

University of Mumbai



No. AAMS_UGS/ICC/2022-23/ 177

CIRCULAR:-

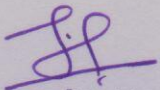
Attention of the Principals of the Affiliated Colleges and Directors of the Recognized Institutions in Faculty of Science & Technology is invited to this office circular No. UG/130 of 2016-17 dated 9th November, 2016, relating to the revised syllabus as per Choice Based Credit System for Master of Engineering (Mechanical) Manufacturing System Engineering Sem. I to IV.

You are hereby informed that the recommendations made by the Board of Studies in **Mechanical Engineering** at its meeting held on 31st May, 2022 and subsequently passed in the Faculty and then by the Board of Deans at its meeting held on 5th July, 2022 vide item No. 6.51 (R) have been accepted by the Academic Council at its meeting held on 11th July, 2022 vide item No. 6.51 (R) and that in accordance therewith, the revised syllabus of **M.E. (Manufacturing System Engineering) (Sem.- I to IV) (CBCS) (REV - 2022 Scheme)**, has been brought into force with effect from the academic year 2022-23. (The circular is available on the University's website www.mu.ac.in).

MUMBAI – 400 032

19th November, 2022

To


(Prof. Sunil Bhirud)
I/c Registrar

The Principals of the Affiliated Colleges and Directors of the Recognized Institutions in Faculty of Science & Technology.

A.C/6.51 (R)/11/07/2022

Copy forwarded with Compliments for information to:-

- 1) The Dean, Faculty of Science & Technology,
- 2) The Chairman, Board of Studies in Mechanical Engineering,
- 3) The Director, Board of Examinations and Evaluation,
- 4) The Director, Board of Students Development,
- 5) The Director, Department of Information & Communication Technology,
- 6) The Co-ordinator, MKCL.

Copy to :-

- 1. The Deputy Registrar, Academic Authorities Meetings and Services (AAMS),**
- 2. The Deputy Registrar, College Affiliations & Development Department (CAD),**
- 3. The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Department (AEM),**
- 4. The Deputy Registrar, Research Administration & Promotion Cell (RAPC),**
- 5. The Deputy Registrar, Executive Authorities Section (EA),**
- 6. The Deputy Registrar, PRO, Fort, (Publication Section),**
- 7. The Deputy Registrar, (Special Cell),**
- 8. The Deputy Registrar, Fort/ Vidyanagari Administration Department (FAD) (VAD), Record Section,**
- 9. The Director, Institute of Distance and Open Learning (IDOL Admin), Vidyanagari,**

They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above circular and that on separate Action Taken Report will be sent in this connection.

- 1. P.A to Hon'ble Vice-Chancellor,**
- 2. P.A Pro-Vice-Chancellor,**
- 3. P.A to Registrar,**
- 4. All Deans of all Faculties,**
- 5. P.A to Finance & Account Officers, (F.& A.O),**
- 6. P.A to Director, Board of Examinations and Evaluation,**
- 7. P.A to Director, Innovation, Incubation and Linkages,**
- 8. P.A to Director, Board of Lifelong Learning and Extension (BLLE),**
- 9. The Director, Dept. of Information and Communication Technology (DICT) (CCF & UCC), Vidyanagari,**
- 10. The Director of Board of Student Development,**
- 11. The Director, Department of Students Welfare (DSD),**
- 12. All Deputy Registrar, Examination House,**
- 13. The Deputy Registrars, Finance & Accounts Section,**
- 14. The Assistant Registrar, Administrative sub-Campus Thane,**
- 15. The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan,**
- 16. The Assistant Registrar, Ratnagiri sub-centre, Ratnagiri,**
- 17. The Assistant Registrar, Constituent Colleges Unit,**
- 18. BUCTU,**
- 19. The Receptionist,**
- 20. The Telephone Operator,**
- 21. The Secretary MUASA**

for information.

University of Mumbai



Revised Syllabus for

M.E.

(Manufacturing System Engineering)

Semester – (I to IV)

(Choice Based Credit System)

(With effect from the academic year 2022-23)

University of Mumbai



O: _____	Title of Course	M.E. (Manufacturing Systems Engineering)
O: _____	Eligibility	Ordinance 0.5134
R: _____	Passing Marks	45%
No. of years/Semesters:		4 semesters
Level:		P.G. / U.G. / Diploma / Certificate
Pattern:		Yearly / Semester
Status:		New / Revised
To be implemented from Academic Year :		With effect from Academic Year : 2022-23

Dr. Vivek Sunnapwar
Chairman
of Board of Studies in Mechanical Engineering

Dr. Suresh K. Ukarande
Associate Dean,
Faculty of Science and Technology

Dr Anuradha Majumdar
Dean,
Faculty of Science and Technology

Preamble

Education in engineering is growing in India and is expected to increase by a factor of several in the near future. The current situation presents a significant challenge in terms of ensuring quality to stakeholders while expanding. To face this challenge, the problem of quality must be addressed, debated, and progressed in a methodical manner. Accreditation is the primary form of quality assurance in higher education, and it signifies that the institution or programme of study is committed to meeting certain minimum stated requirements and is available to external assessment in order to get recognition. The main goal of this accrediting procedure is to assess the outcomes of the programme being evaluated. Program outcomes are a collection of skills and information that a student will possess upon completion of the programme. In keeping with this, the University of Mumbai's Faculty of Science and Technology has taken the lead in implementing the principle of outcome-based education into the curriculum building process.

We are pleased to report that the Postgraduate Program Educational Objectives were completed in a brainstorming session attended by more than 20 members from the University's associated institutes. They were either department heads or senior faculty from the Mechanical Engineering Department. The Program Educational Objectives finalized for the postgraduate program in Mechanical Engineering are listed below;

1. To prepare the Learner with a sound foundation in the mathematical, scientific and engineering fundamentals.
2. To prepare the Learner to use modern tools effectively in order to solve real life problems.
3. To prepare the Learner for a successful career in Indian and Multinational Organisations
4. To encourage and motivate the Learner in the art of self-learning.
5. To inculcate a professional and ethical attitude, good leadership qualities and commitment to social responsibilities in the Learner's thought process.

In addition to the aforementioned, linked Institutes may add 2 to 3 additional programme instructional objectives of their own. In addition to Program Educational Objectives, each course in a postgraduate program's curriculum includes objectives and expected outcomes from the perspective of the learner to support the idea of outcome-based education. We are convinced that even a tiny move in the correct manner will go a long way toward ensuring that the main stakeholders receive high-quality education.

Dr. S. K. Ukarande

Associate Dean

Faculty of Science and Technology

University of Mumbai

Dr Anuradha Muzumdar

Dean

Faculty of Science and Technology

University of Mumbai

Preface

To tackle the challenge of assuring engineering education excellence, the problem of quality must be addressed, debated, and progressed in a methodical manner. Accreditation is the primary way of ensuring the quality of higher education. The main goal of the certification procedure is to determine how good a company is. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this, Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome-based education in the process of curriculum development.

Faculty of Science and Technology, University of Mumbai, in one of its meetings collectively resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEOs), give freedom to Affiliated Institutes to add few (PEOs), course objectives course outcomes to be clearly defined for each course, so that all faculty members in linked institutes are aware of the depth of approach to the subject to be given, so improving the learning process of students It was also decided that while changing the curriculum, the most senior academics from institutions and industry specialists should be included.

We are happy to state that the Board of studies has adhered to the resolutions passed by Faculty of Technology and developed curriculum accordingly. In addition to outcome-based education, Choice Based Credit System is also introduced to ensure quality of engineering education.

Choice Based Credit and Grading System allows for a much-needed shift in education focus from teacher-centric to learner-centric, since the workload estimate is based on time spent learning rather than teaching. It also emphasises constant evaluation, which will improve educational quality. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes. Faculty of Technology has devised a transparent credit assignment policy, adopting a ten-point scale to grade learner's performance. REV-2022 scheme is implemented for Master of Engineering from the academic year 2022-2023.

We trust this revised version of syllabus come up to the expectations of all stakeholders. We wish to place on record our sincere thanks and appreciations to the various contributors from the academia and industry for their most learned inputs in framing this syllabus.

