl. No	Subject Code	Title	Teaching Hours /Week		Examination				Credit
			Theory	Practical/Field Work/Assignment	Duration	I.A. Marks	Theory/Practical Marks	Total Marks	
1	16MSE11	Quality & Reliability Engineering	4		3	20	80	100	4
2	16 MSE12	Advanced Foundry Technology	4		3	20	80	100	4
3	16 MSE13	Theory of Metal Forming	4		3	20	80	100	4
4	16 MSE14	Advanced Materials & Processing	4		3	20	80	100	4
5	16 MSE15X	Elective - I	3		3	20	80	100	3
6	16 MSEL16	Manufacturing laboratory –I		3	3	20	80	100	2
7	16 MSE17	Seminar		3		100		100	1
TOTAL			19	6	18	220	480	700	22

Elective	
16 MSE151	Applied Probability and Statistics
16 MSE152	Composite Materials
16 MSE153	Theory of Metal Cutting
16 MSE154	Computer Integrated Manufacturing & Automation
16 MSE155	Quantitative Techniques in Decision Making
16 MSE156	Operations Management

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

QUALITY AND RELIABILITY ENGINEERING

Subject Code	: 16MSE11	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 50	Exam Marks	: 80

Module – 1

Basic Concepts: Definitions of quality and Reliability, Parameters and Characteristics, Quality control, statistical Quality Control, Reliability concepts.

Concepts in Probability and Statistics : Events, Sample Space, Probability rules, Conditional probability, Dependent and Independent Events, Application of Probability concepts in Quality Control, Problems

Introduction to Probability Distributions: Normal, Poisson and Binomial distribution.

10 Hours

Module – 2

Control Charts: Variable Chart – X Bar chart, R-chart and Sigma chart. Attribute Chart: P – Chart, nP Chart, C-Chart and U – Chart.

Acceptance Sampling: Fundamentals of acceptance sampling, types of acceptance sampling, O.C Curve, AQL, LTPD, AOQL.

10 Hours

Module – 3

Failure Data Analysis : Introduction, Failure Data, Quantitative measures, MTTF, MTBF, Bathtub Curve, Mean Life, Life Testing, Problems, Introduction to Failure Mode and Effect Analysis.

10Hours

Module – 4

System Reliability: Series, parallel and mixed configuration, Block diagram concept, r-out-of-n structure solving problems using mathematical models.

Maintainability and Availability: Introduction, Formulas, Techniques available to improve maintainability and availability trade-off among reliability, maintainability and availability, Simple problems

10 Hours

Module – 5

Reliability Improvement and Allocation : Difficulty in achieving reliability, Methods for improving reliability during design, Different techniques available to improve reliability, Optimization, Reliability-Cost trade off, Prediction and Analysis, Problems.

10 Hours

REFERENCE BOOKS:

1. **Quality Planning and Analysis** - Tata McGraw - Juran, J.M and Gryna, F.M. - Hill publishing Coimpany Ltd., New Delhi, India – 1982.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

2. **Maintainability and Reliability Handbook of Reliability Engineering and Management** - Editors – Ireson. W.G. and Cooms - C.F. McGraw - Hill Book Company Inc. – 1988.
3. **Concepts in Reliability Engineering-** Srinath L S - Affiliated East-West Press Private Limited, New Delhi, India. – 1985.
4. **An Introduction to Reliability and Maintainability Engineering** - TMH Charles Ebeling - Tata Mcgraw Hill – 2000.
5. **Reliability Engineering** - A K Govil - Prentice Hall – 1981

ADVANCED FOUNDRY TECHNOLOGY

Subject Code	: 16MSE12	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 50	Exam Marks	: 80

Module – 1

Solidification of Casting: Concept of solidification of metals. Homogenous and heterogeneous nucleation. Growth mechanism. Solidification of pure metals and alloys. Mechanism of columnar and dendritic growth. Coring or Segregation. Solidification time and Chvorinov's rule. Concept of progressive and directional solidifications.

Principles of Casting and Riser: Purpose of the gating system. Components of the gating System and its functions. Design of the gating System. Different types of gates. Gating ratio and its functions. Definition and functions of the riser. Types of risers and their application. Design of the riser - its shape. Size and location. Use of insulating material and exothermic compounds in risers.

