

UNIVERSITY OF MUMBAI



Revised syllabus (Rev- 2016) from Academic Year 2016 -17

Under

FACULTY OF TECHNOLOGY

Production Engineering

Second Year with Effect from AY 2017-18

Third Year with Effect from AY 2018-19

Final Year with Effect from AY 2019-20

As per **Choice Based Credit and Grading System**

with effect from the AY 2016-17

Co-ordinator, Faculty of Technology's Preamble:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. 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 Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEOs) and give freedom to affiliated Institutes to add few (PEOs). It is also resolved that course objectives and course outcomes are to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth and approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges and experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, and developed curriculum accordingly. In addition to outcome based education, semester based credit and grading system is also introduced to ensure quality of engineering education.

Choice based Credit and Grading system enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes and Faculty of Technology has devised a transparent credit assignment policy and adopted ten points scale to grade learner's performance. Credit assignment for courses is based on 15 weeks teaching learning process, however content of courses is to be taught in 12-13 weeks and remaining 2-3 weeks to be utilized for revision, guest lectures, coverage of content beyond syllabus etc.

Choice based Credit and grading system is implemented from the academic year 2016-17 through optional courses at department and institute level

Dr. S. K. Ukarande

Co-ordinator,

Faculty of Technology,

Member - Academic Council

University of Mumbai, Mumbai

Chairman's Preamble:

Engineering education in India is expanding and is set to increase manifold. The major challenge in the current scenario is to ensure quality to the stakeholders along with expansion. To meet this challenge, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education and reflects the fact that in achieving recognition, the institution or program of study is committed and open to external review to meet certain minimum specified standards. The major emphasis of this accreditation process is to measure the outcomes of the program that is being accredited. Program outcomes are essentially a range of skills and knowledge that a student will have at the time of graduation from the program. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating the philosophy of outcome based education in the process of curriculum development.

As the Chairman, Board of Studies in Mechanical Engineering of the University of Mumbai, I am happy to state here that, the Program Educational Objectives of the Undergraduate Program in Production Engineering, which comes under the same board, were finalized during the multiple brain storming sessions, which was attended by more than 25 members from different affiliated Institutes of the University. They are either Heads of Departments or their senior representatives from the Department of Production Engineering. The Program Educational Objectives finalized for the undergraduate program in Production Engineering are listed below;

1. To prepare the Learner with a sound foundation in the mathematical, scientific and engineering fundamentals related to Manufacturing and its strategies.
2. To motivate the Learner in the art of self-learning and to use modern tools for solving real life problems.
3. To inculcate a professional and ethical attitude, good leadership qualities and commitment to social responsibilities in the Learner's thought process.
4. To prepare the learner to face industrial challenges through practical exposure in an industrial environment.
5. To prepare the Learner for a successful career in Indian and Multinational Organizations.

In addition to Program Educational Objectives, for each course of the program, objectives and expected outcomes from a learner's point of view are also included in the curriculum to support the philosophy of outcome based education. I strongly believe that even a small step taken in the right direction will definitely help in providing quality education to the major stakeholders.

Dr. S. M. Khot

Chairman, Board of Studies in Mechanical Engineering, University of Mumbai

B.E. (Production) Sem.-VIII

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned				Total
		Theory	Pract		Theory	Pract			
PEC801	Fluid Power & Automation	04	--		04	--			04
PEC802	Industrial Engineering and Human Resource Management	04	--		04	--			04
PEC803	Economics, Finance, Accounting & Costing	04	--		04	--			04
PEDLO 803X	Department Level Optional Course III	04	--		04	--			04
ILO802X	Institute Level Optional courses	03	--		03	--			03
PEL801	Fluid Power & Automation Laboratory	--	02		--	01			01
PEL802	Industrial Engineering and Human Resource Management Laboratory	--	02		--	01			01
PEL803	Economics, Finance, Accounting & Costing Tutorial	--	02		--	01			01
	Total	19	06		19	03			22
		Examination Scheme							
Course Code	Course Name	Theory					Term Work	Pract. /Oral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test1	Test 2	Avg.					
PEC801	Fluid Power & Automation	20	20	20	80	03	--	--	100
PEC802	Industrial Engineering and Human Resource Management	20	20	20	80	03	--	--	100
PEC803	Economics, Finance, Accounting & Costing	20	20	20	80	03	--	--	100
PEDLO 803X	Department Level Optional Course III	20	20	20	80	03	--	--	100
ILO802X	Institute Level Optional courses	20	20	20	80	03	--	--	100
PEL801	Fluid Power & Automation Laboratory	--	--	--	--	--	25	25	50
PEL802	Industrial Engineering and Human Resource Management Laboratory	--	--	--	--	--	25	25	50
PEL803	Economics, Finance, Accounting & Costing Tutorial	--	--	--	--	--	25	--	25
	Total			100	400		75	50	625

Course Code	Department Level Optional Course III	Course Code	Institute Level Elective Course II[#]
PEDLO8011	Product Design and Industrial Marketing	ILO8021	Project Management
PEDLO8012	World Class Manufacturing	ILO8022	Finance Management
PEDLO8013	Logistics and Supply Chain Management	ILO8023	Entrepreneurship Development and Management
PEDLO8014	Plant Engineering	ILO8024	Human Resource Management
PEDLO8015	Process Control and Instrumentation	ILO8025	Professional Ethics and CSR
		ILO8026	Research Methodology
		ILO8027	IPR and Patenting
		ILO8028	Digital Business Management
		ILO8029	Environmental Management

Course Code	Course Name	Credits
PEC801	Fluid Power Automation	04

Objectives:

1. To familiarize with the basic concepts of industrial automation.
2. To acquaint with the concept of low cost automation with pneumatic and hydraulic systems.
3. To familiarize with the elements of electrical control systems.
4. To acquaint with the concepts related to fluid power.

Outcomes: Learner will be able to...

1. Apply automation techniques in small manufacturing set-ups.
2. Illustrate the working principles of fluid power accessories like pumps, motors.
3. Analyse pneumatic and hydraulic circuits of medium complexity.
4. Illustrate the working of control and regulation elements used in pneumatic and hydraulic circuits.
5. Demonstrate the use of electrical and electronics control in pneumatic and hydraulic circuits.
6. Analyse the benefits and challenges of Digital Hydraulics.