Board of Studies in Mechanical Engineering

Dr. Vivek K. Sunnapwar	: Chairman
Dr. S. M. Khot	: Member
Dr. V. M. Phalle	: Member
Dr. Siddappa Bhusnoor	: Member
Dr. S.S. Pawar	: Member
Dr. Sanjay U. Bokade	: Member
Dr. Dhanraj Tambuskar	: Member
Dr. V. B. Tungikar	: Member
Dr. K.P. Karunakaran	: Member
Dr. S. S. Thipse	: Member
Dr. Milind Deshmukh	: Member

Semester II

Course Code	Course Name	Teaching Scheme(Contact Hours)			Credits Assigned				
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total	
MSEC201	Industrial Automation	3	--	--	3	--	--	3	
MSEC202	Advanced Quantitative Techniques	3		--	3		--	3	
MSEPE201X	Program Elective 3	3	--	--	3	--	--	3	
MSEPE202X	Program Elective 4	3	--	--	3	--	--	3	
MSEIE20X	Institute Elective 2	3	--	--	3	--	--	3	
MSEL201	Industrial Automation Laboratory	--	2	--	--	1	--	1	
MSESBL201	Manufacturing Simulation Lab	--	4 ^s	--	--	2	--	2	
Total		15	06	--	15	03	--	18	
Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract / Oral	Total
		Internal Assessment			End Sem. Exam	Exam. Duration (in Hrs)			
		Test-1	Test-2	Avg					
MSEC201	Industrial Automation	20	20	20	80	3	--	--	100
MSEC202	Advanced Quantitative Techniques	20	20	20	80	3	--	--	100
MSEPE201X	Program Elective 3	20	20	20	80	3	--	--	100
MSEPE202X	Program Elective 4	20	20	20	80	3	--	--	100
MSEIE201X	Institute Elective 2	20	20	20	80	3	--	--	100
MSEL201	Industrial Automation Laboratory	--	--	--	--	--	25	25	50
MSESBL201	Manufacturing Simulation Lab	--	--	--	--	--	50	50	100
Total		--	--	100	400	--	75	75	650

Note 1: Skill Based Lab- I and II are focused on the learning through experience. SBL shall facilitate the learner to acquire the fundamentals of practical engineering in his or her specialization in a project-oriented environment. The learning through skill based labs can be useful in facilitating their research work and hence useful in early completion of their dissertation work.

Course Code	Program Elective 3	Course Code	Program Elective 4	Course Code	Institute Elective 2
MSEPE2011	Strategic Manufacturing for Sustainability	MSEPE2021	Logistics & Supply Chain Management	MSEIE2011	Project Management
MSEPE2012	Additive Manufacturing and Rapid Prototyping	MSEPE2022	Machine Health Monitoring Management	MSEIE2012	Finance Management
MSEPE2013	Manufacturing Systems Design	MSEPE2023	Smart Industries	MSEIE2013	Entrepreneurship Development and Management
				MSEIE2014	Human Resource Management
				MSEIE2015	Professional Ethics and CSR
				MSEIE2016	Research Methodology
				MSEIE2017	IPR and Patenting
				MSEIE2018	Digital Business Management
				MSEIE2019	Environmental Management

Course Code	Course Name	Credits
MSEC201	Industrial Automation	03

Objectives:

1. To acquaint with basic concepts of industrial automation involving pneumatic and hydraulic controls.
2. To familiarize with the elements of electro-pneumatic interface with control systems.
3. To learn about programmable logic controller.
4. To know the role of robotics in Automation.

Outcomes: On completion of the course, learner will be able to:

1. Students shall be able to understand the working of automation systems and shall acquire the insight to build the automation systems.
2. Illustrates the use of PLC in Automation.

Module	Detailed Contents	Hrs.
01	Introduction to Automation: Need of Automation, Automation Principles and Strategies, Elements of Automated system, Levels of Automation, Automation in manufacturing system, Advanced automation function, Arguments for and against automation (with case studies).	03
02	Hardware components for Automation: Sensors- Displacement, position and Proximity Sensors, Velocity and Motion Sensors, Force and Fluid Pressure Sensors, Liquid level and Flow sensors, Temperature and light Sensors, Actuators- Hydraulic, Pneumatic and electric, ADC and DAC and systems concepts, time domain analysis, frequency domain analysis, time-frequency analysis.	06
03	Industrial Circuits: Pneumatic Control - Different types of valves and Actuators in Pneumatics, their applications and use of their ISO symbols, Design of Pneumatic circuits using Cascade method and Shift Register Method. (Up to 3 cylinders), Design of Electro- Pneumatic Circuits using single solenoid and double solenoid valves; with and without grouping Hydraulic Control - Different types of valves and Actuators in Hydraulics, their applications and use of their ISO symbols, Meter in, meter out and Bleed off circuits. Sequencing circuits, Accumulators and their types. Applications of Accumulator circuits, Problems based on sizing and selection of Hydraulic components, Actuation technology in Hydraulic valves: Proportional and Servo Hydraulics and Digital Hydraulics. Design of Electro- Hydraulic, circuits.	12
04	Programmable and Logic Controller: PLC configuration and selection, PLC Basic components and their symbols Control transformers and fuses - Switches and Indicator lamps, Relays and time delay relays PLC Programming - Fundamentals of Ladder Programming, Ladder programming for logic gates and latching, Sequencing, counters, timers, shift register and Master & Jump control, Data acquisition system, Data logger, Microprocessor, Microcontroller, digital communication, digital controller, SCADA.	08
05	Control Engineering: Design of PD, PI and PID Controllers. Frequency Response Analysis - Frequency domain specifications for second order system, Nyquist plot State Space Analysis - State space representation of systems, Controllability and Observability, Transfer function from state space matrices Mathematical modelling of Servo systems - Armature controlled D. C. motor, Field controlled D.C. motor.	07

06	Robotics: Automation and Robotics, Robot types, anatomy and related attributes, accuracy, repeatability Trajectory planning, Robot control system and end effector, Sensors in robotics, Industrial application and future applications, Introduction to Artificial Intelligence.	06
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Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

5. Question paper will comprise of total six question.
6. All question carry equal marks.
7. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
8. Only Four questions need to be solved.

References:

1. Mikell P. Grover, Automation Production Systems, and Computer Integrated Manufacturing, PHI, 2011, Third Edition.
2. W. Bolton, Mechatronics, Electronic control systems in Mechanical and Electrical Engineering, Pearson Education, 2003.
3. K. Ogata, Modern Controls Engineering, Prentice Hall of India Pvt. Ltd., New Delhi, 2005.
4. Antony Esposito, Fluid Power Systems and control, Prentice-Hall, 1988.
5. Joji P., Pneumatic Controls, Wiley India, 2011.
6. I. J. Nagrath and Gopal, Control System Engineering, New age international (P) Ltd., 2005.

Course Code	Course Name	Credits
MSEC202	Advanced Quantitative Techniques	03

Objectives:

To equip the students with the expert knowledge and skills needed to apply the various quantitative techniques for decision making.

Outcomes: On completion of the course, learner will be able to:

1. Explain significance of sensitivity analysis of LPP and Perform sensitivity analysis on various parameters involved in LP model.
2. Recognize the limitations of simplex method in deriving integer solution to LPP and Employ suitable algorithm to obtain integer solution.
3. Analyse various decision-making situations, Outline decision alternatives and Select the best alternative.
4. Describe a real-world problem as a Non-Linear Programming Problem and Distinguish local, global extreme points and point of inflection.
5. Explain significance of Markov Analysis to predict the state of a system.