10 Hours

Module – 2

Design of Casting: Factors to be considered in casting design. Design consideration in pattern making, moulding techniques and core making and assembly. Cooling stresses and hot spots in casting and modification in casting geometry to overcome them.

Casting Quality Control: Casting defects and factors responsible for them. Different inspection and testing methods to evaluate the casting. Quality control activities in a foundry. Salvaging methods of defective casting.

Furnace Technology: Study of various furnaces used in foundry, construction and operation of crucible and hearth furnaces. Resistance, Arc and Induction furnaces-their construction. Operation and application. Heat treatment furnaces and drying ovens used in foundry.

10 Hours

Module – 3

Gray Cast - Iron Foundry Practice: Chemical Composition and structure of gray cast iron. Moulding, gating and risering techniques. Melting of gray cast iron in

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

Cupola and induction furnace. Inoculation of gray cast iron. Application of gray cast iron castings.

Malleable Cast Iron: Chemical composition and structure of White-heart and black-heart malleable cast iron. Melting malleabilisation heat treatment and application of malleable cast iron.

Ductile Cast Iron: Chemical composition and structure of ductile cast iron. Melting and spherodisation treatment. Inoculation of ductile iron Properties and application of ductiles iron casting.

10 Hours

Module – 4

Steel Casting Practice: Common steel casting, their composition, structure and properties. Melting and refining of steel. Gating and risering of steel castings cleaning of steel castings.

Aluminium Foundry Practice: Composition, properties and application of common aluminium alloy casting. Melting and casting of Al-alloys. Gating and risering of Al-alloy casting.

Copper alloy Foundry Practice: General characteristics of common cast copper alloys. Melting and casting of copper alloys. Gating and risering of cu-alloy castings.

10 Hours

Module – 5

Foundry Mechanization and Modernization: Introduction to modernization. Mechanization of foundry and its advantages. Mechanization of sand plant, moulding and core making mechanization in melting, pouring and shakeout units. Material handling equipments and conveyor systems. Brief sketches and description of layouts of job. Captive and mechanized foundries.

10 Hours

REFERENCE BOOKS:

1. **Principle of metal casting** - Heine, et. al - Tata-McGraw-Hill Publication - 2003.
2. **A test book of Foundry Technology** - Lal, M. Khanna, P.O - Dhanpat Rai & Sons Publication.
3. **Foundry Technology** - Beeley, P.R. – Butterworth.

THEORY OF METAL FORMING

Subject Code	: 16MSE13	IA Marks	: 50
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 50	Exam Marks	: 80

Module – 1

Introduction to Forming process: Introduction to metal forming, Effect of temperature on forming process-hot working, cold working. Effect of Metallurgical structure, Effect of speed of deformation work of Plastic deformation, Friction in forming operation.

10 Hours

Module – 2

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

Forging: Classification, various stages during forging, Forging equipment, brief description, deformation in compression, forging defects. Residual stresses in forging. **10 Hours**

Module – 3

Rolling of Metals: Classification, forces and geometrical relationships in rolling.

Variables in Rolling: Deformation in rolling, Defects in rolled products, Residual stresses in rolled products. Torque and Horsepower. **10 Hours**

Module – 4

Extrusion: Classification, Extrusion equipment, variables in extrusion, Deformation in extrusion, Extrusion defects, Work done in extrusion.

Drawing: Principles of Rod and wire drawing, variables in wire drawing, Residual stresses in rod, wire and tube drawing, Defects in Rod and wire drawing. **10 Hours**

Module – 5

Sheet Metal Forming: Introduction, Forming methods, shearing and Blanking, Bending, stretch forming, Deep drawing, redrawing operations, Defects in formed products. **10 Hours**

REFERENCE BOOKS:

1. **Mechanical Metallurgy** - Dieter G.E. - Mc Graw Hill Publications.
2. **Principles of Metal Working** - R.Rowe - Arnold London – 1965.
3. **Metals Handbook** – ASM - Volume II -.ASM
4. **Fundamentals of working of Metals** - Sach G. - Pergamon Press.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

ADVANCED MATERIALS AND PROCESSING

Subject Code	: 16MSE14	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 50	Exam Marks	: 80

Module – 1

Classification and characteristics: Metals, Ceramics, Polymers and composites.

General properties and structure: Atoms, molecules bonds in solids, Crystalline - Defects in Metallic structure, Dislocations and plastic deformation - Strengthening mechanism - grain size, dislocation - Cold work, precipitation hardening, dispersion hardening - phase reactions, fatigue and Creep behavior.