Module	Contents	Hrs.
01	Introduction to Fluid Power Automation: Definition; Automation in production systems; Automation principles and strategies; Levels of automation; Types of automation; Benefits and Impact of Automation on Manufacturing and Process Industries. Hydraulic & Pneumatic Comparison – ISO symbols for fluid power elements, Hydraulic, pneumatics – Selection criteria.	08
02	Fluid Power Generating/Utilizing Elements Hydraulic pumps and motor, gears, vane, piston. Pumps & motors-selection and specification-Drive characteristics – Linear actuator – Types, mounting details, cushioning – power packs – construction. Reservoir capacity, heat dissipation, accumulators and their types. Applications of Accumulator circuits. Standard circuit symbols, circuit (flow) analysis. Different types of compressors and Actuators in Pneumatics, their applications and use of their ISO symbols.	06
03	Control And Regulation Elements Hydraulic and pneumatic direction, flow and pressure control valves. Methods of actuation, types, sizing of ports – pressure and temperature compensation, overlapped and under lapped spool valves – operating characteristics-electro hydraulic and electro-pneumatic servo valves-different types-characteristics and performance. Difference between Servo and Proportional hydraulic valve.	06
04	Circuit Design Basic Hydraulic Circuits: Meter in, meter out and Bleed off circuits; Intensifier circuits, Regenerative Circuit, Counter balance valve circuit and sequencing circuits. Pneumatic Circuit Designing: Design of Pneumatic sequencing circuits using Cascade method and Shift register method (up to 3 cylinders).	12

05	Sensors and Transducers: Performance Terminology; Displacement, position and Proximity Sensors; Velocity and Motion Sensors; Force and Fluid Pressure Sensors; Liquid level and Flow sensors; Temperature and light Sensors; Control of stepper motors.	04
06	Electro Pneumatics & Electronic Control Of Hydraulic and Pneumatic Circuits: Design of Electro-Pneumatic Circuits using single solenoid and double solenoid valves; with and without grouping; Design of Pneumatic circuits using PLC Control (ladder programming only) up to 2 cylinders, with applications of Timers and Counters and concept of Flag and latching. Digital Hydraulics: Definition & Introduction, Digital vs. analog hydraulic control, different ways to realize motion control with on/off valves, Benefits and challenges of digital Hydraulics, Application case studies.	12

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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**

Reference Books:

1. Mikell P. Groover, *Automation, Production Systems, and Computer-integrated Manufacturing (3rd Edition)*, PHI Learning Private Limited, New Delhi, 2008.
2. Joji P., *Pneumatic Controls*, Wiley India Pvt. Ltd., 2008.
3. Peter Croser, Frank Ebel, *Pneumatics Basic Level*, Festo Didactic GmbH & Co. Germany.
4. Prede G., Scholz D., *Electropneumatics Basic Level*, Festo Didactic GmbH & Co. Germany.
5. Bliesener R., Ebel F., Löffler C., Plagemann B., Regber H., Terzi E. V., Winter A., *Programmable logic controllers Basic Level* Festo Didactic GmbH & Co. Germany.
6. S.Ilango and V. Soundararajan, *Introduction to Hydraulics and Pneumatics*, PHI Learning Pvt. Ltd. New Delhi.
7. *Industrial Hydraulics Manual*, Sperry & Vickers Co.
8. Shanmuga Sundaram.K, *Hydraulic and Pneumatic controls*, Chand& Co. 2006.

Course Code	Course Name	Credits
PEC802	Industrial Engineering and Human Resource Management	04

Objectives

1. To familiarize with the practices of industrial engineering and human resource management.
2. To familiarize with the concepts of strategic objectives, optimization of human resource potential and enhancing of human effectiveness.

Outcomes learner will be able to...

1. Apply different industrial engineering principles for productivity enhancement.
2. Design integrated systems in industrial engineering.
3. Develop a concept in identifying, planning, and deployment of man power.
4. Develop an inter personal and soft skills.
5. Identify the training needs of employs at different levels.
6. Analyze legal aspects of employment

Module	Contents	Hrs
01	<p>1.1 Introduction to Industrial Engineering (IE) : Definition, History and Development of IE, Present Scenario of IE, Contributions to IE, Activities and approaches of IE, Objectives and Functions of IE.</p> <p>Productivity: Definition, Productivity in Enterprise, Task of Management, Productivity of Materials, Land, Building, Machine and Power. Measurement of Productivity, Factors affecting productivity, Productivity Improvement likes 5s, Poka-Yoke, Kaizen, Kanban, Quality Improvement Techniques like QFD, FMEA, Ishikawa diagram, SMED</p> <p>1.2 Method Study: Objectives and procedure for methods analysis, Recording techniques, Micro motion and macro-motion study: Principles of motion economy, Normal work areas and work place design.</p> <p>1.3 Work Measurement: Objectives, Work measurement techniques - time study, work sampling, pre-determined motion time standards (PMTS) Determination of time standards. Observed time, basic time, normal time, rating factors, allowances, and standard time, Maynard's Operation Sequence Technique (MOST).</p> <p>1.4 Job Evaluation and Wage Plan: Objective, Methods of job evaluation, job evaluation procedure, merit rating (performance appraisal), method of merit rating, wage and wage incentive plans.</p>	14
02	<p>2.1 Value Analysis : An Overview Of Value Analysis -Concepts and approaches of value analysis and engineering - importance of value, Function - identity, clarify – analysis Evaluation of VE-Evaluation of function, Problem setting system, problem solving system, value analysis case studies, Effective organization for value work, function analysis system techniques- FAST diagram, Case studies.</p> <p>2.2 Ergonomics :</p>	10