Module	Detailed Contents	Hrs.
01	Introduction to Decision model and Quantitative techniques: Concept of decision making and decision problem, Mathematical Model of decision problem, Concept of Optimization, Quantitative techniques for finding optimal solutions to decision problems. Linear Programming Problem: Mathematical Formulation. Overview of Simplex Method. Sensitivity Analysis. Linear Goal programming: Formulation as Goal programming model, Optimal solution by graphical method and simplex method.	08
02	Integer Programming Problem: Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique.	06
03	Nonlinear programming problems (NLPP): Convex programming. Unconstrained NLPP –Search Algorithm and Gradient method. Constrained NLPP – Kuhn-Tucker Conditions, Geometric Programming. Quadratic programming.	08
04	Network Optimization Models: Shortest Path, Minimum Spanning Tree, and Maximum Flow Problems.	06
05	Decision Theory: Decision Making under risk, under uncertainty, Decision Trees & Utility Theory, Bayesian approach in decision making. Decision Making under certainty, Introduction to concepts of AHP (Analytic Hierarchy Process) & ANP (Analytic Network Process).	08
06	Markov Analysis: Stochastic Process, Markov Process, Transition Probability Matrix, Markov Chain.	06

Assessment:**Internal:**

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

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3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Taha H.A., Operations Research - An Introduction, Prentice Hall.
2. Ravindran A., Phillips, D. T and Solberg, J. J., Operations Research: Principles and Practice, John Willey and Sons.
3. Hiller F. S. and Liebermann G. J., Introduction to Operations Research, Tata McGraw Hill.
4. Pradeep Prabhakar Pai, Operations Research Principles and Practice, Oxford University Press.
5. S. D. Sharma and Kedar Nath Ram Nath, Operations Research, Meerut.

Course Code	Course Name	Credits
MSEPE2011	Strategic Manufacturing for Sustainability	03

Objectives:

1. To get acquainted with concepts, various dimensions and significance of sustainability.
2. Acquire knowledge on emerging approaches in waste management.
3. Understand the ongoing trends and innovations in energy management.
4. Get exposure to the role of environmental management in modern business world.

Outcomes: On completion of the course, learner will be able to:

1. Identify and deal with economic, social and technological concerns in sustainable manufacturing front.
2. Pursue eco-friendly approaches in managing various forms of waste including hazardous waste.
3. Apply environment friendly options in design and manufacturing operations to bring down carbon foot prints.
4. Get adequate exposure to energy efficient initiatives and energy management.
5. Get exposure to environmental standards/legislations and develop capability in assessing environment impact.

Module	Detailed Contents	Hrs.
01	Introduction: Concepts related to sustainability and sustainable development, Green expectations and global sustainability agenda. Confronting climate change and global warming, Environmental preservations, wake up conferences, voice of society and green movement.	07
02	Waste Management: Types & sources of waste, segregation & waste processing, Green processing and engineering approaches, energy recovery, life cycle approach – cost benefits, R3&R6 cycles, methods to infuse sustainability in early phase of product design approach, cradle to cradle approach.	07
03	Materials for Sustainability: Energy efficient and environment friendly materials. New age materials, Materials and process selection, Material disposal, Material for recycling, biodegradable materials, control on non-renewable material usage, integrating sustainability concepts, Toxicity and health impact.	07
04	Design for Sustainability: Conversion technologies, concept of Eco-innovation, sustainable loading on ecosystems, energy conservation and energy audit, environmental analysis from raw material to disposal, product life cycle assessment, sustainable design approach and matrices for sustainable designs, case studies on sustainable design.	07
05	Environment Management: Influence of cultural, political and economic changes in transforming role of environmental management in business world, Environmental standards & legislation, carbon foot print assessment and carbon trading, Anti-Pollution boards, Kyoto protocol, Initiatives at national and global level, Alternative product & process change and manufacturing practices, Environment and human health effect hazards, mitigation management. Role of IT & communication networking.	07

06	Sustainability Assessment: Multi-Objective decision making, concept models and approaches, evolving sustainability issues in operating strategy. Product and process sustainability and risk /benefit assessment. Sustainability impact assessment, corporate social responsibilities and initiatives, sustainability rating schemes, eco - labelling and energy labelling programmes, Continuous sustainability awareness initiatives, Industrial case students.	07
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Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Sustainable Development by M. K. Ghosh Roy - Ane Books Pvt. Ltd.
2. Green Management by M. Karpagam, Geetha Jaikumar - Ane Books Pvt. Ltd.
3. Essential Environmental Studies by S. P. Misra, S.N. Pandey - Sheth Publishers.
4. Design for Environment: A Guide to Sustainable Product Development by Joseph Fiksel - McGraw-Hill Companies.
5. E books Sustainable Manufacturing by J. Paulo Davim – Wiley Publishers.
6. E book - Sustainable Manufacturing- Shaping global value creation by Gunther Seliger – Springer.

Course Code	Course Name	Credits
MSEPE2012	Additive Manufacturing and Rapid Prototyping	03

Objectives:

1. To familiarize with importance of Rapid Prototyping in Product Development.
2. To make students aware about latest additive manufacturing technology used in industry.
3. To make students aware about various additive manufacturing processes and material availability.
4. To enable students to understand, describe and evaluate the different post processing techniques currently used on Additive Manufacturing parts.
5. To make students aware about latest research in the area of additive manufacturing.

Outcomes: On completion of the course, learner will be able to:

1. Understand importance of Rapid Prototyping in product development.
2. Apply basic knowledge of additive manufacturing to decide type of additive manufacturing process and material according components design requirement.
3. To calculate and justify the cost of a typical additive manufacturing operation including labour costs, overhead costs, and consumable costs.
4. Evaluate the different post processing techniques used on AM parts, including those required for removal of support structures, improvement of surface characteristics and structural integrity.
5. Conduct research work and research writing in the field of additive manufacturing.

Module	Detailed Contents	Hrs.
01	Introduction: Product Development Cycle and the product Life Cycle, Problems in Product Development, Relationship between Product Development Cost and the Selling Price, Rapid prototyping need, Classification of RP systems, advantages and limitations of RP, Applications and scope of RP, Introduction to additive manufacturing.	08
02	Design for Additive Manufacturing: Multiple Materials, Hybrids, Functionally Graded Materials, Composite Materials, current and future directions; Process Modelling of AM process- Design optimization through finite-element modelling of AM- Simulation of phase transformations- heating, melting, forming, solidification and finishing and rheological studies of various AM materials.	06
03	Classification of Additive Manufacturing Processes: Seven Classes of Additive Manufacturing, Binder jetting, Directed Energy Deposition, Powder Bed Fusion, Sheet Lamination, Material Extrusion, Material Jetting, Vat Photo Polymerization Detailed discussion on latest technique available on each type of additive manufacturing processes. Specification, working principal, material compatibility and Post processing.	08
04	Additive Manufacturing System Design: Process selection, Material selection, labour cost involved, overhead cost calculation, consumables cost, machine maintenance, Project Planning, Sensors used Jigs and fixtures, Thermal management, Manufacturing Quality management.	08
05	Applications of Additive Manufacturing: Aerospace Applications, Medical applications, Art and Design applications, Energy applications, architecture applications.	06
06	Intellectual Property Rights, IPR in Additive Manufacturing: Case studies on Latest patents in the field of additive manufacturing, Case studies based on latest article Published in Scopus, SCI, and ESCI indexed journal.	06

Assessment:**Internal:**

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Additive Manufacturing Technologies – Ian Gibson, David W Rosen, Brent Stucker., MahyarKhorasani – Springer.
2. Additive Manufacturing – Juan Pou, Antonio Riveiro and J. Paulo Davim – Elsevier.
3. Multi-dimensional Additive Manufacturing – SoshuKiriharal, Kazuhiro Nakata – Springer.
4. Additive Manufacturing Processes – SanjayKumar – Springer.
5. Polymer Based Additive Manufacturing – Declan M. Devine – Springer.
6. Materials for Additive Manufacturing – Yusheng Shi, Chunze Yan, Yan Zhou, Jiamin Wu, Yan Wang, ShengfuYu, Ying Chen – Academic Press, Elsevier.
7. Additive Manufacturing (A Tool for Industrial Revolution 4.0) – M. Manjaiah, K. Raghavendra, N. Balashanmugam, J. Paulo Davim – Woodhead Publishing.

Course Code	Course Name	Credits
MSEPE2013	Manufacturing Systems Design	03

Objectives:

1. To acquaint the students with concepts of manufacturing systems engineering and design.
2. To familiarise the students with various manufacturing systems and approaches for various areas of applications.
3. To impart knowledge in design and adoption of manufacturing systems to achieve improved productivity and cost benefits.

Outcomes: On completion of the course, learner will be able to:

1. Understand and appreciate the capabilities and limitations of various manufacturing systems.
2. Identify and select appropriate manufacturing systems for specific applications.
3. Design and implement appropriate model of manufacturing systems in specific contexts.
4. Cope up with the ongoing demands of the industry, specifically on the manufacturing front.