10 Hours

Module – 2

Ferrous Alloys: iron carbon equilibrium diagrams - Steels and cast irons - properties, structure, composition and applications transformation hardening in steels - TTT diagrams - Heat treatment processes - Effect of alloying elements - High alloy steels, Stainless steel types, tool Steels, Manganese steels, heat resistant steels, HSLA, Maraging steels.

10 Hours

Module – 3

Non Ferrous alloys: Alloys of copper, Aluminum, nickel, magnesium, titanium, lead, tin, Zinc - composition, heat treatment, structure, properties and application.

10 Hours

Module – 4

Composites : Definition - classification and characteristics of composite materials - Volume fraction - laminated composites particulate composites, fibrous composites - Types of reinforcements, their shape and size - production and properties of fiber reinforced plastics, Metal Matrix composites and ceramic matrix composites - Applications.

Ceramics: Nature and structure of Ceramics - Refractory Abrasives glasses - glass ceramics - Advanced ceramics processing methods.

10 Hours

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

Module – 5

Polymers and polymerizations: Structure and properties of thermoplastics and thermo sets – Engineering Applications - property modifications - Mechanical and thermal behavior – processing methods.

Processing of Polymers: Composites, ceramics - thermal spraying - Ion beam machining, diamond coating techniques - tribological Applications.

10 Hours

REFERENCE BOOKS:

1. **Engineering Metallurgy** - Raymond and Higgins - ELBS/EA
2. **Introduction to Material Science and Engineering** - James.F.Shackelford - Mc Millan, NY - 7th edition.
3. **Powder Metallurgy-Metals Hand Book** -ASM, USA - Vol.7, 1974.
4. **Composite Materials - Science and Engineering** - Chawla K.K. , Springer - Verlag, Newyork - 2nd edition, 1998.
5. **Cast Metal Matrix Composites** ASM Metals Hand Book - P.K. Rohagti - VI5.
6. **Elements of Material science and Engineering** - Van Vlack L.H. - Addison Wesley, NY - 1989.

APPLIED PROBABILITY AND STATISTICS

Subject Code	: 16MSE151	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

Module – 1

Introduction to statistics: Statistical Thinking, Collecting data, Statistical Modeling Frame work, measure of central tendency and variance, Importance of Data summary and Display, Tabular and Graphical display.

8 Hours

Module – 2

Discrete Random Variables and Probability distribution: Discrete Random variables, Probability distributions and Probability mass functions, Cumulative distribution functions, Mean and Variance of a discrete random variable, discrete uniform distribution, Binominal distribution, Hyper Geometric distribution, Poisson distribution, Applications.

8 Hours

Module – 3

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

Continuous Random Variables and Probability Distributions: Continuous random variables, Probability distributions and probability density functions, cumulative distribution functions, Mean and Variance of a continuous random variable, uniform distribution, Normal distribution, Normal approximation to Binominal and Poisson distribution, Exponential distribution.

8 Hours

Module – 4

Testing of Hypothesis: Estimation theory, Hypothesis testing, Inference on the mean of a population (variance known and unknown), Inference on the variance of a normal population, Inference on a population proportion, Testing for Goodness of Fit, Inference for a difference in Means, Variances known, Inference for a difference in means of two normal distributions, Variances unknown, Inference on the Variances of two normal populations, Inference on two population proportions.

8 Hours

Module – 5

Simple Linear Regressions and Correlation: Simple Linear Regression, Properties of Least square Estimators and Estimation of variances, Transformations to a straight line, Correlation.

Multiple linear regressions: Multiple linear regressions model, least square estimation of parameters, Matrix approach to multiple linear regression, properties of least square estimators and estimation of variance.

8 Hours

TEXT BOOKS:

1. Applied statistics and Probability for Engineers – Douglas C Montgomery, George C Runger, 2nd Edn, John Wiley and Sons, ISBN-0-471-17027-5, 1999.
2. Statistics for Management, Richard I Levin, David S Rubin, 6th Edn, Prentice Hall India, ISBN-81-203-0893-X.