	<p>Introduction: Inter disciplinary nature of ergonomics modern ergonomics human performance – information processing – factors affecting human performance – physical workload and energy expenditure.</p> <p>Workspace Design - Anthropometry – workspace design for standing and seated workers – Arrangements of components within a physical space – Interpersonal aspect of workplace design.</p> <p>Recent Advances and Trends - Legislative trends – Trends in work system design – occupational diseases – Application of Ergonomics’ in automobiles.</p>	
03	<p>3.1 Human Resource Management : Introduction to HRM and Management Thought, Historical Developments of HRD, HRD core functions and activities, Virtual HR –E-Recruiting, HRIS- Human Resource Information System, E-Training, Human Resource Planning, Job Analysis, Recruitment and selection, Steps and types of Training and Development, Promotion, Safety and OSHA standards for HR, Differences of HR with Personnel Management, Careers with HR.</p>	06
04	<p>4.1 Human Behaviour : Definition, Factors affecting human behaviour – Genetics, social norms, creativity, attitude, faith and culture, Group and Group behaviour.</p> <p>4.2 Motivation : Definition, Types of theories and models of motivation, Practical Applications of motivation – Employee morale, Employee recognition programs, Drug abuse, Education, Business and work engagement.</p>	06
05	<p>5.1 Decision Making : Introduction, Problem Analysis through Decision making tools, Characteristics of decision making, Steps in Rational decision making.</p> <p>5.2 Communication: Definition, Types, Historical Developments in communication, Barriers to communication, Introduction to Bio-communications, Noise and its types,</p> <p>5.3 Leadership: Definition, Leadership Theories, Leadership styles, Self – Leadership.</p>	06
06	<p>Industrial Relations : Introduction, Historic perspective, Industrial Relations today, Collective Bargaining, Trade Unions and Managing Conflicts, Labour Laws and Legislations, Importance of Industrial Relations, Objectives of Industrial Relations, Introduction to Factories Act, Industries Disputes Act, Salary and Wage Fixation and Workman Compensation Act, Employee Grievances, Redressal.</p>	08

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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**

Reference Books:

1. *Industrial Engineering and Production Management* -By M. Mahajan, Dhanpat Rai and Co.
2. *Human Resource Management*, Aswathapa. K, TMH,
3. Miles, L.D., "*Techniques of Value Engineering and Analysis*", McGraw Hill Book Company.
4. "*Industrial Engineering and Management*", Khanna, O.P., Dhanpat Rai and Sons.
5. *Personnel Management and Human Resources*, C.S. Venkataraman, B.K. Srivastava.
6. *Principles of Management*, P.C. Tripathi, P.N. Reddy.
7. *Organizational Behaviour*, Text and cases, Uma Sekaran.
8. *Factory Administration and Management*, A.S. Deshpande.
9. Bridger, R.S. "*Introduction to Ergonomics*", McGraw Hill.
10. Micormic, J. "*Human factors in Engineering and Design*", McGraw Hill,
11. *Work Study*, ILO, Geneva.

Course	Course Name	Credits
PEC803	Economics, Finance, Accounting and Costing	04

Objectives:

1. To acquaint with the concept of Micro and Macro Economics.
2. To familiarize with the concepts like comprehend the need, definition, functions and economic significance of financial institutions and markets.
3. To familiarize with the concept of Fiscal and Monetary Policy.
4. To acquaint with financial statements and Annual Reports of industries.
5. To familiarize with the concept of cost records / statements.

Outcomes: Learner will be able to...

1. Correlate various micro and macro-economic variables.
2. Analyze various market/business strategies.
3. Illustrate concept of Economic policies and their implications.
4. Demonstrate the roles played by various financial institutions/banks.
5. Analyze various accounting and costing practices.
6. Select best investment method.

Module	Contents	Hrs.
01	Introduction Definition of Economy, Central problems of an economy: what, how and for whom to produce; concepts of production possibility frontier and opportunity Cost. Economics, its scope and importance. Introduction to Micro and Macro Economics and their comparison.	04
02	Micro Economics Consumer's Behavior: meaning of utility, marginal utility and law of Diminishing Marginal Utility. Conditions of consumer's equilibrium using marginal utility analysis utility, law of demand and relation between law of demand & law of diminishing marginal utility. Producer's Behavior: law of supply, variation in supply, Types of elasticity of supply. Types of Market: perfect competition, pure competition, Monopoly.	04
03	Macro Economics Concept of National Income: Circular flow of income, Distinction between Gross and Net National Income. Different Methods of Measuring National Income, Definition of Money, Functions of Money, Value of Money and Different concepts of Money. Economic Policy: Monetary, Income and Fiscal Policies. Functions of Central Bank, Functions of Commercial Banks credit Creation, Credit Control Methods, Theory of Inflation, Concepts of Inflation, Effects of Inflation and Anti-inflationary policies.	04

04	<p>Financial Environment of Business: Financial Management-Sources of finance-long term and short term finance</p> <p>Working Capital Management:- Concept of working capital management, Cash Conversion Cycle, Management of stock ,overtrading</p> <p>Capital Markets</p> <p>Primary Market: Basics of capital market mechanism and instruments.</p> <p>Secondary Market: Basics of stock exchange and their role, Role of SEBI, Role of FIIs, MFs and Investment Bankers .Money Markets: Basics of Mon Mechanism, instruments, and institutions.</p> <p>An Overview of investment Appraisal Methods: NPV method, Payback method, discounted payback period method, IRR, Annual worth method.</p>	10
05	<p>Accounting Mechanics, Process and system: Introducing Book Keeping and Record Maintenance, The concept of Double entry and fundamental principles, Journal, Ledger, Trial Balance and Final accounts. Financial Analysis, Ratio Analysis and comparative balance sheet.</p> <p>Management Accounting: Understanding of Financial Statements (Overview), Interpreting Financial statements (overview).</p>	12
06	<p>Cost and Management Accounting Introduction to cost, Types of cost, Treatment of Overheads, Unit Costing (Cost Sheet), Joint Product Costing, Process Costing, Marginal Costing, Cost Volume Profit Analysis and Decision Making. Budgetary Controls, Standard Costing, concept and Importance of Depreciation and Methods of Depreciation.</p>	16

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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**

Reference Books:

1. *Managerial and Cost Accounting*, Larry M. Walther, Christopher J. Skousen.
2. *Corporate Finance Principles and Practices*, Denzil Watson & Tong Heads, Financial Time Pitman Publisher.
3. *Strategic Financial Management*, Robert Alan Hill.
4. *Basics of Accounting & Information Processing The Accounting Cycle*, Larry M. Walther, Christopher J. Skousen.
5. *Introduction to Managerial Accounting*, Larry M. Walther, Christopher J. Skousen.
6. *Essentials of Microeconomics*, Krister Ahlersten.
7. *Essentials of Macroeconomics*, Peter Jochumzen.
8. *Banking: An Introduction*, Dr. AP Faure, Rhodes University.
9. *Financial System: An Introduction*, Dr AP Faure, Rhodes University.
10. *Central Banking & Monetary Policy: An Introduction*, Dr. AP Faure, Rhodes University.