Module	Detailed Contents	Hrs.
01	Manufacturing system fundamentals: Basic concepts and definition of system, system design, structural and transformational aspects of manufacturing systems, integrated manufacturing and management systems.	04
02	Process systems for manufacturing: Logistics planning and design, Product planning and design, Process planning and design, Layout planning and design.	06
03	Group technology and cellular manufacturing systems: Concepts of cellular manufacturing, comparison between cellular and traditional manufacturing, Cell characteristics, Techniques of cellular manufacturing, Advantages and Limitations. Cell design and cell formation techniques, processing of exceptional components in cellular manufacturing. Evaluation of cellular manufacturing solutions, cell characteristics, Production control activities in cellular manufacturing and implementation issues.	10
04	Management systems for manufacturing: Managerial information flow, Aggregate production planning and scheduling, Inventory management, Production control and Quality control.	08
05	Automation systems for manufacturing: CAD, CAM, CIM, FMS, Computer integrated automation systems- concept of ghost factory and Overview of industry 4.0.	07
06	Information system for manufacturing: MIS (Management information systems), SIS (Strategic information systems), Parts oriented production information systems, Online production control systems and Computer based production management systems.	07

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Marco Garetti, Design and Management of Production Systems: Tutorials and Case Studies.
2. Wallace J. Hopp and Mark L. Spearman, Factory Physics, Waveland Press Inc. USA.
3. B. S. Nagendra Parashar, Cellular Manufacturing Systems: An Integrated Approach, PHI Learning Pvt. Ltd.
4. Manufacturing Systems Engineering, KatsundoHitomi, Viva Books Pvt. Ltd.

Course Code	Course Name	Credits
MSEPE2021	Logistics and Supply Chain Management	03

Objectives:

1. To understand the primary differences between logistics and supply chain management.
2. To understand the individual processes of supply chain management and their interrelationships within individual companies and across the supply chain.
3. To understand the management components of supply chain management.
4. Familiarize the students with the tools and techniques used in implementing supply chain management.
5. To understand how supply chain strategy can provide competitive advantage for organization.

Outcomes: On completion of the course, learner will be able to:

1. Demonstrate the functional strategy map of supply chain management.
2. Analyze the determinants of Supply Chain and Transportation networks design.
3. Demonstrate the need of coordination and sourcing decisions in supply chain.
4. Understand pricing, revenue management and role of IT in supply chain.
5. Understand various sustainability aspects of a supply chain.

Module	Detailed Contents	Hrs.
01	<p>Introduction to LSCM: Objective, Importance, Decision Phases, Process Views. Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope, Challenges to Achieving and Maintaining Strategic Fit.</p> <p>Supply Chain Drivers and Metrics: Financial Measures of Performance, Drivers of Supply Chain Performance, Framework for Structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing, Pricing.</p> <p>Creating the Responsive Supply Chain: Product push versus demand pull, The Japanese philosophy, The foundations of agility, A route-map to responsiveness.</p> <p>Information Systems in Supply Chain: IT enabled SC, Best practices & benchmarking for SC, towards Green SC, towards World class SCM.</p> <p>Role of IT in Logistics management, the role of information in the virtual supply chain.</p>	09
02	<p>Network Design in the Supply Chain: The Role of Network Design in the Supply Chain, Factors Influencing Network Design Decisions, Framework for Network Design Decisions, Models for Facility Location and Capacity Allocation.</p>	07
03	<p>Designing Global Supply Chain Networks: The Impact of Globalization on Supply Chain Networks, The Offshoring Decision: Total Cost, Risk Management in Global Supply Chains, Discounted Cash Flows, Evaluating Network Design Decisions Using Decision Trees.</p>	07
04	<p>Coordination and Sourcing Decisions in a Supply Chain: Lack of Supply Chain Coordination and the Bullwhip Effect, The Effect on Performance of Lack of Coordination, Obstacles to Coordination in a Supply Chain, Managerial Levers to Achieve Coordination, Continuous Replenishment and Vendor-Managed Inventories, Collaborative Planning, Forecasting, and Replenishment.</p> <p>The Role of Sourcing in a Supply Chain, In-House or Outsource, Third- and Fourth-Party Logistics Providers, Using Total Cost to Score and Assess Suppliers, Supplier Selection—Auctions and Negotiations, Contracts, Risk Sharing and Supply Chain Performance, Design Collaboration, The Procurement Process.</p>	07

05	Pricing and Revenue Management in a Supply Chain: The Role of Pricing and Revenue Management in a Supply Chain, Pricing and Revenue Management for Multiple Customer Segments, Pricing and Revenue Management for Perishable Assets, Pricing and Revenue Management for Seasonal Demand, Pricing and Revenue Management for Bulk and Spot Contracts.	06
06	Sustainable Supply Chain: The Role of Triple Bottom Line, Key Metrics for Sustainability, Greenhouse gases and the supply chain, Reducing the transport-intensity of supply chains, Beyond the carbon footprint, Reduce, reuse, recycle, Sustainability and Supply Chain Drivers.	06

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Sunil Chopra, P. Meindl, Supply Chain Management, Pearson Education Asia.
2. R. P. Mohanty, S. G. Deshmukh, Essentials of Supply Chain management, Phoenix publishing House Pvt. Ltd.
3. Martin Christopher, Logistics and Supply Chain Management, Pitman Publishing.
4. Bowon Kim, Mastering Business in Asia: Supply Chain Management, John Wiley and Sons.
5. Michael Hugos, Essentials of Supply Chain Management, John Wiley and Sons.
6. S.K. Bhattacharya, Logistics Management, Pearson Publication.
7. R.P. Mohanty, S.G. Deshmukh, Supply Chain management- Theories and Practices, Biztantra.

Course Code	Course Name	Credits
MSEPE2022	Machine Health Monitoring Management	03

Objectives:

3. To introduce parameters involved in machine health monitoring management.
4. To make students aware about Instrumentation and Signal Processing in machine health monitoring management.
5. To introduce importance of pattern recognition in machine health monitoring management.
6. To impart knowledge about the application of artificial intelligence techniques in Condition monitoring.
7. To impart knowledge about the application of Machine learning techniques in Condition monitoring.

Outcomes: On completion of the course, learner will be able to:

1. Understand basics of machine health monitoring management.
2. Apply basic Instrumentation and signal processing technique in machine health monitoring management.
3. Recognize pattern in problems involved in machine health monitoring.
4. Gain knowledge about the application of artificial intelligence techniques in Condition monitoring.
5. Gain knowledge about the application of Machine learning techniques in Condition monitoring.

Module	Detailed Contents	Hrs.
01	Introduction to Asset Management: Digital Asset Management, Fixed Asset Management, IT Asset Management, Enterprise Asset Management, Financial Asset Management, Infrastructure Asset Management. Introduction to Maintenance Strategies: Proactive Maintenance, Predictive Maintenance, Planned Maintenance, Condition-Based Maintenance, Responsive Maintenance, Emergency Maintenance.	08
02	Introduction to Machine Health Monitoring Management: Machine failures, Maintenance strategies, machine condition monitoring, Vibration signatures of faults in rotating and reciprocating machines, detection and diagnosis of faults. Fracture mechanics: LEFM, EPFM, Stress intensity factor, crack identification, crack propagation, residual life, residual life determination, Airy's stress function, Westguard's solution.	08
03	Instrumentation and Signal Processing: Types of sensors used in machine health monitoring: vibration, acoustics and noise, acoustic emission, temperature, ultrasonic and infrared sensors - Signal processing: basic signal and systems concepts, time domain analysis, frequency domain analysis, time-frequency analysis.	06
04	Pattern Recognition: Feature extraction and feature selection methods, feature reduction using PCA - discriminant functions and decision boundaries, decision trees, maximum likelihood and nearest neighbour. Application and case studies of machine health monitoring: Bearings, gear boxes, engines, structural health monitoring, machine tool condition monitoring etc.	08
05	Introduction to Condition Monitoring Using Artificial Intelligence: Approaches to Condition Monitoring, Components of Condition Monitoring, Measurement System and Pre-processing, Feature Extraction, Statistical Features, Vibration-based Condition Monitoring, Dissolved Gas Analysis, Artificial Intelligence Approaches, Single AI Approaches, Hybrid AI Approaches.	06