REFERENCES:

1. **Probability and Statistics in Engineering** - William W Hines, Douglas C Montgomery - John Wiley and Sons - 2nd Edn,.
2. **Business Statistics for Management and Economics** - Daniel, Terrell - Houghton Mifflin Company - 6th Edn, ISBN-0-395-62835-0.
3. **Probability and Statistics** - by Walpole & Mayer - MacMillan Publishing Company - 1989.

COMPOSITE MATERIALS

Subject Code	: 16MSE152	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

Module – 1

Introduction to Composite Materials: Definition, Classification, Types of matrices & reinforcements, characteristics & selection, Fiber composites, laminated composites, particulate composites, prepegs, sandwich construction.

8 Hours

Module – 2

Micro Mechanical Analysis of a Lamina: Introduction, Evaluation of the four elastic moduli – Rule of mixture, Macro mechanics of a lamina: Hooke's law for different types of materials, number of elastic constants, Laminate code, Failure criterion.

8 Hours

Module – 3

Manufacturing: Lay Up and Curing – open and closed mould processing – Hand lay up techniques Bag moulding and filament winding. Pultrusion, Pulforming, Thermoforming, Injection moulding, Cutting, Machining and joining, tooling, Quality assurance Introduction, material qualification, types of defects, NDT methods.

8 Hours

Module – 4

Fabrication of Composites: Cutting, machining, drilling, mechanical fasteners & adhesive bonding joining computer aided design manufacturing tooling fabrication equipment

Design of Fibre Reinforced Composite Structures: Introduction, Composite structural design, Design criteria, Laminate design, Mathematical analysis of the laminate, Design of composite stiffeners.

8 Hours

Module – 5

Application Developments – Aircrafts, missiles, space hardware, automobile, electrical and electronics, marine, recreational and sports equipment-future potential of composites.

Metal Matrix Composites: Re-reinforcement materials, types, Characteristics & Selection, base metals-selection, applications. Powder metallurgy technique, liquid metallurgy technique

8 Hours

TEXT BOOKS:

1. **Composite Materials Handbook** - Mein Schwartz - Mc Graw Hill Book Company - 1984.
2. **Mechanics of Composite Materials** - Autar K.Kaw - CRC Press New York - 1st edi, 1997.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

THEORY OF METAL CUTTING

Subject Code	: 16MSE153	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

Module – 1

Mechanics of Metal Cutting: Mechanism of chip formation, Orthogonal & Oblique cutting, types of chips, built-up edge, Determination of shear plane angle, forces on the chips, forces in orthogonal cutting, Merchant circle diagram and analysis, Theory of Lee & Shaffer, co-efficient of friction, power & energy relationship, velocity relationship, shear-strain, factors affecting forces and power, problems.

8 Hours

Module – 2

Geometry of Cutting Tools: Single point and multi point cutting tools, tools nomenclature, tool point referencesystems, tool angle specifications –ISO and ASA systems, conversion from one system to another. Recommended tool angles, Effect of cutting parameters on tool geometry.

Tool Materials and Their Properties: Characteristics of tool materials, types of tool materials – carbon tool steels, high speed steels, cast alloys, cemented carbides, ceramics, diamonds, SIALON, CBN, UCON, recommended cutting speeds for the above tools, discussion on steels,air, water, oil hardening of tools and their applications.

8 Hours

Module – 3

Measurement of Cutting Forces: Reasons for measuring cutting forces, Classification of cutting force dynamometers – mechanical, hydraulic, pneumatic, optical, inductance, piezoelectric, and strain gage type dynamometers, Dynamometers for lathe, drilling, and milling, Calibration of dynamometers.

Tool Wear, Tool Life: Mechanisms of tool wear, Sudden & gradual wear, crater wear, flank wear, tool failure criteria, tool life equations, effect of process parameters on tool life, tool life tests, conventional & accelerated tool wear measurement, machinability index.

8 Hours

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

Module – 4

Thermal Aspects in Metal Cutting: Heat sources in metal cutting, temperature in chip formation, temperature distribution, experimental determination of tool temperatures.

Cutting fluids: Basic actions of cutting fluids, properties of cutting fluids, selection of cutting fluids, application of cutting fluids, filtration of fluids, recommended cutting fluids.

8 Hours

Module – 5

Economics of Machining: Introduction, elements of total production cost, optimum cutting speed and tool life for minimum cost, optimum cutting speed and tool life for maximum production, problems.