Course Code	Course Name	Credits
PEDLO8011	Product Design and Industrial Marketing	04

Objectives

1. To acquaint with various approaches in designing and developing new products.
2. To familiarize with various software solutions for designing and developing products.
3. To familiarize with modern approaches like concurrent engineering, product life cycle management, robust design, rapid prototyping / rapid tooling, etc.
4. To familiarize with characteristics of business markets, buying situations, trends in industrial marketing and relevant industrial strategies.

Outcomes: Learner will be able to...

1. Design and develop products right from the conceptual level.
2. Demonstrate concept of computer aided product design approach.
3. Illustrate various modern approaches like concurrent engineering, product life cycle management, robust design, rapid prototyping / rapid tooling.
4. Analyze products based on ergonomics and aesthetic aspects.
5. Apply appropriate strategies in industrial marketing.
6. Demonstrate various aspects related to Industrial Marketing Communication, Advertising, Sales promotion, Publicity Media Plan.

Module	Contents	Hrs.
01	<p>1.1. Introduction: Definition of product design, Classification of products, Design by evolution, Design by innovation, Product Mix, Various phases in product development and Design, Morphology of Design, Considerations in product design, Product specifications.</p> <p>1.2. Conceptual Design: Market research, Generation , Selection and Embodiment of concept, Product Architecture, Customer centric product designing</p> <p>1.3. Creativity: Role of creativity in problem solving, Vertical and lateral thinking, Brain storming, Synectics, Group working dynamics, Adaptation to changing scenarios in economics, social, cultural and technological fronts, Anticipation of new needs and aspirations.</p> <p>1.4. Materials: Overview of materials including new generation materials, Tailor made material concepts, Material selection process.</p>	06
02	<p>2.1. Design for manufacturing (DFM): Guidelines and Methodology, Producibility requirements, Accuracy and Precision requirements, Strength considerations in Design: Criteria and objectives, Designing for uniform strength, Designing for stiffness and rigidity, Practical ideas for material saving in design - ribs, corrugations, rim shapes, bosses, laminates, etc.</p> <p>2.2. Design for forged and Cast components, Design for Sheet Metal processed components, powder metallurgical components, Expanded metals and wire forms</p>	12

	<p>2.3. Designing with plastics: Mechanical behavior, special characteristics and considerations, Design concepts for product features to be manufactured by various production process technologies, Special considerations for designing of components for load bearing applications,</p> <p>2.4. Other DFX Principles : Designs for Maintainability, Safety, Reliability, Sustainable Design</p> <p>2.5. Design for Assembly (DFA): DFA Index, Analysis of assembly requirements, Standardization, Ease of Assembly and disassembly, Design for bolted, welded and riveted components, Design for hinge and snap fit assemblies, maintenance, consideration of handling and safety, Modular concepts.</p>	
03	<p>3.1. Product Ergonomics: Anthropometry, Environmental conditions, thermal, noise, vibration, displays, illusions, Psycho and psychological aspects in design, Man-machine information exchange.</p> <p>3.2. Product Aesthetics: Visual awareness, Form elements in context of product design, Concepts of size, shape and texture, Introduction to colour and colour as an element in design, Colour classifications and dimensions of colour, Colour combinations and colour dynamics, Interaction / communication of colours, Psychological aspects of colours, generation of products forms with analogies from nature.</p> <p>3.3. Product Graphics: Graphics composition and layout, Use of grids in graphics composition, Study of product graphics and textures.</p>	06
04	<p>4.1. Value Engineering: Product value and its importance, Value analysis job plan, Steps to problem solving and value analysis, Value analysis tests, Value Engineering idea generation check list, Material and process selection in value engineering, Cost reduction, case studies and exercises.</p> <p>4.2. Software solutions: Software for drafting, modeling, assembly, detailing, CAM interfacing, Rapid tooling/rapid prototyping, etc.</p> <p>4.3. Modern Applications: Concurrent Engineering, Robust Design, Additive Manufacturing/Rapid Prototyping, Product Life Cycle Management techniques and application areas.</p>	08
05	<p>Introduction to Industrial Marketing, Understanding Industrial Markets, Nature of Industrial Buying, Industrial Market Segmentation, New Products and Established product strategies, Resource based and Value based strategy, Industrial Pricing: Price Determinants, Pricing Policies, Pricing Decisions, Pricing - Value based and Competition based.</p>	08
06	<p>6.1. Industrial Marketing Channels: Channel participants, Channel effectiveness, Marketing logistics, Physical Distribution and Marketing Strategy, Value added market channels</p> <p>6.2. Industrial Marketing Communication, Advertising, Sales promotion, Publicity Media Plan, Integrated Promotion Plan, Industrial Sales force Management, Technical Support for Marketing – customer technical services and feedback.</p>	08

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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 Books:

1. *Product Design & Development*, Karl Ulrich, Steven Eppinger,
2. *Design Fundamentals*, R. G. Scott.
3. *Design methods inter science*, Jomes.
4. *Creative Engineering Design*, Buhl H. R.
5. *The Science of Engineering Design*, Holt, Hill Percy H.
6. *Ergonomics*, Merilyn Joyce, Ulrika Waller Steiner.
7. *Human Factors in Engineering & Design*, 4th edition
8. *Human Engineering Guide & Equipment Design*, Morgon C. T. & Others
9. *Barron D.ed, Creativity*, New York, Art Directors
10. *Design for Production*, Baldwin E. W. & Niebel B. W. Edwin, Homewood Illinois.
11. *Industrial design of plastic products*, Gordon, 2003
12. *Plastics Engineered Product Design*, Rosato, 2001
13. *Industrial Marketing Analysis, Planning and control* , Robert R Reeder, Edward G Brierty, Betty H Reeder, Prentice Hall India
14. *Industrial Marketing*, Havalder, Krishna K, Tata McGraw Hill, New Delhi.
15. *Industrial Marketing*, P.K.Ghosh, Oxford University Press, New Delhi.

Course Code	Course Name	Credits
PEDLO8012	World Class Manufacturing	04

Objectives

1. To familiarize with the concepts of Business excellence and competitiveness.
2. To acquaint with the business challenges and the future manufacturing competition.
3. To acquaint with the current trends of manufacturing scenario at domestic and global level.

Outcomes: Learner will be able to ...

1. Illustrate relevance and basics of World Class Manufacturing.
2. Co-relate factors of competitiveness and performance measures with respect to benchmarking.
3. Apply productivity tools for world class manufacturing.
4. Demonstrate Human Resource Managerial approaches for value addition.
5. Analyze the current Status of Indian Manufacturing scenario.
6. Design and develop a roadmap to achieve world class manufacturing status for industries.