06	Introduction to Machine Learning in Conditioning monitoring: Machine Learning Tools, Artificial Neural Network, Support Vector Machine, Extension Neural Network, Fuzzy ARTMAP. Introduction to Incremental Learning and its Application to Condition Monitoring.	06
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Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Telli Van der Lei, Paulien Herder and YpeWijnia, Asset Management, Springer.
2. Dan B. Marghitu and Mihai DupacButterworthHeinemann, Machine Component Analysis with MATLAB, Elsevier.
3. Juan Carlos A. Jauregui Correa and Alejandro A. Lozano Guzman, Mechanical Vibrations and Condition Monitoring, Academic Press, Elsevier.
4. Hasmat Malik, NuzhatFatema and Atif Iqbal, Intelligent Data-Analytics for Condition Monitoring, Academic Press, Elsevier.
5. Ray S. Beebe, Predictive Maintenance of Pumps Using Condition Monitoring, Elsevier Science.
6. William Bolton Newnes, Instrumentation and Control Systems, Elsevier.
7. Leonidas Deligiannidis and Hamid R. Arabnia Morgan Kaufmann, Emerging Trends in Image Processing, Computer Vision and Pattern Recognition, Elsevier.
8. SergiosTheodoridis, AggelosPikrakis, Konstantinos Koutroumbas and DionisisCavouras, Introduction to Pattern Recognition, Academic Press, Elsevier.
9. Lin C. and Lee G., Neural Fuzzy Systems, Prentice Hall International Inc.
10. Cornelius Leondes, Fuzzy Logic and Expert Systems Applications, Academic Press, Elsevier.

Course Code	Course Name	Credits
MSEPE2023	Smart Industries	03

Objectives:

To provide students with a comprehensive understanding of the smart industry concept, Industry Revolution and Industry 4.0, key drivers and technologies for Smart Industries and Implications of Smart Industry.

Outcomes: On completion of the course, learner will be able to:

1. Understand the basic principles behind smart industry.
2. Identify smart industry key levers and drivers.
3. Understand the supporting technologies for Smart factories.
4. Learn from leading industries and develop smart factory roadmaps.

Module	Detailed Contents	Hrs.
01	Introduction to Smart Industry: Traditional Manufacturing Practices and Limitations, Industry Revolution, Introduction to Fourth Industrial Revolution and Concept of Smart Industry, Journey of Smart Industry, Key Drivers of smart industry/Industry 4.0, Changing Society, Product and Processes, Need for renovating and standardizing production and manufacturing Industries to compete with global challenges, Smart Industry Roadmap, Opportunities and Challenges.	06
02	Supporting Tools and Technologies for Smart Industries – Part I: Introduction to and Use of following Technologies in Smart Industries: Industrial IOT, Sensing and actuation, Autonomous Robots, Additive Manufacturing, Horizontal and Vertical System Integration.	06
03	Supporting Tools and Technologies for Smart Industries – Part II: Introduction to and Use of following Technologies in Smart Industries: AI, Cloud Computing, Big Data and advanced analytics, ICT, Block chain technology, smart grids, Cyber Physical Systems, Augmented Reality and Virtual Reality in Smart Factories.	10
04	Dimensions of Smart Manufacturing and Logistics: Smart manufacturing: Smart and connected products, Smart Machines, Smart materials, smart manufacturing processes, Smart material handling, Sustainable manufacturing and renewable energy. Smart Logistics: Marketing and sales, post sales service and customer relationship management, Smart Money: Digital payment strategy in India.	10
05	Real time tracking and Machine monitoring: Real time tracking of parts, WIP, tools, personnel and associated tools and challenges. Purpose of machine monitoring, tools and functions involved in predictive maintenance of machines.	05
06	Smart Industry applications with case studies: Discussion on case studies and success stories across industries who had developed and implemented several smart factory solutions.	05

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Handbook of Industry 4.0 and SMART Systems, Diego Galar Pascual, Pasquale Daponte and Uday Kumar, CRC Press.
2. Implementing Industry 4.0: The Model Factory as the Key Enabler for the Future of Manufacturing, Carlos Toro, Wei Wang, and Humza Akhtar, Springer Publications.
3. Smart Digital Manufacturing: A guide of digital transformation with real case studies across industries, Rene Wolf and RaffaelloLepratti, Wiley- VCH publications.
4. Intelligent Transportation Systems: Smart and Green Infrastructure Design, Frank Kreith, Mechanical Engineering Series, Taylor and Francis Group.
5. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, Pethuru Raj and Anupama C. Raman, CRC Press.
6. Internet of Things, Jeeva Jose, Khanna Publishing House, Delhi.
7. Block Chain Basics, Daniel Drescher, Apress.
8. Sensors and Actuators, C.W. De Silava, CRC Press.
9. Introduction to sensors, J. Vetelino and A. Reghu, CRC Press.
10. Smart Plant Factory: The Next Generation Indoor Vertical Farms, ToyokiKozai, Springer Nature Publications.
11. Introduction to Industry 4.0 and Industrial Internet of Things, Prof. Sudip Misra, NPTEL Course, IIT Kharagpur.
12. Smart Industry & Smart Education, Michael E. Auer and Reinhard Langmann – Springer Publications.
13. Cyber physical systems in the context of Industry 4.0, IEEE International Conference on Automation, Quality and Testing, Robotics, 2014.

Course Code	Course Name	Credits
MSEIE2011	Project Management	03

Objectives:

1. To familiarize the students with the use of a structured methodology/approach for each and every unique project undertaken, including utilizing project management concepts, tools and techniques.
2. To appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

Outcomes: On completion of the course, learner will be able to:

1. Apply selection criteria and select an appropriate project from different options.
2. Write work break down structure for a project and develop a schedule based on it.
3. Identify opportunities and threats to the project and decide an approach to deal with them strategically.
4. Use Earned value technique and determine & predict status of the project.
5. Capture lessons learned during project phases and document them for future reference.

Module	Detailed Contents	Hrs.
01	Project Management Foundation: Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical) Project phases and stage gate process. Role of project manager. Negotiations and resolving conflicts. Project management in various organization structures. PM knowledge areas as per Project Management Institute (PMI).	07
02	Initiating Projects: How to get a project started, Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter, Project proposal. Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics.	06
03	Project Planning and Scheduling: Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart. Introduction to Project Management Information System (PMIS).	07
04	Planning Projects: Crashing project time, Resource loading and leveling, Goldratt's critical chain, Project Stakeholders and Communication plan. Risk Management in projects: Risk management planning, Risk identification and risk register. Qualitative and quantitative risk assessment, Probability and impact matrix. Risk response strategies for positive and negative risks.	08
05	Executing Projects: Planning monitoring and controlling cycle. Information needs and reporting, engaging with all stakeholders of the projects. Team management, communication and project meetings. Monitoring and Controlling Projects: Earned Value Management techniques for measuring value of work completed, Using milestones for measurement, change requests and scope creep. Project audit. Project Contracting: Project procurement management, contracting and outsourcing,	07

06	<p>Project Leadership and Ethics: Introduction to project leadership, ethics in projects. Multicultural and virtual projects.</p> <p>Closing the Project: Customer acceptance, Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report, doing a lessons learned analysis, acknowledging successes and failures, Project management templates and other resources, Managing without authority, Areas of further study.</p>	07
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Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Jack Meredith & Samuel Mantel, Project Management: A managerial approach, Wiley India, 7thEd.
2. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 5th Ed, Project Management Institute PA, USA.
3. Gido Clements, Project Management, Cengage Learning.
4. Gopalan, Project Management, Wiley, India.
5. Dennis Lock, Project Management, Gower Publishing England, 9th Ed.

Course Code	Course Name	Credits
MSEIE2012	Finance Management	03

Objectives:

1. Overview of Indian financial system, instruments and market.
2. Basic concepts of value of money, returns and risks, corporate finance, working capital and its management.
3. Knowledge about sources of finance, capital structure, dividend policy.