8 Hours

REFERENCE BOOKS

1. **Metal Cutting Principles** - M.C. Shaw - Oxford Publication – 1985.
2. **Fundamentals of metal cutting & Machine Tools** - by B.L.Juneja & G.S – Sekhar - Wiley Eastern.
3. **Metal Cutting** - V.C.Venkatesh & S.Chandrasekhanan - Pantice Hall – 1991.
4. **Metal Cutting** - Dr. B.J.Ranganath -Vikas Publications

COMPUTER INTEGRATED MANUFACTURING AND AUTOMATION

Subject Code	: 16MSE154	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

Module – 1

Production Development Through CIM: Computers in Industrial manufacturing, Product cycle & Production development cycle, Introduction of CAD/CAM & CIM, sequential and concurrent engineering, soft and hard prototyping.

8 Hours

Module – 2

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

Computer Process Monitoring: Process control methods, direct digital control, supervisory computer control, steady state optimal control, on line search strategies, adaptive control.

Computer Aided Quality Control: The computer in Q.C, automated inspection principles and methods, Contact inspection methods, non-contact inspection methods, machine vision system, optical inspection method, sensors, coordinate, measuring machine, Computer-Aided testing, Integration of CAQL with CAD/CAM.

8 Hours

Module – 3

Computer Integrated Manufacturing: Fundamentals of CAD/CAM, Computerized Manufacturing planning systems, shop floor control & automatic identification techniques. Computer Network for manufacturing and the future automated factor.

Detroit type of Automation: Flow lines, Transfer Mechanisms, work pattern transfer, Different methods, & Problems.

8 Hours

Module – 4

Analysis of Automated flow lines: Analysis of transfer lines without storage with storage buffer single stage, Double stage, Multistage with problems, Automated assembly systems, Design for automated assembly, parts feeding devices, analysis of Multi station assembly machine, Analysis of Single stage assembly machine.

8 Hours

Module – 5

Automated Material Handling Storage: Material functions, types of material handling equipment, analysis of material handling systems, design of system, conveyor system, automated guided vehicle systems, automated storage/retrieval systems, caroused storage systems work in process storage, interfacing handling & storage with manufacturing.

8 Hours

REFERENCE BOOKS:

1. **CAD/CAM** - Zimmers & Grover – PHI.
2. **CAD/CAM/CIM** - P.Radhakrishna - New Age International - 2nd edition.
3. **Automation, Production systems & Computer Aided Manufacturing** - M.P. Grover - Prentice Hall - 1984.
4. **CAD/CAM** - Zeid – Mc-Graw Hill - 2005.
5. **CAD/CAM** - P.N.Rao - TMH.- 2nd edition, 2004.
6. **Robotics for Engineering** - Koren.Y - Mc-Graw Hill - 1985.
7. **Robert vision & Sensory Controls** - Rooks B. - North Holland. - (ed) vol-3

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

Subject Code	: 16MSE155	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

Module – 1

Introduction: Applications of statistics in managerial decision making, The basic vocabulary of statistics, Types of variables, Data collection – primary and secondary data, the methods of collecting data, Measures of central tendency, Measure of dispersion, Skewness and Kurtosis, Measures of a population, Probability - basic concepts, types, rules of probability, Baye's theorem; Random variables, Probability distributions - Binomial, Poisson, and Normal.

8 Hours

Module – 2

Linear Programming Problem: Formulation of L.P.P., Solution of L.P.P. - graphical method, simplex method, special cases; Concept of duality, Conversion of primal LP problems into dual LP problems and vice versa, Solution of L.P.P. by dual simplex method, Sensitivity analysis in the solution of L.P problems.

8 Hours

Module – 3

Transportation and Assignment Problems: Structure of transportation problem and various methods to find I.B.F.S., Optimality test of transportation problems by MODI method, Solution of unbalanced transportation problems and maximization problems, degeneracy in the solution of transportation problems; Assignment problems and solution by Hungarian method, Traveling Salesman problem.

8 Hours

Module – 4

Decision Making under Uncertainty: Alternative criteria for decision under uncertainty, Bayesian approach

Theory of Games: Terminology involved, Types of games, Solution of mixed strategy games by dominance rule, algebraic method, graphical method, and by linear programming approach.

Network Analysis: Network construction, Analysis techniques – PERT and CPM, Determination of critical path, Computation of ES, EF, LS, LF, TF and FF, Crashing of a project, Resource scheduling and leveling in a project.