Module	Contents	Hrs.
01	Historical Perspective World class Excellent organizations–Models for manufacturing excellence: Schonberger, Halls, Gunn and Maskell models, Business Excellence.	06
02	Benchmark, Bottlenecks and Best Practices Concepts of benchmarking, Bottleneck and best practices, Best performers – Gaining. Competitive edge through world class manufacturing – Value added manufacturing – Value. Stream mapping - Eliminating waste –Toyota Production System – Example.	08
03	System and Tools for World Class Manufacturing [8hrs] Improving Product & Process Design – Lean Production – SQC, FMS, Rapid Prototyping, PokaYoke, 5-S, 3M, JIT, Product Mix, Optimizing, Procurement & stores practices, Total Productive maintenance, Visual Control.	08
04	Human Resource Management in WCM Adding value to the organization– Organizational learning – techniques of removing Root cause of problems–People as problem solvers–New organizational structures. Associates–Facilitators–Teams manship– Motivation and reward in the age of continuous improvement.	06
05	Typical Characteristics of WCM Companies Performance indicators like POP, TOPP and AMBITE systems– what is world class Performance –six Sigma philosophies	08
06	Indian Scenario Case studies on leading Indian companies towards world class manufacturing –Task Ahead. Green Manufacturing, Clean manufacturing, Agile manufacturing with applications of Timers and Counters and concept of Flag and latching.	12

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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**

Reference Books:

1. Sahay B.S., Saxena KBC. and Ashish Kumar, “*World Class Manufacturing – Strategic Perspective*”, Mac Milan Publications, New Delhi.
2. Korgaonkar M.G., “*Just In Time Manufacturing*”, MacMilan Publications.
3. Narayanan V.K., “*Managing Technology and Innovation for Competitive Advantage*”, Prentice Hall, 2000.
4. Adam and Ebert, “*Production and Operational Management*”, 5th Edition, Prentice Hall learning pvt. Ltd., New Delhi.
5. Ron Moore, “*Making Common Sense Common Practice – Models for Manufacturing excellence*”, Butter worth Heinmann.
6. Jeffrey K.Liker, “*The Toyota Way – 14 Management Principles*”, Mc-Graw Hill, 2003.
7. Chase Richard B., Jacob Robert., “*Operations Management for Competitive Advantage*”, 11th Edition, McGraw Hill Publications, 2005.
8. Moore Ron, “*Making Common Sense Common Practice*”, Butterworth-Heinemann, 2002.
9. Womack J.P., Jones D.T., “*Machine That Changed The World: The Story of Lean Production*”, Harper Perennial, 1991.

Course Code	Course Name	Credits
PEDLO8013	Logistics and Supply Chain Management	04

Objectives:

1. To acquaint with the concept of key drivers of supply chain performance and their inter-relationships with strategy.
2. To impart analytical and problem solving skills necessary to develop solutions for a variety of supply chain management.
3. To acquaint with the design problems and develop an understanding of information technology in supply chain optimization.
4. To acquaint with the complexity of inter-firm and intra-firm coordination in implementing programs such as e-collaboration, quick response, jointly managed inventories and strategic alliances.

Outcomes: Learner will be able to:-

1. Demonstrate the functional strategy map of supply chain management.
2. Design supply chain strategy of a firm.
3. Demonstrate concepts and ideas related to Materials management.
4. Illustrate various aspects pertaining to logistics for any organization.
5. Demonstrate activities of business logistics.
6. Use technology to change logistics and supply chain management.

Module	Contents	Hours
01	<p>Building a Strategic Framework to Analyse Supply Chains Building a Strategic Framework to Analyse Supply Chains Understanding the Supply Chain: What Is a Supply Chain?, The Objective of a Supply Chain, The Importance of Supply Chain Decisions, Decision Phases in a Supply Chain, Process Views of a Supply Chain, Examples of Supply Chains. Supply Chain Performance- Achieving Strategic Fit and Scope: Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope, Obstacles to Achieving Strategic Fit Supply Chain Drivers and Metrics: Drivers of Supply Chain Performance, Framework for Structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing, Pricing</p>	10
02	<p>Designing the Supply Chain Network Designing the Supply Chain Network, Designing Distribution Networks and Applications to e-business: The Role of Distribution in the Supply Chain, Factors Influencing Distribution Network Design, Design Options for a Distribution Network, E-Business and the Distribution Network, Distribution Networks in Practice.</p>	06
03	<p>Designing and Planning Transportation Networks Transportation in a Supply Chain: The Role of Transportation in a Supply Chain, Modes of Transportation and Their Performance Characteristics, Transportation Infrastructure and Policies, Design Options for a Transportation Network, Trade-Offs in Transportation Design, Tailored Transportation, The Role of IT in Transportation, Risk Management in Transportation, Making Transportation Decisions in Practice.</p>	08

04	<p>4.1 Designing Global Supply Chain Networks Designing Global Supply Chain Networks, The Impact of Globalization on Supply Chain Networks: The Offshoring Decision: Total Cost, Risk Management in Global Supply Chains, The Basic Aspects of Evaluating Global Supply Chain Design, Evaluating Network Design Decisions Using Decision Trees, Evaluation of Global Supply Chain Design, Decisions Under Uncertainty, Making Global Supply Chain Design, Decisions Under Uncertainty in Practice.</p> <p>4.2 Managing Cross-Functional Drivers in a Supply Chain Sourcing Decisions in a Supply Chain: The Role of Sourcing in a Supply Chain, In-House or Outsource, Third and Fourth-Party Logistics Providers, Supplier Scoring and Assessment, Supplier Selection-Auctions and Negotiations, Contracts, Risk Sharing, and Supply Chain Performance, Design Collaboration, The Procurement Process, Sourcing Planning and Analysis, The Role of IT in Sourcing, Risk Management in Sourcing, Making Sourcing Decisions in Practice.</p>	08
05	<p>IT in a Supply Chain Information Technology in a Supply Chain: The Role of IT in a Supply Chain, The Supply Chain IT Framework, Customer Relationship Management, Internal Supply Chain Management, Supplier Relationship Management, The Transaction Management Foundation, The Future of IT in the Supply Chain, Risk Management in IT, Supply Chain IT in Practice</p>	06
06	<p>Coordination in a Supply Chain Coordination 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, Building Strategic Partnerships and Trust Within a Supply Chain, Continuous Replenishment and Vendor-Managed Inventories, Collaborative Planning, Forecasting, and Replenishment (CPFR), The Role of IT in Coordination, Achieving Coordination in Practice. Reverse logistics: Reasons, Role, Activities; RFID systems: Components, Applications, Implementation; Lean supply chain, Implementation of Six Sigma in supply chain, Basics of Green supply chain management.</p>	08