Outcomes: On completion of the course, learner will be able to:

1. Understand Indian finance system and corporate finance.
2. Take investment, finance as well as dividend decisions.

Module	Detailed Contents	Hrs.
01	<p>Overview of Indian Financial System: Characteristics, Components and Functions of Financial System.</p> <p>Financial Instruments: Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills.</p> <p>Financial Markets: Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market.</p> <p>Financial Institutions: Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment-Merchant Banks and Stock Exchanges.</p>	08
02	<p>Concepts of Returns and Risks: Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio.</p> <p>Time Value of Money: Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding and Continuous Discounting.</p>	07
03	<p>Overview of Corporate Finance: Objectives of Corporate Finance; Functions of Corporate Finance— Investment Decision, Financing Decision, and Dividend Decision.</p> <p>Financial Ratio Analysis: Overview of Financial Statements—Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis.</p>	06
04	<p>Capital Budgeting: Meaning and Importance of Capital Budgeting; Inputs for Capital Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR).</p> <p>Working Capital Management: Concepts of Meaning Working Capital; Importance of Working Capital Management; Factors Affecting an Entity's Working Capital Needs; Estimation of Working Capital Requirements; Management of Inventories; Management of Receivables; and Management of Cash and Marketable Securities.</p>	08
05	<p>Sources of Finance: Long Term Sources—Equity, Debt, and Hybrids; Mezzanine Finance; Sources of Short Term Finance—Trade Credit, Bank Finance, Commercial Paper; Project Finance.</p> <p>Capital Structure: Factors Affecting an Entity's Capital Structure; Overview of Capital Structure Theories and Approaches— Net Income Approach, Net Operating Income Approach; Traditional Approach, and Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value; Concept of Optimal Capital Structure.</p>	07

06	Dividend Policy: Meaning and Importance of Dividend Policy; Factors Affecting an Entity's Dividend Decision; Overview of Dividend Policy Theories and Approaches— Gordon's Approach, Walter's Approach, and Modigliani-Miller Approach.	06
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Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Fundamentals of Financial Management, 13th Edition (2015) by Eugene F. Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.
2. Analysis for Financial Management, 10th Edition (2013) by Robert C. Higgins; Publishers: McGraw Hill Education, New Delhi.
3. Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education, New Delhi.
4. Financial Management, 11th Edition (2015) by I. M. Pandey; Publisher: S. Chand (G/L) & Company Limited, New Delhi.

Course Code	Course Name	Credits
MSEIE2013	Entrepreneurship Development and Management	03

Objectives:

1. To acquaint with entrepreneurship and management of business.
2. Understand Indian environment for entrepreneurship.
3. Idea of EDP, MSME.

Outcomes: On completion of the course, learner will be able to:

1. Understand the concept of business plan and ownerships.
2. Interpret key regulations and legal aspects of entrepreneurship in India.
3. Understand government policies for entrepreneurs.

Module	Detailed Contents	Hrs.
01	Overview of Entrepreneurship: Definitions, Roles and Functions/Values of Entrepreneurship, History of Entrepreneurship Development, Role of Entrepreneurship in the National Economy, Functions of an Entrepreneur, Entrepreneurship and Forms of Business Ownership Role of Money and Capital Markets in Entrepreneurial Development: Contribution of Government Agencies in Sourcing information for Entrepreneurship.	06
02	Business Plans and Importance of Capital to Entrepreneurship: Preliminary and Marketing Plans, Management and Personnel, Start-up Costs and Financing as well as Projected Financial Statements, Legal Section, Insurance, Suppliers and Risks, Assumptions and Conclusion, Capital and its Importance to the Entrepreneur Entrepreneurship And Business Development: Starting a New Business, Buying an Existing Business, New Product Development, Business Growth and the Entrepreneur Law and its Relevance to Business Operations.	08
03	Women's Entrepreneurship Development, Social entrepreneurship-role and need, EDP cell, role of sustainability and sustainable development for SMEs, case studies, exercises.	06
04	Indian Environment for Entrepreneurship: Key regulations and legal aspects, MSMED Act 2006 and its implications, schemes and policies of the Ministry of MSME, role and responsibilities of various government organisations, departments, banks etc., Role of State governments in terms of infrastructure developments and support etc., Public private partnerships, National Skill development Mission, Credit Guarantee Fund, PMEGP, discussions, group exercises. etc.	08
05	Effective Management of Business: Issues and problems faced by micro and small enterprises and effective management of M and S enterprises (risk management, credit availability, technology innovation, supply chain management, linkage with large industries), exercises, e-Marketing.	07
06	Achieving Success in The Small Business: Stages of the small business life cycle, four types of firm-level growth strategies, Options – harvesting or closing small business Critical Success factors of small business.	07

Assessment:**Internal:**

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Poornima Charantimath, Entrepreneurship development- Small Business Enterprise, Pearson.
2. Education Robert D. Hisrich, Michael P Peters, Dean A. Shapherd, Entrepreneurship, latest edition, The McGrawHill Company.
3. Dr. T. N. Chhabra, Entrepreneurship Development, Sun India Publications, New Delhi.
4. Dr. C. N. Prasad, Small and Medium Enterprises in Global Perspective, New century Publications, New Delhi.
5. Vasant Desai, Entrepreneurial development and management, Himalaya Publishing House.
6. MaddhurimaLall, ShikahSahai, Entrepreneurship, Excel Books.
7. Rashmi Bansal, STAY hungry STAY foolish, CIIE, IIM Ahmedabad.
8. Law and Practice relating to Micro, Small and Medium enterprises, Taxmann Publication Ltd.
9. Kurakto, Entrepreneurship- Principles and Practices, Thomson Publication.
10. LaghuUdyogSamachar
11. www.msme.gov.in
12. www.dcmesme.gov.in
13. www.msmetraining.gov.in

Course Code	Course Name	Credits
MSEIE2014	Human Resource Management	03

Objectives:

1. To introduce the students with basic concepts, techniques and practices of the human resource management.
2. To provide opportunity of learning Human resource management (HRM) processes, related with the functions, and challenges in the emerging perspective of today's organizations.
3. To familiarize the students about the latest developments, trends & different aspects of HRM.
4. To acquaint the student with the importance of inter-personal & inter-group behavioral skills in an organizational setting required for future stable engineers, leaders and managers.

Outcomes: On completion of the course, learner will be able to:

1. Understand the concepts, aspects, techniques and practices of the human resource management.
2. Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective.
3. Gain knowledge about the latest developments and trends in HRM.
4. Apply the knowledge of behavioral skills learnt and integrate it with in inter personal and intergroup environment emerging as future stable engineers and managers

Module	Detailed Contents	Hrs.
01	Introduction to HR: Human Resource Management- Concept, Scope and Importance, Interdisciplinary Approach Relationship with other Sciences, Competencies of HR Manager, HRM functions. Human resource development (HRD): changing role of HRM – Human resource Planning, Technological change, Restructuring and rightsizing, Empowerment, TQM, Managing ethical issues.	06
02	Organizational Behavior (OB): Introduction to OB Origin, Nature and Scope of Organizational Behavior, Relevance to Organizational Effectiveness and Contemporary issues. Personality: Meaning and Determinants of Personality, Personality development, Personality Types, Assessment of Personality Traits for Increasing Self Awareness. Perception: Attitude and Value, Effect of perception on Individual Decision making, Attitude and Behavior. Motivation: Theories of Motivation and their Applications for Behavioral Change (Maslow, Herzberg, McGregor); Group Behavior and Group Dynamics: Work groups formal and informal groups and stages of group development. Team Effectiveness: High performing teams, Team Roles, cross functional and self-directed team. Case study.	08
03	Organizational Structure & Design: Structure, size, technology, Environment of organization; Organizational Roles & conflicts: Concept of roles; role dynamics; role conflicts and stress. Leadership: Concepts and skills of leadership, Leadership and managerial roles, Leadership styles and contemporary issues in leadership. Power and Politics: Sources and uses of power; Politics at workplace, Tactics and strategies.	06