8 Hours

Module – 5

Waiting Line: Basic structure of queuing systems and characteristics, Expressions for M/M/1 and M/M/c queuing models.

Simulation of Management Systems: Steps in building a simulation model, Advantages and disadvantages of simulation, the applications of simulation to managerial decision making, Monte Carlo Simulation, Waiting line and Inventory simulation models.

8 Hours

REFERENCE BOOKS:

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

1. **Quantitative Techniques for Management** – David M. Levine, Timothy C. Krehbiel, Mark L. Berenson, Barry Render, Ralph M. Stair, Jr., Michael E. Hanna, Pearson, Latest Edition.
2. **Operations Research** – Prem Kumar Gupta, Dr. D. S. Hira, S. Chand, Latest Edition.
3. **Quantitative Techniques for Managerial Decisions** – Srivastava, U.K. - New Age International Private Limited, Latest Edition

OPERATIONS MANAGEMENT

Subject Code	: 16MSE156	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

Module – 1

Operations Planning Concepts: Introduction, Operations Functions in Organizations, Historical development, Framework for managing operations, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations, Production systems decisions- a look ahead.

8 Hours

Module – 2

Operations Decision Making : Introduction, Management as a science, Characteristics of decisions, Framework for decision making, Decision methodology, Decision Tree Problems, Economic models-Break Analysis in operations, P/V ratio, Statistical models.

System Design and Capacity : Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning.

8 Hours

Module – 3

Forecasting Demand: Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Moving Average methods, Exponential smoothing, Trend adjusted Exponential Smoothing, Regression and correlation methods, Application and control of forecasts-Mean Absolute Deviation, BIAS, Tracking Signal.

Aggregate Planning and Master Scheduling: Introduction- planning and scheduling, Objectives of aggregate planning, Three Pure Strategies, Aggregate planning methods, Master scheduling objectives, Master scheduling methods.

8 Hours

Module – 4

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

Material and Capacity Requirements Planning : Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities.

Scheduling and Controlling Production Activities: Introduction, PAC, Objectives and Data requirements, Loading –Finite and Infinite Scheduling methodology, priority sequencing, capacity control.

8 Hours

Module – 5

Single Machine Scheduling : Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule.

Flow –Shop Scheduling: Introduction, Johnson’s rule for ‘n’ jobs on 2 and 3 machines, CDS heuristic.

Job-Shop Scheduling: Types of schedules, Heuristic procedure, scheduling 2 jobs on ‘m’ machines.

8 Hours

Text Books:

1. Monks, J.G., Operations Management, McGraw-Hill International Editions, 1987.
2. Productions & operations management by Adam & Ebert.
3. Pannerselvam. R., Production and Operations Management, PHI.
4. Chase Jacobs Aquilano, Operations Management for Competitive Advantages, 10th Edition, TMH

References:

1. Buffa, Modern Production/Operations Management, Wiley Eastern Ltd.
2. Chary, S.N., Production and Operations Management, Tata-McGraw Hill.
3. Operations management by James Dilworth.
4. Lee J Karjewski and Larry P Ritzman, Operations Management – strategy and Analysis, 6th Edn, Pearson Education Asia
5. B J Ranganath , System Dynamics by - I K International Publishing house Pvt. Ltd.

MANUFACTURING LABORATORY - I

Subject Code	: 16MSE16	IA Marks	: 20
No. of Lecture Hours/Week	: 03	Exam Hours	: 03
Total No. of Lecture Hours	: 36	Exam Marks	: 80

1. Determination of Chip reduction co-efficient (reciprocal of chip thickness ratio) during single point turning.
2. Forces measurements during orthogonal turning.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION 2016-2017

3. Estimation of Power required during orthogonal turning.
4. Torque and Thrust measurement during drilling.
5. Determination of cutting forces during milling using Milling tool dynamometer
6. Measurement of Chip tool Interface temperature during turning using thermocouple technique.
7. Study the variation of surface roughness with different speed and feed during plain milling operation on flat surface.
8. Study of capstan lathe and its tooling and prepare a tool layout & job as per given drawing.
9. To prepare metallic samples for metallographic examination and to study the principle & construction of the Metallurgical Microscope.
10. Study of Microstructure and Hardening of steel in different medium and cooling rates.
11. Effect of Carbon percentage on the hardness of Steel.
12. CNC milling- Writing and execution of part program for contour milling.