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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**

Reference Books:

1. *Supply Chain Management–Strategy, Planning & Operation*. Sunil Chopra & Peter Meindl, Pearson Education Asia, 2001, ISBN: 81-7808-272-1.
2. *Supply Chain Redesign–Transforming Supply Chains into Integrated Value Systems*. Robert B Handfield, Ernest L Nichols, Jr., Pearson Education Inc, 3rd Edition (3rd Impression), 2007, ISBN: 81-317- 0401-7
3. *Modelling the Supply Chain -Jeremy F Shapiro, Duxbury, Thomson Learning, 2002, ISBN 0-534-37363* 3. *Designing & Managing the Supply Chain*. David Simchi Levi, Philip Kaminsky & Edith Simchi Levi; Mc Graw Hill
4. *Supply Chain Redesign: Transforming Supply Chains into Integrated Value Systems*, Robert B Handfield, Ernest L Nicholas.
5. *The Management of Business Logistics: A Supply Chain Perspective*, Coyle, Bardi, Langley

Course Code	Course Name	Credits
PEDLO8014	Plant Engineering	04

Objectives:

1. To acquaint with various plant organizing functions.
2. To familiarize with various type of maintenance work and systems in a plant.
3. To acquaint with various methods of pollution control, noise control and vibration control.
4. To acquaint with concept of energy conservation programs.

Outcomes:-Learner will be able to...

1. Illustrate various organization of plant engineering.
2. Apply of heating, ventilating and air conditioning system.
3. Demonstrate process of material handling systems in plant engineering
4. Demonstrate various operational and safety aspects.
5. Illustrate concepts of pollution control, noise control, vibration control and fire control methods.
6. Apply energy conservation programs.

Module	Contents	Hours
01	Organization of the plant engineering function, the role of first line supervisor, design of plant engineering organization-Classification of maintenance work, computer based maintenance, predictive maintenance, reliability centered maintenance, integrated system. Standalone system. Ventilation and air-conditioning, Sanitation control and housekeeping. Electric system management, Reliability, power quality, utility rate structures.	10
02	Producer Gas Plants-operation and safety aspects in P.G. Compressor and Oxygen plants.	04
03	Applications of heating, ventilating and air conditioning system- General considerations, occupancies, exhaust systems. Communication and computer networks- The network, hardware, backing up data. peripherals, environment, security	04
04	Material handling Planning Solving material handling problems, justification of material handling projects. Material handling containerization -AS and RS (Automatic Storage and Retrieval System)-AGV and robotics- piping system design and components- Pollution control Regulatory requirement, emission safety, emission control methods and plant safety Lighting Determining lighting criteria, determining light source requirement, utilize multiple designs	10
05	Noise control – Occupational noise control limits, occupational hearing conservation requirement, Human response to noise, control of plant noise, computer modelling, measurement and instrumentation. Vibration control-	10

	<p>Characterization of vibrations, causes of vibrations, effects of vibration, the need for vibration control, vibration control strategy.</p> <p>Fire control The nature of fire, The plant fire problem: causes and prevention, plant fire hazards, fire hazards of materials, design and construction for fire safety, fire detection and alarm system, special agent suppression systems, portable fire extinguishers, codes and standards.</p>	
06	<p>Energy Conservation- Energy conservation program preparation. Determining energy conservation potential, refining the problem, implementation, savings maintenance.</p> <p>Lubrication and corrosion- Synthetic and solid lubricants -lubrication systems - causes and control deterioration - paints and protective coatings</p>	10

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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**

Reference Books:

1. *1.Lindley and Higgins, "Maintenance Engineers Hand Book", 7th Edition, McGraw Hill Professional, 2008.*
2. *2. Rosaler, R.C. "Standard HandBook of Plant Engineering", 3rd Edition, McGraw Hill, 2002.*

Course Code	Course Name	Credits
PEDLO8015	Process Control and Instrumentation	04

Objectives:

1. To familiarize with various measuring instruments and methods of measurements of important process parameters.
2. To acquaint with the principles of automation and automatic process control techniques.
3. To familiarize with concepts of measurement and automatic process control related to specific industrial applications.

Outcomes: Learner will be able to...

1. Illustrate basic principles of working and error estimation of measuring instruments.
2. Select various measuring instruments.
3. Illustrate basics of automatics control and control modes.
4. Measure process parameters.
5. Apply automatic process control approaches to various industrial application areas.
6. Identify Industrial applications of process control techniques.

Module	Contents	Hrs
01	Basics of instruments: Types of measurements, classification, types of measuring instruments, constructional and design features, performance characteristic. Generalised configuration of a measurement systems.	05
02	Measurements of process parameters (Temperature and pressure): 2.1 Temperature measurement: sensors for temperature measurement – Thermistor, Thermocouple and Resistance Temperature Detectors. Solid and liquid expansion thermometers, Radiation and optical pyrometers. 2.2 Pressure measurement: pressure sensors, Elastic Electrical and Inductance type pressure transducers, Barometer, Manometers – Types and comparisons, Differential pressure measurement, vacuum measurement, Pressure gauges – Types.	10
03	Measurements of Process Parameters (Level, Flow, and Humidity) 3.1 Level and density Measurement: Direct Level measurement – Point contact, Gauge glass and buoyancy methods. Indirect Level measurement – Hydrostatic, capacitance, radiation and ultrasonic methods. Density measurement techniques. 3.2 Flow measurement: Flow measuring methods, head flow measurements – Orifice plate, Venturi-tube flow nozzle and pitot tubes- applications and sources of errors. Variable area flow measurement – Rotameter and valve type area meter, Electromagnetic flow meter, Flow integrators, Positive displacement flow meters – types, Velocity Flow meter and turbine flow meters. 3.3 Humidity measurement: measurement of humidity using psychrometer and hygrometer (Mechanical and Electrical types), Moisture measurement in solids.	10