04	Human resource Planning: Recruitment and Selection process, Job-enrichment, Empowerment – Job Satisfaction, employee morale. Performance Appraisal Systems: Traditional & modern methods, Performance Counseling, Career Planning. Training & Development: Identification of Training Needs, Training Methods.	07
05	Emerging Trends in HR: Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development, managing processes & transformation in HR. Organizational Change, Culture, Environment. Cross Cultural Leadership and Decision Making: Cross Cultural Communication and diversity at work, Causes of diversity, managing diversity with special reference to handicapped, women and ageing people, intra company cultural difference in employee motivation.	07
06	HR & MIS: Need, purpose, objective and role of information system in HR, Applications in HRD in various industries (e.g. manufacturing R&D, Public Transport, Hospitals, Hotels and service industries). Strategic HRM: Role of Strategic HRM in the modern business world, Concept of Strategy, Strategic Management Process, Approaches to Strategic Decision Making; Strategic Intent – Corporate Mission, Vision, Objectives and Goals. Labor Laws & Industrial Relations: Evolution of IR, IR issues in organizations, Overview of Labor Laws in India; Industrial Disputes Act, Trade Unions Act, Shops and Establishments Act.	08

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Stephen Robbins, Organizational Behavior, 16th Ed., 2013.
2. V. S. P. Rao, Human Resource Management, 3rd Ed., 2010, Excel publishing.
3. Aswathapa, Human resource management: Text & cases, 6th Ed., 2011.
4. C. B. Mamoria and S. V. Gankar, Dynamics of Industrial Relations in India, 15th Ed., 2015, Himalaya Publishing, 15th edition, 2015.
5. P. Subba Rao, Essentials of Human Resource management and Industrial relations, 5th Ed., 2013, Himalaya Publishing.
6. Laurie Mullins, Management & Organizational Behavior, Latest Ed., 2016, Pearson Publications.

Course Code	Course Name	Credits
MSEIE2015	Professional Ethics and Corporate Social Responsibility (CSR)	03

Objectives:

1. To understand professional ethics in business.
2. To recognized corporate social responsibility.

Outcomes: On completion of the course, learner will be able to:

1. Understand rights and duties of business.
2. Distinguish different aspects of corporate social responsibility.
3. Demonstrate professional ethics.
4. Understand legal aspects of corporate social responsibility.

Module	Detailed Contents	Hrs.
01	Professional Ethics and Business: The Nature of Business Ethics, Ethical Issues in Business, Moral Responsibility and Blame, Utilitarianism: Weighing Social Costs and Benefits, Rights and Duties of Business.	07
02	Professional Ethics in the Marketplace: Perfect Competition, Monopoly Competition, Oligopolistic Competition, Oligopolies and Public Policy Professional Ethics and the Environment: Dimensions of Pollution and Resource Depletion, Ethics of Pollution Control, Ethics of Conserving Depletable Resources.	07
03	Professional Ethics of Consumer Protection: Markets and Consumer Protection, Contract View of Business Firm's Duties to Consumers, Due Care Theory, Advertising Ethics, Consumer Privacy Professional Ethics of Job Discrimination: Nature of Job Discrimination, Extent of Discrimination, Reservation of Jobs.	07
04	Introduction to Corporate Social Responsibility: Potential Business Benefits—Triple bottom line, Human resources, Risk management, Supplier relations, Criticisms and concerns—Nature of business, Motives, Misdirection. Trajectory of Corporate Social Responsibility in India.	07
05	Corporate Social Responsibility: Articulation of Gandhian Trusteeship Corporate Social Responsibility and Small and Medium Enterprises (SMEs) in India, Corporate Social Responsibility and Public-Private Partnership (PPP) in India.	07
06	Corporate Social Responsibility in Globalizing India: Corporate Social Responsibility Voluntary Guidelines, 2009 issued by the Ministry of Corporate Affairs, Government of India, Legal Aspects of Corporate Social Responsibility—Companies Act, 2013.	07

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Business Ethics: Texts and Cases from the Indian Perspective (2013) by Ananda Das Gupta; Publisher: Springer.
2. Corporate Social Responsibility: Readings and Cases in a Global Context (2007) by Andrew Crane, Dirk Matten, Laura Spence; Publisher: Routledge.
3. Business Ethics: Concepts and Cases, 7th Edition (2011) by Manuel G. Velasquez; Publisher: Pearson, New Delhi.
4. Corporate Social Responsibility in India (2015) by Bidyut Chakrabarty, Routledge, New Delhi.

Course Code	Course Name	Credits
MSEIE2016	Research Methodology	03

Objectives:

1. To understand Research and Research Process.
2. To acquaint students with identifying problems for research and develop research strategies.
3. To familiarize students with the techniques of data collection, analysis of data and interpretation.

Outcomes: On completion of the course, learner will be able to:

1. Prepare a preliminary research design for projects in their subject matter areas.
2. Accurately collect, analyze and report data.
3. Present complex data or situations clearly.
4. Review and analyze research findings.

Module	Detailed Contents	Hrs.
01	Introduction and Basic Research Concepts: Research – Definition, Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle, Research methods vs Methodology, Need of Research in Business and Social Sciences, Objectives of Research, Issues and Problems in Research, Characteristics of Research: Systematic, Valid, Verifiable, Empirical and Critical.	07
02	Types of Research: Basic Research, Applied Research, Descriptive Research, Analytical Research, Empirical Research, Qualitative and Quantitative Approaches.	06
03	Research Design and Sample Design: Research Design – Meaning, Types and Significance, Sample Design – Meaning and Significance Essentials of a good sampling Stages in Sample Design Sampling methods/techniques Sampling Errors.	07
04	Research Methodology: Meaning of Research Methodology, Stages in Scientific Research Process: Identification and Selection of Research Problem, Formulation of Research Problem, Review of Literature, Formulation of Hypothesis, Formulation of research Design, Sample Design, Data Collection, Data Analysis, Hypothesis testing and Interpretation of Data, Preparation of Research Report.	08
05	Formulating Research Problem: Considerations- Relevance, Interest, Data Availability, Choice of data, Analysis of data, Generalization and Interpretation of analysis.	07
06	Outcome of Research: Preparation of the report on conclusion reached, Validity Testing & Ethical Issues, Suggestions and Recommendation.	07

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers Distributors.
2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nded), Singapore, Pearson Education.

Course Code	Course Name	Credits
MSEIE2017	IPR and Patenting	03

Objectives:

1. To understand intellectual property rights protection system.
2. To promote the knowledge of Intellectual Property Laws of India as well as International treaty procedures.
3. To get acquaintance with Patent search and patent filing procedure and applications.

Outcomes: On completion of the course, learner will be able to:

1. Understand Intellectual Property assets.
2. Assist individuals and organizations in capacity building.
3. Work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting.

Module	Detailed Contents	Hrs.
01	Introduction to Intellectual Property Rights (IPR): Meaning of IPR, Different category of IPR instruments - Patents, Trademarks, Copyrights, Industrial Designs, Plant variety protection, Geographical indications, Transfer of technology, etc. Importance of IPR in Modern Global Economic Environment: Theories of IPR, Philosophical aspects of IPR laws, Need for IPR, IPR as an instrument of development.	07
02	Enforcement of Intellectual Property Rights: Introduction, Magnitude of problem, Factors that create and sustain counterfeiting/piracy, International agreements, International organizations (e.g. WIPO, WTO) active in IPR enforcement. Indian Scenario of IPR: Introduction, History of IPR in India, Overview of IP laws in India, Indian IPR, Administrative Machinery, Major international treaties signed by India, Procedure for submitting patent and Enforcement of IPR at national level, etc.	08
03	Emerging Issues in IPR: Challenges for IP in digital economy, e-commerce, human genome, biodiversity and traditional knowledge, etc.	07
04	Basics of Patents: Definition of Patents, Conditions of patentability, Patentable and non-patentable inventions, Types of patent applications (e.g. Patent of addition, etc.), Process Patent and Product Patent, Precautions while patenting, Patent specification Patent claims, Disclosures and non-disclosures, Patent rights and infringement, Method of getting a patent.	06
05	Patent Rules: Indian patent act, European scenario, US scenario, Australia scenario, Japan scenario, Chinese scenario, Multilateral treaties where India is a member (TRIPS agreement, Paris convention etc.).	06
06	Procedure for Filing a Patent (National and International): Legislation and Salient Features, Patent Search, Drafting and Filing Patent Applications, Processing of patent, Patent Litigation, Patent Publication, Time frame and cost, Patent Licensing, Patent Infringement. Patent databases: Important websites, Searching international databases.	08

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Rajkumar S. Adukia, 2007, A Handbook on Laws Relating to Intellectual Property Rights in India, The Institute of Chartered Accountants of India.
2. Keayla B. K., Patent system and related issues at a glance, Published by National Working Group on Patent Laws.
3. T. Sengupta, 2011, Intellectual Property Law in India, Kluwer Law International.
4. Tzen Wong and Graham Dutfield, 2010, Intellectual Property and Human Development: Current Trends and Future Scenario, Cambridge University Press.
5. Cornish, William Rodolph & Llewelyn, David. 2010, Intellectual Property: Patents, Copyrights, Trade Marks and Allied Right, 7th Edition, Sweet & Maxwell.
6. LousHarns, 2012, The enforcement of Intellectual Property Rights: A Case Book, 3rd Edition, WIPO.
7. Prabhuddha Ganguli, 2012, Intellectual Property Rights, 1st Edition, TMH.
8. R. Radhakrishnan & S Balasubramanian, 2012, Intellectual Property Rights, 1st Edition, Excel Books.
9. M. Ashok Kumar and Mohd Iqbal Ali, 2-11, Intellectual Property Rights, 2nd Edition, Serial Publications.
10. Kompal Bansal and Praishit Bansal, 2012, Fundamentals of IPR for Engineers, 1st Edition, BS Publications.
11. Entrepreneurship Development and IPR Unit, BITS Pilani, 2007, A Manual on Intellectual Property Rights.
12. Mathew Y. Maa, 2009, Fundamentals of Patenting and Licensing for Scientists and Engineers, World Scientific Publishing Company.
13. N. S. Rathore, S. M. Mathur, Priti Mathur, Anshul Rathi, IPR: Drafting, Interpretation of Patent Specifications and Claims, New India Publishing Agency.
14. Vivien Irish, 2005, Intellectual Property Rights for Engineers, IET.
15. Howard B. Rockman, 2004, Intellectual Property Law for Engineers and scientists, Wiley-IEEE Press.

Course Code	Course Name	Credits
MSEIE2018	Digital Business Management	03

Objectives:

1. To familiarize with digital business concept.
2. To acquaint with E-commerce.
3. To give insights into E-business and its strategies.

Outcomes: On completion of the course, learner will be able to:

1. Identify drivers of digital business.
2. Illustrate various approaches and techniques for E-business and management.
3. Prepare E-business plan.

Module	Detailed Contents	Hrs.
01	Introduction to Digital Business: Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts Difference between physical economy and digital economy. Drivers of digital business: Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things(digitally intelligent machines/services) Opportunities and Challenges in Digital Business.	07
02	Overview of E-Commerce: E-Commerce- Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement. B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC and Corporate portals. Other E-C models and applications, innovative EC System-From E-government and learning to C2C, mobile commerce and pervasive computing. EC Strategy and Implementation-EC strategy and global EC, Economics and Justification of EC, Using Affiliate marketing to promote your e-commerce business, Launching a successful online business and EC project, Legal, Ethics and Societal impacts of EC.	08
03	Digital Business Support services: ERP as e –business backbone, knowledge Tope Apps, Information and referral system. Application Development: Building Digital business Applications and Infrastructure.	07
04	Managing E-Business: Managing Knowledge, Management skills for e-business, Managing Risks in e –business Security Threats to e-business -Security Overview, Electronic Commerce Threats, Encryption, Cryptography, Public Key and Private Key Cryptography, Digital Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP, SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Prominent Cryptographic Applications.	07
05	E-Business Strategy: E-business Strategic formulation – Analysis of Company’s Internal and external environment, Selection of strategy, E-business strategy into Action, challenges and E-Transition (Process of Digital Transformation).	07
06	Materializing e-business: From Idea to Realization-Business plan preparation Case Studies and presentations.	06

Assessment:**Internal:**

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. A textbook on E-commerce, Er. Arunrajan Mishra, Dr. W. K. Sarwade, Neha Publishers & Distributors, 2011.
2. E-commerce from vision to fulfilment, Elias M. Awad, PHI-Restricted, 2002.
3. Digital Business and E-Commerce Management, 6th Ed., Dave Chaffey, Pearson, August 2014.
4. Introduction to E-Business-Management and Strategy, Colin Combe, Elsevier, 2006.
5. Digital Business Concepts and Strategy, Eloise Coupey, 2nd Edition, Pearson.
6. Trend and Challenges in Digital Business Innovation, Vinocenzo Morabito, Springer.
7. Digital Business Discourse Erika Darics, April 2015, Palgrave Macmillan.
8. E-Governance-Challenges and Opportunities in: Proceedings in 2nd International Conference theory and practice of Electronic Governance.
9. Perspectives the Digital Enterprise – A framework for Transformation, TCS consulting journal, Vol.5.
10. Measuring Digital Economy – A new perspective – DOI:10.1787/9789264221796-enOECD Publishing.

Course Code	Course Name	Credits
MSEIE2019	Environmental Management	03

Objectives:

1. Understand and identify environmental issues relevant to India and global concerns.
2. Learn concepts of ecology.
3. Familiarise environment related legislations.

Outcomes: On completion of the course, learner will be able to:

1. Understand the concept of environmental management.
2. Understand ecosystem and interdependence, food chain, etc.
3. Understand and interpret environment related legislations.

Module	Detailed Contents	Hrs.
01	Introduction and Definition of Environment: Significance of Environment Management for contemporary managers, Career opportunities. Environmental issues relevant to India, Sustainable Development, The Energy scenario.	06
02	Global Environmental concerns: Global Warming, Acid Rain, Ozone Depletion, Hazardous Wastes, Endangered life-species, Loss of Biodiversity, Industrial/Manmade disasters, Atomic/Biomedical hazards, etc.	08
03	Concepts of Ecology: Ecosystems and interdependence between living organisms, habitats, limiting factors, carrying capacity, food chain, etc.	07
04	Scope of Environment Management, Role & functions of Government as a planning and regulating agency, Environment Quality Management and Corporate Environmental Responsibility.	08
05	Total Quality Environmental Management, ISO-14000, EMS certification.	06
06	General overview of major legislations like Environment Protection Act, Air (P & CP) Act, Water (P & CP) Act, Wildlife Protection Act, Forest Act, Factories Act, etc.	07

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum Two Modules) and the other is either a class test or assignment on live problems or course project.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six question.
2. All question carry equal marks.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
4. Only Four questions need to be solved.

References:

1. Environmental Management: Principles and Practice, C. J. Barrow, Routledge Publishers London, 1999.
2. A Handbook of Environmental Management Edited by Jon C. Lovett and David G. Ockwell, Edward Elgar Publishing.
3. Environmental Management, T. V. Ramachandra and Vijay Kulkarni, TERI Press.
4. Indian Standard Environmental Management Systems — Requirements with Guidance for Use, Bureau of Indian Standards, February 2005.
5. Environmental Management: An Indian Perspective, S. N. Chary and Vinod Vyasulu, Macmillan India, 2000. Introduction to Environmental Management, Mary K. Theodore and Louise Theodore, CRC Press.
6. Environment and Ecology, Majid Hussain, 3rd Ed. Access Publishing, 2015.

Course Code	Course Name	Credits
MSEL201	Industrial Automation Lab	01

Module	Detailed Contents	Lab. Sessions
01	Simulation of basic hydraulic, pneumatic and electric and combination circuits using software like automation studio etc.	05
02	Design and Testing of hydraulic, pneumatic, electro pneumatic and PLC circuits.	03
03	Simulation of Nyquist plots and State-space representation.	02
04	Development of Ladder logic programmer for control of real time processes.	03

Assessment:

End Semester Examination: Practical/Oral examination is to be conducted by pair of internal and external examiners

Course Code	Course Name	Credits
MSESBL201	Manufacturing Simulation Lab	02

Module	Detailed Contents	Lab. Sessions
01	Simulation in the Fields of Forming considering any of the following: Cold Forming, Hot Forging, Ring Rolling, Sheet Metal Forming, Rolling.	05
02	Simulation in the Fields of Joining considering any of the following: Arc Welding, Mechanical Joining.	04
03	Simulation in the Fields of Additive Manufacturing considering any of the following Fields of application: Power bed Fusion, Deposition method, Metal Binder Jetting.	04

The experiments can be performed on SIMUFACT, ANSYS or Any other relevant software.

Assessment:

End Semester Examination: Practical/Oral examination is to be conducted by pair of internal and external examiners