04	Automatic process control: Fundamentals of automatic process control, Process dynamics – process response, process time tags, types of lags- capacitance, resistance, transportation and inertia lag, Process classification – first order and second order systems.	06
05	Automatic control and control modes: 5.1 Automatic control: block diagram, feedback and feedback forward control, servo and regulator operations, Controlling of batch and continuous process. 5.2 Control modes: classification of controllers, ON-OFF control; Proportional (P) control; Integral (I) control; Differential (D) control; P & I control; P & D control; P, I & D control, Selection of control modes. ISA (instrumentation society of America) codes and flow-plan symbols; Typical instrumentation symbols.	10
06	Industrial Application of process control: Examples of control systems used for measurement and control of – Temperature, Pressure, Level and Flow. Ratio Control and Cascade control. Alarm systems and indications, Basic concepts of telemetry and telecontrol of operations.	07

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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**

Reference Books:

1. *Fundamentals of industrial instrumentation and process control*, William C. Dunn, TMH.
2. *Process/ industrial instruments and controls handbook*, Gregory Mc-Millian, TMH.
3. *Instrumentation and process control*, Anandan Prasad M.; N. Jayaswal; Vishnu Priye; I. K. international publisher.
4. *Instrumentation for process measurement and control*, Anderson, Taylor and Francis Publisher.
5. *Process control*, Peter Harriott, TMH.
6. *Trends in process instrumentation and control*, Agashe, Ceneage publication.
7. *Process control and instrumentation technology*, Curtis D. Johnson, Pearson publication.

Course Code	Course Name	Credits
ILO 8021	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: 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)	5
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.	6
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).	8
04	Planning Projects: Crashing project time, Resource loading and levelling, 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	6
05	5.1 Executing Projects: Planning monitoring and controlling cycle, Information needs and reporting, engaging with all stakeholders of the projects, Team management, communication and project meetings 5.2 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 5.3 Project Contracting Project procurement management, contracting and outsourcing,	8

06	<p>6.1 Project Leadership and Ethics: Introduction to project leadership, ethics in projects, Multicultural and virtual projects</p> <p>6.2 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>	6
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Assessment:

Internal Assessment for 20 marks:

Consisting Two Compulsory Class Tests

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End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

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4. Only **Four questions need to be solved**

REFERENCES:

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

Course Code	Course Name	Credits
ILO 8022	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: 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>	06
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>	06
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>	09
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>	10
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>	05

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	03
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Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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
ILO8023	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: 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	04
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	09
03	Women's Entrepreneurship Development, Social entrepreneurship-role and need, EDP cell, role of sustainability and sustainable development for SMEs, case studies, exercises	05
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	08
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	05

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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 TN Chhabra, Entrepreneurship Development, Sun India Publications, New Delhi
4. Dr CN Prasad, Small and Medium Enterprises in Global Perspective, New century Publications, New Delhi
5. Vasant Desai, Entrepreneurial development and management, Himalaya Publishing House
6. Maddhurima Lall, Shikah Sahai, 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. Laghu Udyog Samachar
11. www.msme.gov.in
12. www.dcmesme.gov.in
13. www.msmetraining.gov.in

Course Code	Course Name	Credits
ILO8024	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 behavioural skills in an organizational setting required for future stable engineers, leaders and managers

Outcomes: 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 behavioural skills learnt and integrate it with in inter personal and intergroup environment emerging as future stable engineers and managers.

Module	Detailed Contents	Hrs
01	<p>Introduction to HR</p> <ul style="list-style-type: none"> • 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 	5
02	<p>Organizational Behaviour (OB)</p> <ul style="list-style-type: none"> • Introduction to OB Origin, Nature and Scope of Organizational Behaviour, 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 Behaviour • Motivation: Theories of Motivation and their Applications for Behavioural Change (Maslow, Herzberg, McGregor); • Group Behaviour 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 	7
03	<p>Organizational Structure & Design</p> <ul style="list-style-type: none"> • 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. 	6

04	<p>Human resource Planning</p> <ul style="list-style-type: none"> • Recruitment and Selection process, Job-enrichment, Empowerment - Job-Satisfaction, employee morale • Performance Appraisal Systems: Traditional & modern methods, Performance Counselling, Career Planning • Training & Development: Identification of Training Needs, Training Methods 	5
05	<p>Emerging Trends in HR</p> <ul style="list-style-type: none"> • 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 	6
06	<p>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)</p> <p>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</p> <p>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</p>	10

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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 edition, 2011
4. C. B. Mamoria and S V Gankar, Dynamics of Industrial Relations in India, 15th Ed, 2015, Himalaya Publishing, 15thedition, 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
ILO8025	Professional Ethics and Corporate Social Responsibility (CSR)	03

Objectives:

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

Outcomes: 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	04
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	08
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.	06
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	05
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	08
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.	08

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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
ILO8026	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: 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 1.1 Research – Definition; Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle. Research methods vs Methodology 1.2 Need of Research in Business and Social Sciences 1.3 Objectives of Research 1.4 Issues and Problems in Research 1.5 Characteristics of Research: Systematic, Valid, Verifiable, Empirical and Critical	09
02	Types of Research 2.1. Basic Research 2.2. Applied Research 2.3. Descriptive Research 2.4. Analytical Research 2.5. Empirical Research 2.6 Qualitative and Quantitative Approaches	07
03	Research Design and Sample Design 3.1 Research Design – Meaning, Types and Significance 3.2 Sample Design – Meaning and Significance Essentials of a good sampling Stages in Sample Design Sampling methods/techniques Sampling Errors	07
04	Research Methodology 4.1 Meaning of Research Methodology 4.2. Stages in Scientific Research Process: a. Identification and Selection of Research Problem b. Formulation of Research Problem c. Review of Literature d. Formulation of Hypothesis e. Formulation of research Design f. Sample Design g. Data Collection h. Data Analysis i. Hypothesis testing and Interpretation of Data j. Preparation of Research Report	08
05	Formulating Research Problem 5.1 Considerations: Relevance, Interest, Data Availability, Choice of data, Analysis of data, Generalization and Interpretation of analysis	04
06	Outcome of Research 6.1 Preparation of the report on conclusion reached	04

	6.2 Validity Testing & Ethical Issues	
	6.3 Suggestions and Recommendation	

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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
ILO8027	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: 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	Hr
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	05
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.	07
03	Emerging Issues in IPR: Challenges for IP in digital economy, e-commerce, human genome, biodiversity and traditional knowledge etc.	05
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	07
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.)	08
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	07

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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.**

REFERENCE BOOKS:

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. Lous Harns, 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 Radha Krishnan & 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
ILO 8028	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: The 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 content	Hours
1	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,	09
2	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	06
3	Digital Business Support services: ERP as e –business backbone, knowledge Tope Apps, Information and referral system Application Development: Building Digital business Applications and Infrastructure	06
4	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	06
5	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)	04
6	Materializing e-business: From Idea to Realization- Business plan preparation Case Studies and presentations	08

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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, ELSVIER, 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
ILO8029	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: 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	10
02	Global Environmental concerns : Global Warming, Acid Rain, Ozone Depletion, Hazardous Wastes, Endangered life-species, Loss of Biodiversity, Industrial/Man-made disasters, Atomic/Biomedical hazards, etc.	06
03	Concepts of Ecology: Ecosystems and interdependence between living organisms, habitats, limiting factors, carrying capacity, food chain, etc.	05
04	Scope of Environment Management, Role and functions of Government as a planning and regulating agency Environment Quality Management and Corporate Environmental Responsibility	10
05	Total Quality Environmental Management, ISO-14000, EMS certification.	05
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.	03

Assessment:

Internal Assessment for 20 marks:

Consisting **Two Compulsory Class Tests**

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions, each carrying 20 marks**
2. **Question 1** will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if 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
6. Introduction to Environmental Management, Mary K Theodore and Louise Theodore, CRC Press
7. Environment and Ecology, Majid Hussain, 3rd Ed. Access Publishing.2015

Course Code	Course Name	Credits
PEL801	Fluid Power Automation Laboratory	01

Objectives:

1. To familiarize with software based pneumatics, electro-pneumatics and PLC circuits' simulation.
2. To familiarize with setup and execution of pneumatics, electro-pneumatics and PLC circuits on an experimental kit.

Outcomes: The learner will be able to...

1. Design & Simulate Pneumatic, Electro-Pneumatic and PLC based circuits on any compatible software.
2. Setup and execute Pneumatic, Electro-Pneumatic and PLC based circuits on an experimental kit.
3. Design & Simulate PLC based circuits (Ladder Diagram) on any compatible software.
4. Set up and execute Pneumatic circuits on an experimental kit.
5. Set up and execute electro-pneumatic circuits on an experimental kit.
6. Set up and execute PLC based circuit on an experimental kit.

Sr no	Circuit Design/Assignment
01	Designing & Simulation of two pneumatic circuits on any compatible software.
02	Designing & Simulation of two electro-pneumatic circuits on any compatible software.
03	Designing & Simulation of two PLC based circuits (Ladder Diagram) on any compatible software.
04	Two Pneumatic circuits Setup and execution on experimental kit.
05	Two Electro-Pneumatic circuits Setup and execution on experimental kit.
06	Two PLC based circuits Setup and execution on experimental kit.

Term Work:

Term work shall consist of exercises listed in the above list

The distribution of marks for term work shall be as follows:

Circuit Simulation : **10** marks

Circuit Setup and Execution : **10** marks

Attendance : **05** marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Practical/Oral Exam:

The practical/Oral exam shall consists of the following;

Circuit Simulation: one problem : **15** marks

Circuit Setup and Execution: one problem : **10** marks

Course Code	Course Name	Credits
PEL802	Industrial Engineering and Human Resource Management Laboratory	01

Objectives

1. To familiarize with the concepts like Design, develop, implement, and improve integrated systems.
2. To acquaint with basic philosophy of enhancing effectiveness of the human resource potential of their organization.

Outcomes learner will be able to...

1. Apply different industrial engineering principles for productivity enhancement.
2. Develop an integrated systems.
3. Develop skills in identifying, planning, and deploying of man power.
4. Develop inter personal and soft skills.
5. Develop skills in identifying training needs of employs at different levels.
6. Apply legal aspects of employment.

Sr. No.	List of Assignments (any Five assignments)
1	Exercise on Decision Making process in solving a chosen problem.
2	Exercise on a Case analysis of Human Behavior at work place.
3	Exercise on any one of the Time Measurement techniques.
4	Exercise on Assessment of Leadership Quality.
5	Exercise on a case study on Value Analysis.
6	Exercise on Ergonomic Design of a part / product.
7	Presentation on current scenario of Industrial Relations.

Term Work

Term work shall consist of at least 5 assignments from above list.

The distribution of marks for term work shall be as follows:

Assignments : 20 Marks

Attendance (Theory and Practical) : 05 Marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Oral Examination

1. Examiners are expected to evaluate learner's practical understanding of fundamental skills involved in the field of Industrial Engineering as well his/her grasp of the knowledge of Human Resources, being a very crucial and critical resource in modern firms. The oral examination should be conducted broadly based on the practical significance of the syllabus.
2. The distribution of marks for oral examination shall be as follows:
3. Oral25 marks

Course Code	Course Name	Credits
PEL803	Economics, Finance, Accounting and Costing Tutorial	01

Objectives:

1. To acquaint the students with the concepts of Micro and Macro Economics.
2. To enable the students to comprehend the need, definition, functions and economic significance of financial institutions and markets.
3. To familiarize the students with the concept of Fiscal and Monetary Policy.
4. To acquaint the students with financial statements and Annual Reports of industries.
5. To familiarize the students with cost records / statements.

Outcomes: Learner should be able to...

1. Correlate various micro and macro-economic variables.
2. Illustrate economic policies and their implications.
3. Get familiarized with the roles played by various financial institutions/banks.
4. Get exposure to various business strategies.
5. Get familiarized with accounting and costing practices.
6. Get an exposure to wider intricacies of financial management.

List of Assignments

Sr. No.	List of Assignments
01	An assignment on Micro and Macro Economics.
02	An assignment on Financial Management.
03	An assignment on Job Costing
04	Assignment on Marginal Costing.
05	Assignment on Standard Costing.
06	Assignment on Process Costing.

One assignment each on the above mentioned list of assignments and a Mini Project based on the syllabus in the subject of Economics, Finance, Accounting and Costing. Students have to present the mini project in a group of 3-4. Some areas suggested are as follows:-

- a. Study of annual report and final accounts of a company (currently active) and comment upon the financial aspects of the firm.
- b. Making of a profit & loss statement and Balance sheet of any firm using hypothetical data /actual data and presentation of same.
- c. Any other mini project based on the subject syllabus.

Assignments	: 10 Marks
Mini Project	: 10 Marks
Attendance	: 05 Marks
Total	: 25 Marks